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COAST GUARD

CHRIS

Hazardous Chemical Data

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Stock Number 050-012-00147-2

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DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

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COMDTINST M16465.12

11 SEP 1978

• COMMANDANT INSTRUCTION M16465.12 (old CG-446-2)

Subj: Manual Two of the Chemical Hazards Response Information System (CHRIS)

1. PURPOSE. This revision adds 500 chemicals, corrects errors, and adds new data to CHRIS. A further expansion from the present 900 to approximately 1000 chemicals will be made in the future. This manual provides the On-Scene Coordinator or other officials with some of the technical information necessary to properly respond to discharges of hazardous chemicals. The information provided in this manual may also be used for contingency planning and orientation. This manual is one part of CHRIS and is fully effective only when used in conjunction with the other system elements, COMDTINST's M16465.11, .13 and .14 (series).
2. DIRECTIVES AFFECTED. Manual Two of the Chemical Hazards Response Information System (CG-446-2) is hereby cancelled. ✓
3. ACTION. District Commanders and appropriate unit commanding officers shall ensure that proper training in the use of CHRIS is conducted frequently for all response personnel.
4. CHANGES. The submittal of recommended changes and corrections to COMMANDANT (G-WEP) is encouraged.

Distribution: (SDL No. 107)

A: None
B: n(MES School) (75); e(40); o(10); c(mep)(6); t(3); bq(2); p(1)
C: e(5); g(3); m(1)
D: b(15); g(1)
E: o(7); bn(1)
F: bk(1)

RECORD OF CHANGES

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1. INTRODUCTION

→ The Chemical Hazard Response Information System (CHRIS) is designed to provide information needed for decision-making by responsible Coast Guard personnel during emergencies that occur during the water transport of hazardous chemicals. CHRIS also provides much information that can be used by the Coast Guard in its efforts to achieve better safety procedures and so prevent accidents.

CHRIS consists of four handbooks or manuals, a hazard assessment computer system (HACS), and technical support personnel located at Coast Guard headquarters. These components and their relations to one another are described in Section 2 of this manual.

↖

2. COMPONENTS OF CHRIS

2.1 A CONDENSED GUIDE TO CHEMICAL HAZARDS

The Condensed Guide contains information needed to help personnel make the proper *response* in an emergency situation; it is the only CHRIS handbook that will be carried to the actual scene of an accident. It is intended for use by port security personnel and others who may be the first to arrive at the site of an accidental discharge or fire and who need readily available and easily understood information about the hazardous properties of the chemical involved. It will be used to determine the proper actions that should be taken immediately to safeguard life and property and to prevent contamination of the environment.

The Condensed Guide briefly describes the chemical and biological hazards of various materials so that personnel at the scene of an accident can assess the danger and consider the appropriate large-scale response. It also lists the on-scene information needed for proper use of the Hazard Assessment Handbook. Selected information on each chemical covered by CHRIS is summarized from the more extensive material in the Hazardous Chemical Data Manual and is presented on a single page.

2.2 HAZARDOUS CHEMICAL DATA

This manual is the cornerstone of CHRIS. For each substance, it lists the specific chemical, physical, and biological data needed for the preparation and use of the other components of the system. It can also be used after the initial response action, when there is sufficient time to use more detailed information.

The Hazardous Chemical Data Manual is intended for use primarily by the On-Scene Coordinator (OSC) and by Regional and National Response Centers for devising, evaluating, and carrying out response plans.

Much of the quantitative information found in the Hazardous Chemical Data Manual is needed for the hazard assessment calculations described in the Hazard Assessment Handbook. The Hazardous Chemical Data Manual contains the so-called Hazard Assessment Code which directs the user of the Hazard Assessment Handbook to the appropriate calculation procedure. The Hazardous Chemical Data Manual also suggests general responses to an accidental discharge which summarize the detailed information given in the Response Methods Handbook.

2.3 HAZARD ASSESSMENT HANDBOOK (CG-446-3)

The Hazard Assessment Handbook describes procedures to be used for estimating the quantity of a hazardous chemical that may be released accidentally during shipment. It also describes how to estimate its concentration in air and in water as a function of time and distance from the discharge. Methods for predicting the resulting toxicity, fire, and explosion effects are also described. The calculations use data from the Hazardous Chemical Data Handbook.

2.4 HAZARD ASSESSMENT COMPUTER SYSTEM

The Hazard Assessment Computer System (HACS) is a computerized version of the Hazard Assessment Handbook. It permits trained headquarters specialists to obtain very detailed hazard evaluations quickly, when requested by OSC personnel. Methods for using HACS are described in the Hazard Assessment Handbook.

Although HACS and the Hazardous Chemical Data Handbook are based on the same original body of data, differences will occasionally arise because HACS is more readily updated than the printed manual.

2.5 RESPONSE METHODS HANDBOOK

The Response Methods Handbook is written specifically for Coast Guard OSC personnel who have had some training or experience in hazard and pollution response. The handbook describes cautionary and corrective response methods for reducing and eliminating hazards that result from chemical discharge.

Although general types of response are suggested in the Hazardous Chemical Data Handbook, the specific response, to be chosen from among those described in the Response Methods Handbook, should be determined by the results from the Hazard Assessment Handbook.

2.6 REGIONAL DATA BASE

The Coast Guard's Regional Contingency Plans, although not considered a part of CHRIS, are an important adjunct to the system. Each Regional Contingency Plan contains a section (Annex XX) that presents data on a specific region, sub-region, or locale. These data, which are intended for use by OSC personnel, include such information as the following:

- An inventory of physical resources and strike forces;
- Vulnerable or exposed resources (critical water-use areas);
- Potential pollution sources;
- Geographic and environmental features;
- Cooperating organizations;
- Recognized experts with identified skills.

3. EXPLANATION OF TERMS

This section explains the special terms used in the data sheets in Section 11, gives the sources of specific items, and includes other information that will be useful to the reader in interpreting the data. The paragraphs below are keyed to the relevant portions of Section 11 by the subheading and number used in the data sheets.

The expression "Not pertinent" means that the data item either has no real meaning (such as the flash point of a nonflammable chemical) or is not required for assessing a hazardous situation. The expression "Data not available" means that the information sought was not found in the general or specialized data sources listed in Section 10 of this manual. In a few cases where important data were not available, values were estimated by usually reliable procedures: all such values are labeled "(est.)". If more accurate values for those items are found, they will be included in later revisions.

The *name* used for each of the chemicals included in the CHRIS manuals is either (1) that specified in the Code of Federal Regulations, Title 46, Table 151.01-10(b) (Compounds Regulated by Subchapter O) and Table 151.01-10(d) (Compounds to be Regulated by Subchapter D) or (2) a common name for those chemicals not now regulated by Subchapters O and D but known to be hazardous during shipment. The data sheets are arranged in alphabetical order by chemical name, not by the 3-letter code.

The *3-letter code* is designed to facilitate correct identification of chemicals in oral or written communication. The code should be used only *in addition* to the compound name: it should not be used alone. For transmitting the code, use the phonetic alphabet given in the "International Code of Signals."

1. RESPONSE TO DISCHARGE

In every case of a discharge or leak, it is obvious that an effort should be made to reduce, stop, or contain the flow of material at its source if this can be done safely. The purpose of the terms used in this section is to describe in a general way the cautionary and corrective responses that are described in greater detail in the Response Methods Handbook.

- "*Issue warning*" is used when the chemical is a *poison*, has a *high flammability*, is a *water contaminant*, is an *air contaminant* (so as to be hazardous to life), is an *oxidizing material*, or is *corrosive*. In the Response Methods Handbook the italicized properties are the bases for cautionary responses to restrict ignition, and to restrict contaminated water for human use, farm use, and industrial use.

- "*Restrict access*" is used only for those chemicals that are unusually and immediately hazardous to personnel unless they are protected properly by gas masks, eye goggles, protective clothing, etc. In the Response Methods Handbook this cautionary response is sometimes used in a broader sense to ensure exclusion of spectators and others who might ignite flammable compounds.
- "*Evacuate area*" is used primarily for unusually poisonous chemicals or those that ignite easily. The same expression is used in the Response Methods Handbook for this cautionary response.
- "*Mechanical containment*" is used for water-insoluble chemicals that float and do not evaporate readily. In the Response Methods Handbook the corresponding corrective response is "Contain".
- "*Should be removed*" is used for chemicals that cannot be allowed to disperse because of their harmful effect on humans or on the ecological system in general. The term is not used unless there is a reasonable chance of preventing dispersal, after a discharge or leak, by chemical and physical treatment.
- "*Chemical and physical treatment*" is recommended for chemicals that can be removed by skimming, pumping, dredging, burning, neutralization, absorption, coagulation, or precipitation. The corrective response may also include the use of dispersing agents, sinking agents, and biological treatment. Specific procedures to be followed are found in the Response Methods Handbook. Cleaning of the shoreline is also specified there for some compounds.
- "*Disperse and flush*" is used for chemicals that can be made non-hazardous to humans by simple dilution with water; a corresponding corrective response is used in the Response Methods Handbook. In a few cases the response is indicated even when the compound reacts with water because, when proper care is taken, dilution is still the most effective way of removing the primary hazard.

2. LABELS

The labels illustrated in Section 2 are those specified by the United Nations Labelling System (see Code of Federal Regulations, Title 49, Part 172). Labels are shown for all chemicals that are listed by name in the Code of Federal Regulations and also for most flammable chemicals that fall under listed generic categories, such as "Solvents," "Distillates," or "Alcohols."

3. CHEMICAL DESIGNATIONS

3.1 Synonyms — Alternative systematic chemical names and commonly used trivial names are given. Commercial or trade names are shown in a few cases where they are in common use. An index of synonyms is included in this manual (Section 8); it includes only those names given in Section 3.1.

3.2 Coast Guard Compatibility Classification — An entry is made when the chemical has been assigned to one of the 43 cargo groups listed in Navigation and Vessel Inspection Circular No. 4-75, "Guide to Compatibility of Chemicals." Appropriate parts of the Guide are included in this manual. Some chemicals not now included in the Guide were assigned to a group by the Cargo and Hazardous Materials Division, Coast Guard Headquarters. If the chemical is not a liquid carried in bulk in ships' tanks, this data item is "Not applicable."

3.3 Chemical Formula — This has been limited to a commonly used one-line formula. In the case of some organic compounds it has not been possible to represent chemical structure within such a limitation.

3.4 IMCO/United Nations Numerical Designation — The designation is that of the "International Maritime Dangerous Goods Code" published by the Inter-Governmental Maritime Consultative Organization (IMCO), London, 1972.

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped) — All chemicals that are listed in Code of Federal Regulations, Title 46, Tables 151.01-10(b) and 151.01-10(d) are shipped as liquids. Other designations include liquefied gas, liquefied compressed gas, and solid. Where a compound may be shipped either as a liquid or solid, both designations are given.

4.2 Color — All color descriptions found in the common reference sources are included. The color description is that for pure material. Occasionally the color of a chemical changes when it dissolves in water or becomes a gas.

4.3 Odor — All odor descriptions found in the common reference sources are included. The expression "characteristic" is used only when no other reasonable description was found. The odor description is that for pure material.

5. HEALTH HAZARDS

5.1 Personal Protective Equipment — The items listed are those recommended by (a) manufacturers, either in technical bulletins or in Material Safety Data Sheets, (b) the Manufacturing Chemists Association, or (c) the National Safety Council, for use by personnel while responding to fire or accidental discharge of the chemical. They are intended to protect the lungs, eyes, and skin. Safety showers and eyewash fountains are considered to be important protective equipment for the handling of almost all chemicals; they are not usually listed.

5.2 Symptoms Following Exposure — These are brief descriptions of the effects observed in humans when the vapor (gas) is inhaled, when the liquid or solid is ingested (swallowed), and when the liquid or solid comes in contact with the eyes or skin.

5.3 Treatment for Exposure — "First-aid" procedures are recommended. They deal with exposure to the vapor (gas), liquid, or solid and include inhalation, ingestion (swallowing) and contact with eyes or skin. The instruction "Do NOT induce vomiting" is given if an unusual hazard is associated with the chemical being sucked into the lungs (aspiration) while the patient is vomiting. "Seek medical attention" or "Call a doctor" is recommended in those cases where only competent medical personnel can treat the injury properly. In all cases of human exposure, seek medical assistance as soon as possible.

5.4 Toxicity by Inhalation (Threshold Limit Value) — The threshold limit value (TLV) is usually expressed in units of parts per million (ppm) — i.e., the parts of vapor (gas) per million parts of contaminated air by volume at 25°C (77°F) and atmospheric pressure. For a chemical that forms a fine mist or dust, the concentration is given in milligrams per cubic meter (mg/m^3). The TLV is defined as the concentration of the substance in air that can be breathed for five consecutive eight-hour workdays (40-hour work week) by most people without adverse effect.* As some people become ill after exposure to concentrations lower than the TLV, this value cannot be used to define exactly what is a "safe" or "dangerous" concentration.

No entry appears when the chemical is a mixture; it is possible to calculate the TLV for a mixture only when the TLV for each component of the mixture is known and the composition of the mixture by weight is also known.

*American Conference of Governmental Industrial Hygienists, "Threshold Limit Values for Substance in Workroom Air, Adopted by ACGIH for 1972"

5.5 Short-Term Inhalation Limits – The parts of vapor (gas per million parts of contaminated air by volume at 25°C (77°F) and atmospheric pressure is given. The limits are given in milligrams per cubic meter for chemicals that can form a fine mist or dust. The values given are the maximum permissible average exposures for the time periods specified. Most of the data came from the Commonwealth of Pennsylvania, Department of Environmental Resources, Title 25, Article IV, Chapter 201 (1971). Some of the data (called "Emergency Exposure Limits") were provided by the Committee on Toxicology, National Academy of Science – National Academy of Engineering, National Research Council.

In some instances the values disagree, or the short-term limits overlap the TLV given in 5.4. These are not errors; the values were supplied by several laboratories, each of which used its own experimental techniques and methods of calculation.

5.6 Toxicity by Ingestion – The Grade and corresponding LD₅₀ value are those defined by the National Academy of Sciences, Committee on Hazardous Materials, "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," Washington, D.C., 1972. Data were also collected from other sources and converted to the appropriate Grade before entry in this manual. The term LD₅₀ signifies that about 50% of the animals given the specified dose by mouth will die. Thus, for a Grade 4 chemical (below 50 mg/kg) the toxic dose for 50% of animals weighing 70 kg (150 lb) is $70 \times 50 = 3500 \text{ mg} = 3.5 \text{ g}$, or less than 1 teaspoonful; it might be as little as a few drops. For a Grade 1 chemical (5 to 15g/kg), the LD₅₀ would be between a pint and a quart for a 150-lb man. All LD₅₀ values have been obtained using small laboratory animals such as rodents, cats, and dogs. The substantial risks taken in using these values for estimating human toxicity are the same as those taken when new drugs are administered to humans for the first time.

5.7 Late Toxicity – Where there is evidence that the chemical can cause cancer, mutagenic effects, teratogenic effects, or a delayed injury to vital organs such as the liver or kidney, a qualitative description of the effect is given.

5.8 Vapor (Gas) Irritant Characteristics – The most appropriate of five statements listed below is given. (Source: National Academy of Sciences, Committee on Hazardous Materials, "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," Washington, D.C., 1970.)

(1) Vapors are nonirritating to eyes and throat.

- (2) Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- (3) Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
- (4) Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.
- (5) Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.

5.9 Liquid or Solid Irritant Characteristics – The most appropriate of the following five statements is given (same source as 5.8 above):

- (1) No appreciable hazard. Practically harmless to the skin.
- (2) Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin.
- (3) Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure.
- (4) Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact.
- (5) Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.

5.10 Odor Threshold – This is the lowest concentration in air that most humans can detect by smell. The value cannot be relied on to prevent over-exposure, because human sensitivity to odors varies over wide limits, some chemicals cannot be smelled at toxic concentrations, odors can be masked by other odors, and some compounds rapidly deaden the sense of smell.

6. FIRE HAZARDS

6.1 Flash Point – This is defined as the lowest temperature at which vapors above a volatile combustible substance will ignite in air when exposed to a flame. Depending on the test method used, the values given are either Tag closed cup (C.C.) (ASTM D56) or Cleveland open cup (O.C.) (ASTM D93). The values, along with those in 6.2 and 6.7 below, give an indication of the relative flammability of the chemical. In general, the open cup value is about 10° to 15°F higher than the closed cup value.

6.2 Flammable Limits in Air -- The percent concentration in air (by volume) is given for the lower (LFL) and upper (UFL) limit. The values, along with those in 6.1 and 6.7, give an indication of the relative flammability of the chemical. The limits are sometimes referred to as "lower explosive limit" (LEL) and "upper explosive limit" (UEL).

6.3 Fire Extinguishing Agents -- The agents are listed in decreasing order of importance. The general capabilities of all agents are described by G.H. Tryon, "Fire Protection Handbook," 13th ed., National Fire Protection Association, Boston, Mass., 1969.

6.4 Fire Extinguishing Agents Not to be Used -- The agents listed must not be used because they react with the chemical and create an additional hazard. In some cases they are listed because they are ineffective in putting out the fire.

6.5 Special Hazards of Combustion Products -- Some chemicals decompose or burn to give off toxic and irritating gases. Such gases may also be given off by chemicals that vaporize in the heat of a fire without either decomposing or burning. If no entry appears, the combustion products are thought to be similar to those formed by the burning of oil, gasoline, or alcohol; they include carbon monoxide (poisonous), carbon dioxide, and water vapor. The specific combustion products are usually not well known over the wide variety of conditions existing in fires; some may be hazardous.

6.6 Behavior in Fire -- Any characteristic behavior that might increase significantly the hazard involved in a fire is described. The formation of dense smoke or flammable vapor clouds, and the possibility of polymerization and explosions is stated. Unusual difficulty in extinguishing the fire is also noted.

6.7 Ignition Temperature -- This is the minimum temperature at which the material will ignite without a spark or flame being present. Along with the values in 6.1 and 6.2 above, it gives an indication of the relative flammability of the chemical. It is sometimes called the "autoignition temperature." The method of measurement is given in ASTM D-2155.

6.8 Electrical Hazard -- The ease with which the chemical is ignited by electrical equipment is indicated by the *Group* and *Class* assignment made in "Fire Codes," Vol. 5, National Fire Protection Association, Boston, Mass., 1972, pp. 70-289. This information is available for relatively few chemicals, so an absence of data does not necessarily mean that the substance is not hazardous in the presence of electrical equipment.

6.9 Burning Rate – The value is the rate (in millimeters per minute) at which the depth of a pool of liquid decreases as the liquid burns. Details of measurement are given by D.S. Burgess, A. Strasser, and J. Grumer, "Diffusive Burning of Liquid Fuels in Open Trays," Fire Research Abstracts and Reviews, 3, 177 (1961).

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water – The term "No reaction" means that no hazard results when the chemical reacts or mixes with water. Where a hazard does result, it is described.

7.2 Reactivity with Common Materials – This is limited to hazardous reactions with fuels and with common materials of construction such as metal, wood, plastics, cement, and glass. The nature of the hazard, such as severe corrosion or formation of a flammable gas, is described.

7.3 Stability During Transport – The term "Stable" means that the chemical will not decompose in a hazardous manner under the conditions of temperature, pressure, and mechanical shock that are normally encountered during shipment; the term does *not* apply to fire situations. Where there is a possibility of hazardous decomposition, an indication of the conditions and the nature of the hazard is given.

7.4 Neutralizing Agents for Acids and Caustics – In all cases involving accidental discharge, dilution with water may be followed by use of the agent specified, particularly if the material cannot be flushed away; the agent specified need not necessarily be used. More detailed information for this kind of response is given in the Response Methods Handbook, CG-446-4.

7.5 Polymerization – A few chemicals can undergo rapid polymerization to form sticky, resinous materials, with the liberation of much heat. The containers may explode. For these chemicals the conditions under which the reaction can occur are given. See Section 13.16 for quantitative data.

7.6 Inhibitor of Polymerization – The chemical names and concentrations of inhibitors added by the manufacturer to prevent polymerization are given.

8. WATER POLLUTION

8.1 Aquatic Toxicity – The form of data presentation used by the Environmental Protection Agency's "Oil and Hazardous Material-Technical Assistance Data System (OHM-TADS)" is used here. Reading from left to right and separated by slashes (/) are the following data:

- Concentration in parts per million by weight (or milligrams per liter) at which the chemical was tested;
- Time of exposure in hours;
- Name of the aquatic species studied;
- Effect observed; LC_{50} means that approximately 50% of the fish will die under the conditions of concentration and time given. TL_m (Median Tolerance Limit) means that approximately 50% of the fish will show abnormal behavior (including death) under the conditions of concentration and time given; the term EC_{50} (Effective Concentration₅₀) is used sometimes instead of TL_m ;
- The kind of water used in the test (fresh or salt).

Some chemicals have been tested with many species of fish. Where the data were available, the data sheet cites one illustrative test in fresh water and one in salt water.

8.2 Waterfowl Toxicity —Very little information is available. In a few cases there is entered the LD_{50} value, which indicates the dose (in milligrams per kilogram of body weight) that is lethal to about half the waterfowl tested.

8.3 Biological Oxygen Demand (BOD) — Also called "biochemical oxygen demand," this is a standard way of describing how much oxygen dissolved in water is consumed by biological oxidation of the chemical during the stated period of time. The unit *lb/lb* indicates the pounds of oxygen consumed by each pound of chemical during the time stated. When given in *percent*, the values indicate the pounds of oxygen consumed by each 100 pounds of chemical during the time stated. If the percentage is followed by "(theor.)", it indicates the pounds of oxygen theoretically required to completely oxidize 100 pounds of the chemical.

8.4 Food Chain Concentration Potential — If the chemical is consumed by fish, marine plants, waterfowl, etc., that are in turn eaten by other species, the substance may accumulate and ultimately be consumed by humans. Where this occurs, an indication of the potential hazard and its significance is given.

9. SELECTED MANUFACTURERS

Three manufacturers are named wherever possible. When production data for the chemical were available, the manufacturers were selected from among the major producers. The "1972 Directory of Chemical Producers, United States of

America" (Chemical Information Services, Stanford Research Institute, Menlo Park, California) and "Buyers Guide Issue," *Chemical Week*, 111, No. 7, Part Two (October 25, 1972) were the sources used.

10. SHIPPING INFORMATION

10.1 Grades or Purity — The grades USP (United States Pharmacopoeia) and CP (chemically pure) are quite pure. Where "Technical" or "Commercial" grades are given, the percent by weight of the pure chemical present is usually indicated. In a few cases the identity of the major impurities is given. If the properties of the less pure grades differ significantly from those of the pure substance, the differences in properties are described in general terms.

10.2 Storage Temperature — The range of temperatures at which the chemical is normally shipped in bulk by water transport is given. "Ambient" means the temperature of the surroundings.

10.3 Inert Atmosphere — The terms used are "inerted," "padded," "ventilated (forced)," "ventilated (natural)," and "no requirement." They are given when found in the Code of Federal Regulations, Title 46, beginning in Part 151.05.

10.4 Venting — The terms used are "open," "pressure-vacuum," and "safety relief" (same source as 10.3 above).

11. HAZARD ASSESSMENT CODE

The code designates the assessment calculation route to be used in the Hazard Assessment Handbook when evaluating the hazard.

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations — This is the hazard class specified in the Code of Federal Regulations, Title 49, Part 172, December 31, 1976. Chemicals not specifically listed therein have been classified as "Flammable" if their flash point (closed cup) is below 100°F.

12.2 NAS Hazard Rating for Bulk Water Transportation — The indicated ratings are given in "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," National Academy of Sciences, Committee on Hazardous Materials, Washington, D.C., 1972. An outline of the rating system is given in Table 1.

TABLE 1
EXPLANATION OF NAS HAZARD RATINGS

<u>Rating</u>	<u>Fire</u>	<u>Health</u>		
		<u>Vapor Irritant</u>	<u>Liquid or Solid Irritant</u>	<u>Poisons</u>
0	No hazard	No effect	No effect	No effect
1	Flash point (C.C.) above 140°F	Slight effect	Causes skin smarting	Slightly toxic
2	Flash point (C.C.) 100 to 140°F	Moderate irritation; temporary effect	First-degree burns, short exposure	Intermediate toxicity
3	Flash point (C.C.) below 100°F ; boiling point above 100°F	Irritating; cannot be tolerated	Second-degree burns, few minutes' exposure	Moderately toxic
4	Flash point (C.C.) below 100°F ; boiling point below 100°F	Severe effect; may do permanent injury	Second-degree and third-degree burns	Severely toxic

<u>Rating</u>	<u>Water Pollution</u>		
	<u>Human Toxicity</u>	<u>Aquatic Toxicity</u>	<u>Aesthetic Effect</u>
0	Nontoxic ; $LD_{50} > 15$ g/kg	Acute threshold limits above 10,000 ppm	No significant pollution; gases and odorless liquids
1	Practically non-toxic; LD_{50} 5 to 15 g/kg	Threshold limits 1,000 to 10,000 ppm	Mild-odored light oils and soluble chemicals
2	Slightly toxic; LD_{50} 0.5 to 5 g/kg	Threshold limits 100 to 1,000 ppm	Mild-odored, colorless, water-insoluble oils; boiling point 150-450°F
3	Moderately toxic; LD_{50} 50 to 500 mg/kg	Threshold limits 1 to 100 ppm	Light-colored high-boiling oils; odorous water-soluble compounds
4	Toxic; $LD_{50} < 50$ mg/kg	Threshold limits below 1 ppm	Heavy oils, colored or bad odors

TABLE 1 (Continued)

Rating	Reactivity		
	Other Chemicals	Water	Self-reaction
0	Inactive; may be attacked by materials rated 4	No reaction	No reaction
1	React only with materials rated 4	Mild reaction; unlikely to be hazardous	Mild self-reaction under some conditions
2	React with materials rated 3 or 4	Moderate reaction	Will undergo self-reaction if contaminated; do not require stabilizer
3	React with each other and with materials rated 2 or 4	More vigorous reaction; may be hazardous	Vigorous self-reaction; require stabilizer
4	React with each other and materials rated 0-3	Vigorous reaction; likely to be hazardous	Self-oxidizing chemical; capable of explosion or detonation

12.3 NFPA Hazard Classifications — The indicated ratings are given in "Fire Protection Guide on Hazardous Materials," Code 704M, 4th ed., National Fire Protection Association, Boston, Mass., 1972. Changes in the rating that are described in "1973 NFPA Technical Committee Reports, Volume A" are included. The classifications are defined in Table 2 below. The symbol used in conjunction with these ratings is illustrated in Section 4.2.

TABLE 2
EXPLANATION OF NFPA HAZARD CLASSIFICATIONS

<u>Classification</u>		<u>Definition</u>
<u>Health Hazard (blue)</u>		
4		Materials which on very short exposure could cause death or major residual injury even though prompt medical treatment were given.
3		Materials which on short exposure could cause serious temporary or residual injury even though prompt medical treatment were given.
2		Materials which on intense or continued exposure could cause temporary incapacitation or possible residual injury unless prompt medical treatment is given.
1		Materials which on exposure would cause irritation but only minor residual injury even if no treatment is given.
0		Materials which on exposure under fire conditions would offer no hazard beyond that of ordinary combustible material.
<u>Flammability (red)</u>		
4		Materials which will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature, or which are readily dispersed in air and which will burn readily.
3		Liquids and solids that can be ignited under almost all ambient temperature conditions.
2		Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur.

TABLE 2 (Continued)

<u>Classification</u>	<u>Definition</u>
<u>Flammability (red) cont'd</u>	
1	Materials that must be preheated before ignition can occur.
0	Materials that will not burn.
<u>Reactivity (yellow)</u>	
4	Materials which in themselves are readily capable of detonation or of explosive decomposition or reaction at normal temperatures and pressures.
3	Materials which in themselves are capable of detonation or explosive reaction but require a strong initiating source or which must be heated under confinement before initiation or which react explosively with water.
2	Materials which in themselves are normally unstable and readily undergo violent chemical change but do not detonate. Also materials which may react violently with water or which may form potentially explosive mixtures with water.
1	Materials which in themselves are normally stable, but which can become unstable at elevated temperatures and pressures or which may react with water with some release of energy but not violently.
0	Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.
<u>Other (white)</u>	
-W-	Materials which react so violently with water that a possible hazard results when they come in contact with water, as in a fire situation. Similar to Reactivity Classification 2.
Oxy	Oxidizing material; any solid or liquid that readily yields oxygen or other oxidizing gas, or that readily reacts to oxidize combustible materials.

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm — The statement indicates whether the chemical is a solid, liquid, or gas after it has reached equilibrium with its surroundings at "ordinary" conditions of temperature and pressure.

13.2 Molecular Weight — The value given is the weight of a molecule of the chemical relative to a value of 12 for one atom of carbon.

The molecular weight is useful in converting from molecular units to weight units, and in calculating the pressure, volume and temperature relationships for gaseous materials. The ratio of the densities of any two gases is approximately equal to the ratio of their molecular weights (see 13.10).

The molecular weights of mixtures can be calculated if both the identity and quantity of each component of the mixture are known. Because the composition of mixtures described in this manual is not known exactly, or because it varies from one shipment to another, no molecular weights are given for such mixtures.

13.3 Boiling Point at 1 atm — The value is the temperature of a liquid when its vapor pressure is 1 atm. For example, when water is heated to 100°C (212°F) its vapor pressure rises to 1 atm and the liquid boils.

The boiling point at 1 atm indicates whether a liquid will boil and become a gas at any particular temperature and sea-level atmospheric pressure.

13.4 Freezing Point — The freezing point is the temperature at which a liquid changes to a solid. For example, liquid water changes to solid ice at 0°C (32°F). Some liquids solidify very slowly even when cooled below their freezing point. When liquids are not pure (for example, salt water) their freezing points are lowered slightly.

13.5 Critical Temperature — The maximum temperature at which a liquid can exist, no matter what the pressure on it, is called the critical temperature. For example, the critical temperature of water is 372°C (705°F). The value can be used to estimate many properties whose values are not immediately available.

13.6 Critical Pressure — The vapor pressure of a chemical at the critical temperature (see 13.5) is called the critical pressure. For example, the critical pressure of water is 218 atm. Values are given in pounds per square inch absolute, atmospheres, and meganewtons per square meter. The value can be used for estimating many property values that are not immediately available.

13.7 Specific Gravity – The specific gravity of a chemical is the ratio of the weight of the solid or liquid to the weight of an equal volume of water at 4°C (or at some other specified temperature).

If the specific gravity is less than 1.0 (or less than 1.03 in seawater) the chemical will float; if higher, it will sink. Where the change in the value with temperature is important, more data are found in 13.17.

13.8 Liquid Surface Tension – This property is a measure of the tensile force at the surface of a liquid that tends to shape liquid fragments into spherical drops. Values are expressed in dynes per centimeter and newtons per meter. Liquids with high surface tensions show less tendency to spread. Water has a surface tension of about 73 dynes/cm; seawater has a slightly higher value.

13.9 Liquid-Water Interfacial Tension – The value is a measure of the tensile forces existing at the interface between a liquid and water. Approximately, it is the difference between the individual surface tension of the liquid and that of water. Low values of the interfacial tension indicate that the chemical spreads readily on a water surface. The units are the same as in 13.8.

13.10 Vapor (Gas) Specific Gravity – The value is the ratio of the weight of vapor to the weight of an equal volume of dry air at the same conditions of temperature and pressure. Buoyant vapors have a vapor specific gravity less than one. The value may be approximated by the ratio $M/29$, where M is the molecular weight of the chemical (see 13.2).

In some cases the vapor may be at a temperature different from that of the surrounding air. For example, the vapor from a container of boiling methane at -172°F sinks in warm air, even though the vapor specific gravity of methane at 60°F is about 0.6.

For the effect of temperature on vapor density, see 13.23.

13.11 Ratio of Specific Heats of Vapor (Gas) – This property is the ratio of the specific heat at constant pressure (C_p) to the specific heat at constant volume (C_v); its value is always greater than one. In most cases it was calculated by use of the expression

$$\frac{C_p}{C_v} = \frac{C_p}{(C_p - R)}$$

where R is the Universal Gas Constant.

The ratio varies slightly with temperature; the value given is at 20°C (68°F). The ratio is often of value in estimating temperature changes when gases are compressed or expanded. Higher values of the ratio lead to larger temperature changes for a given pressure change.

13.12 Latent Heat of Vaporization — The value is the heat that must be added to the specified weight of a liquid before it can change to vapor (gas). It varies with temperature; the value given is that at the boiling point at 1 atm (see 13.3). The units used are Btu per pound, calories per gram, and joules per kilogram.

No value is given for chemicals with very high boiling points at 1 atm, because such substances are considered essentially nonvolatile.

13.13 Heat of Combustion — The value is the amount of heat liberated when the specified weight is burned in oxygen at 25°C. The products of combustion, including water, are assumed to remain as gases; the value given is usually referred to as the "lower heat value." The negative sign before the value indicates that heat is given off when the chemical burns. Units are the same as in 13.12.

13.14 Heat of Decomposition — The value is the amount of heat liberated when the specified weight decomposes to more stable substances. The value is given for very few chemicals, because most are stable and do not decompose under the conditions of temperature and pressure encountered during shipment. The negative sign before the value simply indicates that heat is given off during the decomposition. The value does *not* include heat given off when the chemical burns. Units are the same as in 13.13.

13.15 Heat of Solution — The value represents the heat liberated when the specified weight of chemical is dissolved in a relatively large amount of water at 25°C ("infinite dilution"). A negative sign before the value indicates that heat is given off, causing a rise in temperature. (A few chemicals absorb heat when they dissolve, causing the temperature to fall.) Units are the same as in 13.12.

In those few cases where the chemical reacts with water and the reaction products dissolve, the heat given off during the reaction is included in the heat of solution.

13.16 Heat of Polymerization — The value is the heat liberated when the specified weight of the compound (usually called the monomer) polymerizes to form the polymer. In some cases the heat liberated is so great that the temperature rises significantly, and the material may burst its container or

catch fire. The negative sign before the value indicates that heat is given off during the polymerization reaction. Units are the same as in 13.12.

Items 13.17 through 13.24 consist of graphs. The temperature range over which each graph is reliable is indicated by the length of the curve.

13.17 Saturated Liquid Density — The value is the weight (in pounds) of one cubic foot of liquid that is in equilibrium with its vapor. Liquid densities decrease slightly with an increase in temperature; where literature data or reliable estimation methods were applicable, a graph shows this effect.

13.18 Liquid Heat Capacity — The value is the heat (in Btu) required to raise the temperature of one pound of the liquid one degree Fahrenheit at constant pressure. For example, it requires almost 1 Btu to raise the temperature of 1 pound of water from 68°F to 69°F. The value is useful in calculating the increase in temperature of a liquid when it is heated, as in a fire. The value increases slightly with an increase in temperature; the graph shows this effect.

13.19 Liquid Thermal Conductivity — The value is a measure of the ability of a liquid to conduct heat. It represents the number of Btu per hour that pass through an area of liquid one square foot in cross-section when the temperature gradient is 1°F per inch of depth. Higher values indicate that the liquid conducts heat more readily.

Liquid thermal conductivities decrease slightly with an increase in temperature. Where applicable, the graph shows this effect.

A basic law of heat conduction states that the energy flow per unit area per unit time is proportional to the gradient in temperature. The constant of proportionality is the liquid thermal conductivity.

13.20 Liquid Viscosity — The value (in centipoise) is a measure of the ability of a liquid to flow through a pipe or a hole; higher values indicate that the liquid flows less readily under a fixed pressure head. For example, heavy oils have higher viscosities (i.e., are more viscous) than gasoline.

Liquid viscosities decrease rapidly with an increase in temperature. In some cases a graph is given to show the effect. In other cases only a single data point was found in the literature.

A basic law of fluid mechanics states that the force per unit area needed to shear a fluid is proportional to the velocity gradient. The constant of proportionality is the viscosity.

13.21 Solubility in Water — The value represents the pounds of a chemical that will dissolve in 100 pounds of pure water. Solubility usually increases when the temperature increases; where the change has been measured, a graph is given to show the effect. The following terms are used when numerical data are either unavailable or not applicable:

The term "Miscible" means that the chemical mixes with water in all proportions. The term "Reacts" means that the substance reacts chemically with water; thus, its solubility has no real meaning. "Insoluble" usually means that one pound of the chemical does not dissolve entirely in 100 pounds of water. (Weak solutions of "Insoluble" materials may still be hazardous to humans, fish, and waterfowl, however.)

13.22 Saturated Vapor Pressure — The value is the pressure (in pounds per square inch absolute) of the vapor in equilibrium with the liquid form at the specified temperature. Vapor pressure values can be used to estimate the relative volatility of chemicals at a given temperature, and to calculate the pressure over a liquid that is shipped in a closed container.

The vapor pressure increases as temperature increases; a graph is given to show this effect. Note that the vapor pressure scale is logarithmic.

13.23 Saturated Vapor Density — The value is the weight (in pounds) of one cubic foot of vapor that is in equilibrium with the liquid form.

If it is assumed that the vapor behaves as an ideal gas, the relation pM/RT holds, where p is the vapor pressure, M is the molecular weight, R is the gas constant, and T is the temperature (in absolute units).

Since the vapor pressure varies with temperature (see 13.22), the saturated vapor density also varies with temperature, as shown on the graph. Note that the density scale is logarithmic.

13.24 Ideal Gas Heat Capacity — The value is the number of Btu needed to raise the temperature of one pound of gas by 1° Fahrenheit. The property can be used only when the pressure of the gas is less than about 10 atm. The ideal gas heat capacity is not a function of pressure (below about 10 atm), but it does increase with temperature, and a graph is given to show the effect.

4. OTHER INFORMATION SYSTEMS

4.1 CHEMICAL TRANSPORTATION EMERGENCY CENTER (CHEMTREC)

The Manufacturing Chemists Association operates CHEMTREC 24 hours a day. By calling the appropriate toll-free number listed below, one can consult experts on chemicals and spill response.

Continental United States (except Alaska & District of Columbia)	800-424-9300
Alaska, Hawaii, and District of Columbia	202-483-7616

4.2 NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

The NFPA's "Recommended System for the Identification of the Fire Hazards of Materials" (NFPA No. 704M) provides basic warning information to fire fighters in industrial plants and storage facilities. This system uses a diamond-shaped warning symbol (Figure 4.1). The top, left, and right boxes refer to flammability, health, and reactivity hazards respectively and contain a number from 0 to 4. The exact meaning of each number is explained in Section 3 (§ 12.3) of this manual, and the applicable numbers for each chemical are listed in Section 11 under "NFPA Hazard Classifications." The bottom box is used for special hazards; the most common of these is a warning against the use of water, indicated by the symbol W .

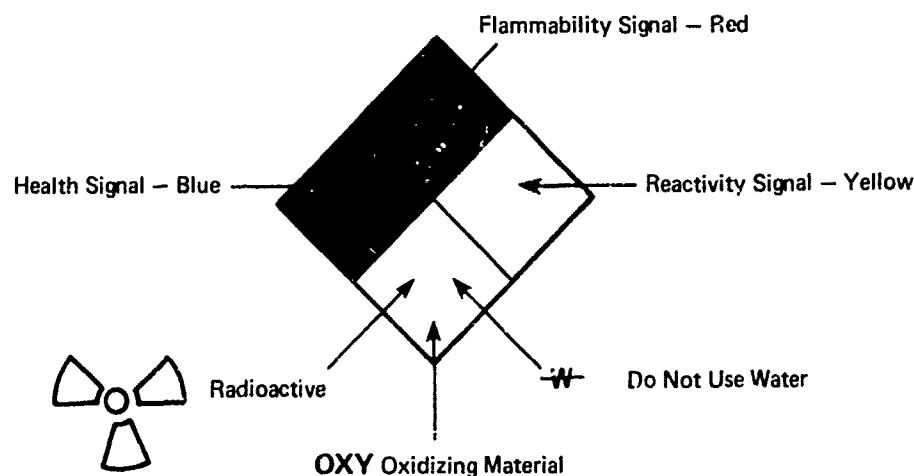


FIGURE 4.1 NFPA 704M SYMBOL

4.3 INTERNATIONAL MARITIME CONSULTATIVE ORGANIZATION (IMCO)

Foreign vessels using U.S. waterways generally utilize, in addition to U.S. requirements, an international labeling system developed by IMCO. This system consists of 15 diamond-shaped labels (Figure 4.2). Each identifies a particular hazard by a descriptive picture, a word, and a distinctive color.

The number at the bottom of each diamond identifies the class to which IMCO has assigned the chemical and is the same as the first digit in the IMCO/UN numerical designation, one of the items given under "Chemical Designations" in Section 11 of this manual.

4.4 DEPARTMENT OF TRANSPORTATION (DOT)

At the time this manual was in preparation, a Hazard Information (HI) System had been proposed by the Department of Transportation – Hazardous Materials Regulation Board. It uses IMCO-type warning labels with a number between 1 and 89 added at the bottom of the diamond. This number refers to the section number in a guide containing general hazard and response information for 89 categories of chemicals. The information is similar to that provided in this manual, except that it does not consider water pollution. At the time of publication of this manual, the HI System had not yet been adopted.

4.5 NATIONAL ACADEMY OF SCIENCES (NAS)

A booklet entitled "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals – A Tentative Guide" was prepared for the USCG by the Committee on Hazardous Materials of the National Academy of Sciences, National Research Council. It rates the fire, health, water pollution, and radioactivity hazards of over 200 chemicals on a scale of 0 to 4; the meaning of each number is explained in Section 3 of this manual, and the applicable numbers for each chemical are listed in Section 11 under "NAS Hazard Rating for Bulk Water Transportation." No response guidance is provided.

4.6 OHM-TADS (EPA)

The Oil and Hazardous Materials Technical Assistance Data System (OHM-TADS) has been developed by the Environmental Protection Agency (EPA) to provide information on physical and chemical properties, hazards, pollution characteristics, and shipping information for over 800 hazardous materials. OHM-TADS consists of a computerized data base which can be accessed from terminals at the 10 EPA Regional Offices and from EPA Headquarters in Washington, D.C. The System can provide either information on specifically requested properties for a material, or it can print all the information in its files for that material.

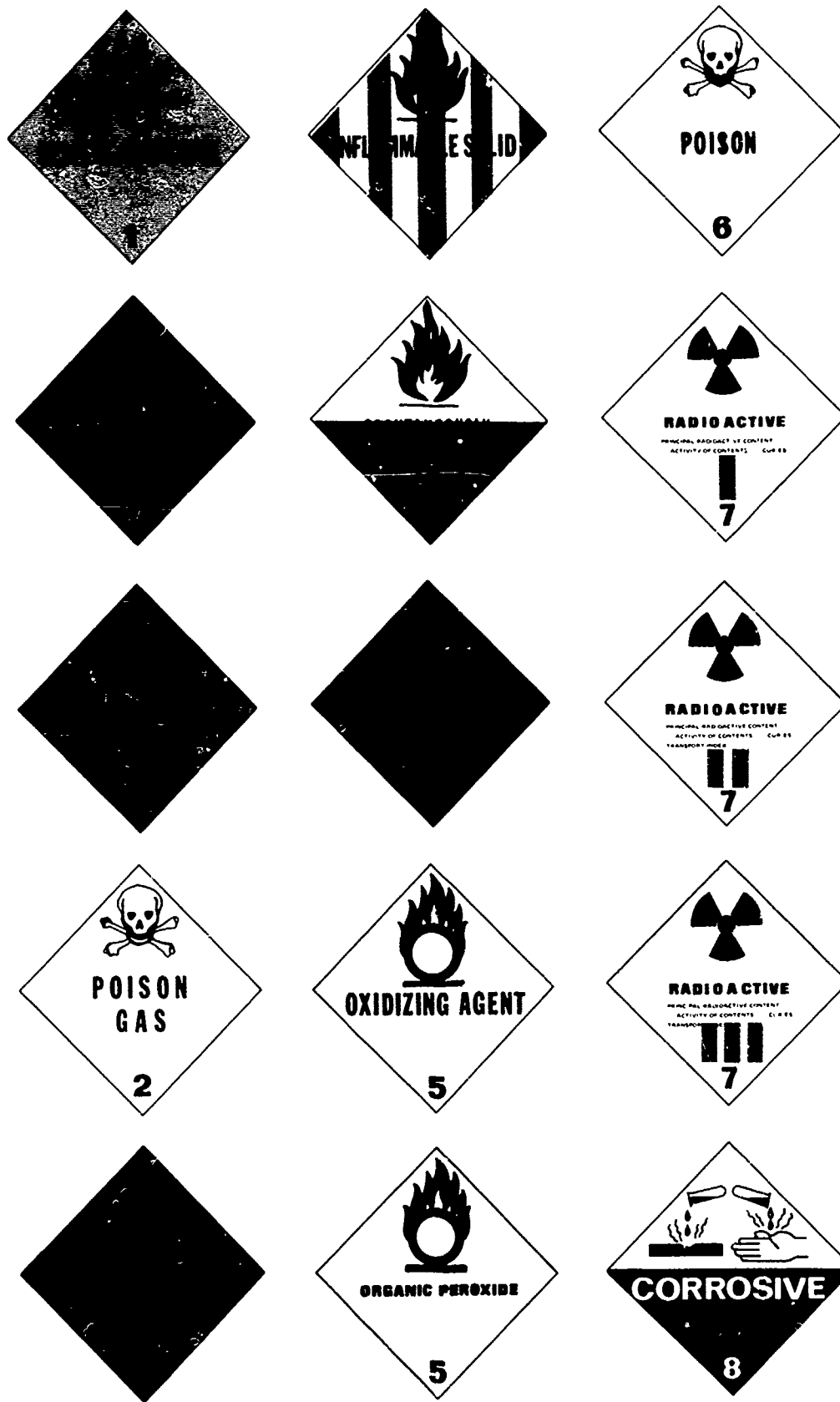


FIGURE 4-2
IMCO SHIPPING LABELS

Some of the same information appears in both this manual and OHM-TADS, but each contains some information not found in the other.

4.7 POISON CONTROL CENTERS

Throughout the country, local Poison Control Centers are maintained at hospitals. These Centers can provide information on the chemical composition, appearance, and toxicity of common poisonous materials as well as information on the symptoms of exposure and on the emergency procedures recommended in the event of exposure. The information available at these centers deals mainly with common household materials.

Poison Control Centers are coordinated through the Department of Health, Education and Welfare in Washington, D.C., but information should be requested through the local centers.

The telephone number of the local Poison Control Center can be found in a local telephone directory or in the Regional Contingency Plan.

5. CONVERSION FACTORS

To Convert	To	Multiply by
Length		
inches	millimeters	25.4*
inches	feet	0.0833
feet	inches	12*
feet	meters	0.3048*
feet	yards	0.3333
feet	miles (U.S. statute)	0.0001894
yards	feet	3*
yards	miles (U.S. statute)	0.0005682
miles (U.S. statute)	feet	5280*
miles (U.S. statute)	yards	1760*
miles (U.S. statute)	meters	1609
miles (U.S. statute)	nautical miles	0.868
meters	feet	3.231
meters	yards	1.094
meters	miles (U.S. statute)	0.0006214
nautical miles	miles (U.S. statute)	1.152
Area		
square inches	square centimeters	6.452
square inches	square feet	0.006944
square feet	square inches	144*
square feet	square meters	0.09290
square meters	square feet	10.76
square miles	square yards	3,097,600*
square yards	square feet	9*
Volume		
cubic inches	cubic centimeters	16.39
cubic inches	cubic feet	0.0005787
cubic feet	cubic inches	1728*
cubic feet	cubic meters	0.02832
cubic feet	U.S. gallons	7.481
cubic meters	cubic feet	35.31
liters	quarts (U.S. liquid)	1.057
quarts (U.S. liquid)	liters	0.9463
U.S. gallons	barrels (petroleum)	0.02381
U.S. gallons	cubic feet	0.1337
U.S. gallons	Imperial gallons	0.8327
barrels (petroleum)	U.S. gallons	42*
Imperial gallons	U.S. gallons	1.201
milliliters	cubic centimeters	1*

*Exact value

To Convert	To	Multiply by
Time		
seconds	minutes	0.01667
seconds	hours	0.0002778
seconds	days	0.00001157
minutes	seconds	60*
minutes	hours	0.01667
minutes	days	0.0006944
hours	seconds	3600*
hours	minutes	60*
hours	days	0.04167
Mass or Weight		
pounds	kilograms	0.4536
pounds	short tons	0.0005*
pounds	long tons	0.0004464
pounds	metric tons	0.0004536
tons (short)	pounds	2000*
tons (metric)	pounds	2205
tons (long)	pounds	2240*
kilograms	pounds	2.205
tonnes (metric tons)	kilograms	1000*
Energy		
calories	Btu	0.003968
calories	joules	4.187
Btu (British thermal units)	calories	252.0
Btu	joules	1055
joules	calories	0.2388
joules	Btu	0.0009479
Velocity		
feet per second	meters per second	0.3048
feet per second	miles per hour	0.6818
feet per second	knots	0.5921
meters per second	feet per second	3.281
meters per second	miles per hour	2.237
miles per hour	meters per second	0.4470
miles per hour	feet per second	1.467
knots	meters per second	0.5148
knots	miles per hour	1.151
knots	feet per second	1.689
Density		
pounds per cubic foot	grams per cubic centimeter	0.01602
grams per cubic centimeter	pounds per cubic foot	62.42
grams per cubic centimeter	kilograms per cubic meter	1000*
kilograms per cubic meter	grams per cubic centimeter	0.001

*Exact value

To Convert	To	Multiply by
Pressure		
pounds per square inch (absolute)(psia)	kilonewtons per square meter (kN/m ²)	6.895
psia	atmospheres	0.0680
psia	inches of water	27.67
psia	millimeters of mercury (torr)	51.72
pounds per square inch (gauge) (psig)	psia	add 14.70
millimeters of mercury (torr)	psia	0.01934
millimeters of mercury (torr)	kN/m ²	0.1333
inches of water	psia	0.03614
kilograms per square centimeter	millimeters of mercury (torr)	735.6
inches of water	kN/m ²	0.2491
kilograms per square centimeter	atmospheres	0.9678
atmospheres	kN/m ²	101.3
kilograms per square centimeter	psia	14.22
atmospheres	psia	14.70
bars	kN/m ²	100*
kilonewtons per square meter (kN/m ²)	psia	0.1450
bars	atmospheres	0.9869
kilonewtons per square meter (kN/m ²)	atmospheres	0.009869
bars	kilograms per square centimeter	1.020
Viscosity		
centipoises	pounds per foot per second	0.0006720
pounds per foot per second	centipoises	1488
centipoises	poises	0.01*
centipoises	newton seconds per square meter	0.001*
poises	grams per centimeter per second	1*
grams per centimeter per second	poises	1*
newton seconds per square meter	centipoises	1000*
Thermal Conductivity		
Btu per hour per foot per °F	watts per meter-kelvin	1.731
Btu per hour per foot per °F	kilocalories per hour per meter per °C	1.488
watts per meter-kelvin	Btu per hour per foot per °F	0.5778
kilocalories per hour per meter per °C	watts per meter-kelvin	1.163
kilocalories per hour per meter per °C	Btu per hour per foot per °F	0.6720
Heat Capacity		
Btu per pound per °F	calories per gram per °C	1*
Btu per pound per °F	joules per kilogram-kelvin	4187
joules per kilogram-kelvin	Btu per pound per °F	0.0002388
calories per gram per °C	Btu per pound per °F	1*
Concentration (in water solution)		
parts per million (ppm)	milligrams per liter	1*
milligrams per liter	ppm	1*
milligrams per cubic meter	grams per cubic centimeter	1 x 10 ⁻⁹
grams per cubic centimeter	milligrams per cubic meter	1 x 10 ⁹

*Exact value

To Convert	To	Multiply by
Concentration (in water solution) (Continued)		
grams per cubic centimeter	pounds per cubic foot	62.42
pounds per cubic foot	grams per cubic centimeter	0.01602
Temperature		
degrees Kelvin ($^{\circ}\text{K}$)	degrees Rankine ($^{\circ}\text{R}$)	1.8*
degrees Rankine ($^{\circ}\text{R}$)	degrees Kelvin ($^{\circ}\text{K}$)	0.5556
degrees centigrade ($^{\circ}\text{C}$)	degrees Fahrenheit ($^{\circ}\text{F}$)	First multiply by 1.8, then add 32
degrees Fahrenheit ($^{\circ}\text{F}$)	degrees centigrade ($^{\circ}\text{C}$)	First subtract 32, then mul- tiply by 0.5556
degrees centigrade ($^{\circ}\text{C}$)	degrees Kelvin ($^{\circ}\text{K}$)	<u>add 273.2</u>
degrees Fahrenheit ($^{\circ}\text{F}$)	degrees Rankine ($^{\circ}\text{R}$)	<u>add 459.7</u>
Flow		
cubic feet per second	U.S. gallons per minute	448.9
U.S. gallons per minute	cubic feet per second	0.002228
Universal Gas Constant (R)		
	8.314 joules per gram mole-kelvin	
	1.987 calories per gram mole-kelvin	
	1.987 Btu per pound mole per $^{\circ}\text{F}$	
	10.73 psia-cubic feet per pound mole per $^{\circ}\text{F}$	
	82.057 atm-cubic centimeters per gram mole-kelvin	
	62.361 millimeters mercury liter per gram mole-kelvin	

*Exact value

6. SELECTED PROPERTIES OF FRESH WATER, SEA WATER, ICE, AND AIR

The following properties are useful for engineering calculations described in the Hazard Assessment Handbook. The values for *fresh water* are those recorded for pure water. The values for the water of lakes and streams differ somewhat from those of pure water, but since no "standard" fresh water has ever been defined, the values for pure water must be used.

A "standard" *sea water* has been defined as one containing 35 grams of salts per kilogram of solution. The values for the water of tidal estuaries differ somewhat from those of "standard" sea water because the water has a salinity somewhere between those of fresh and sea waters.

The value for the density of *air* was derived from the ideal gas law; the air is assumed to be dry and at 1 atmosphere pressure.

6.1 FREEZING POINT

Fresh Water	0°C	32°F
Sea Water	-1.9°C	28.6°F

6.2 LATENT HEAT OF FUSION OF ICE

$$79.6 \text{ cal/g} = 143.3 \text{ Btu/lb}$$

6.3 DENSITY (See Figures 6.1, 6.2, and 6.3)

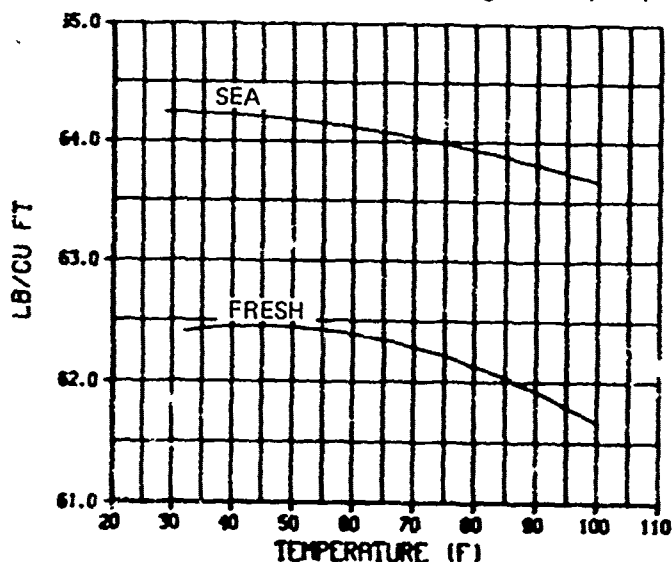


FIGURE 6.1 DENSITY OF WATER

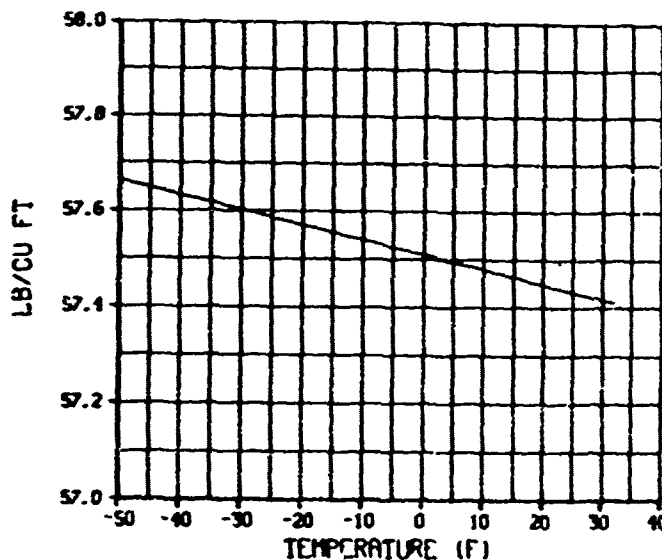


FIGURE 6.2 DENSITY OF ICE

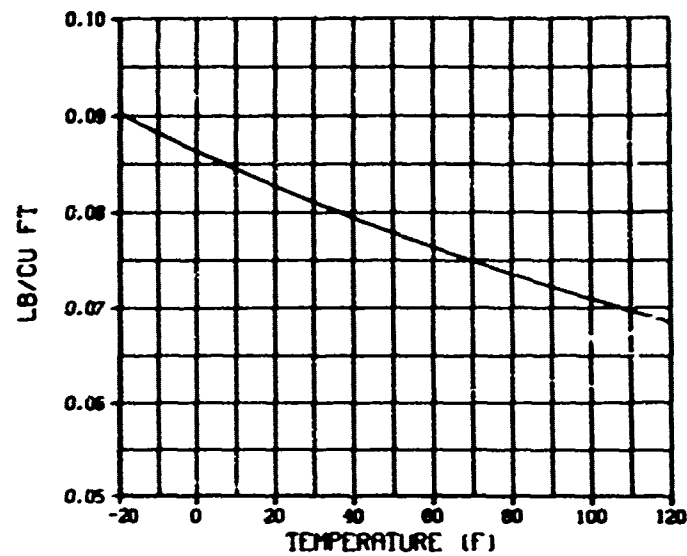


FIGURE 6.3 DENSITY OF DRY AIR (1 atm.)

6.4 VISCOSITY (See Figure 6.4)

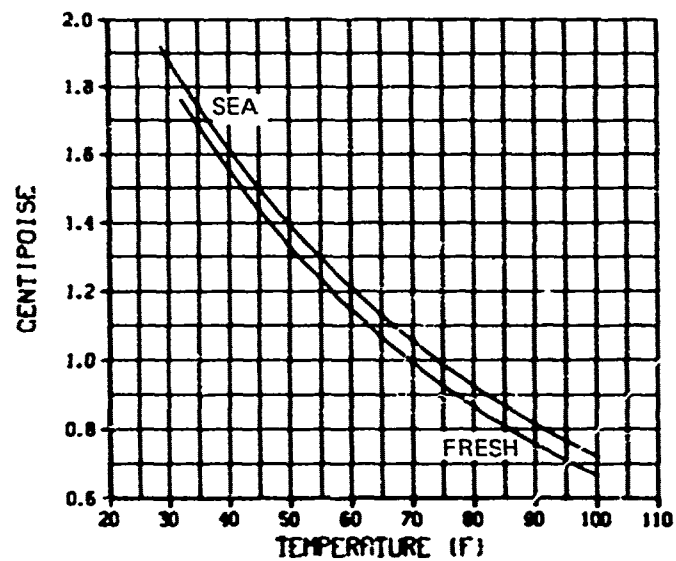


FIGURE 6.4 VISCOSITY OF WATER

6.5 HEAT CAPACITY (See Figures 6.5 and 6.6)

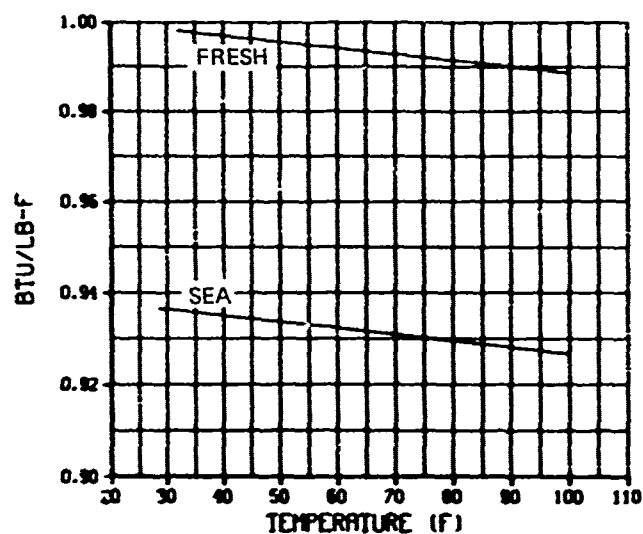


FIGURE 6.5 HEAT CAPACITY OF WATER

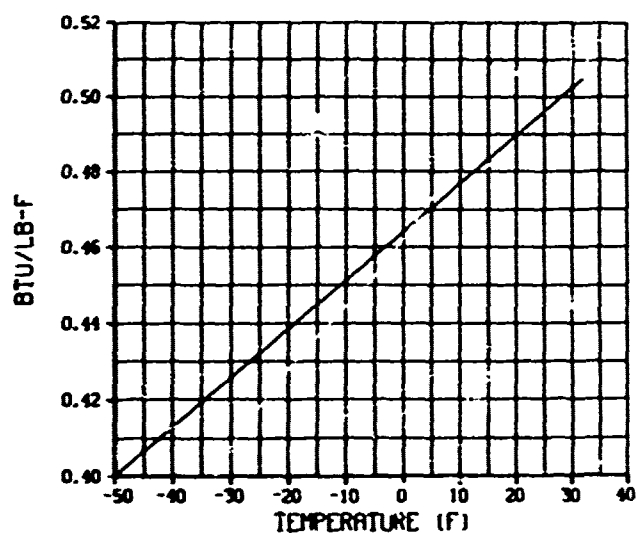


FIGURE 6.6 HEAT CAPACITY OF ICE

6.6 THERMAL CONDUCTIVITY (See Figures 6.7 and 6.8)

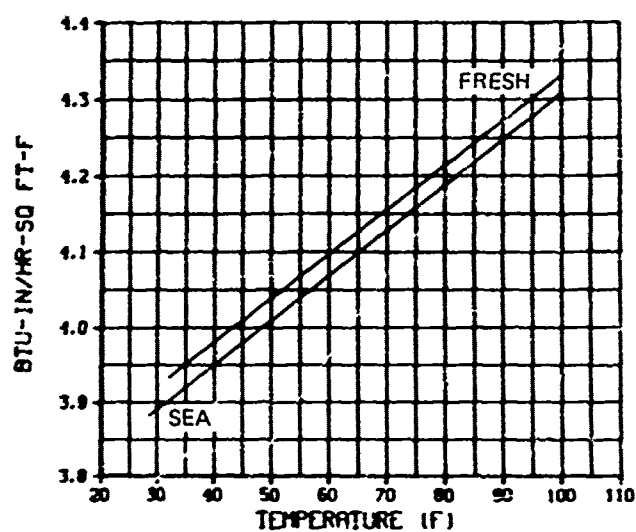


FIGURE 6.7 THERMAL CONDUCTIVITY OF WATER

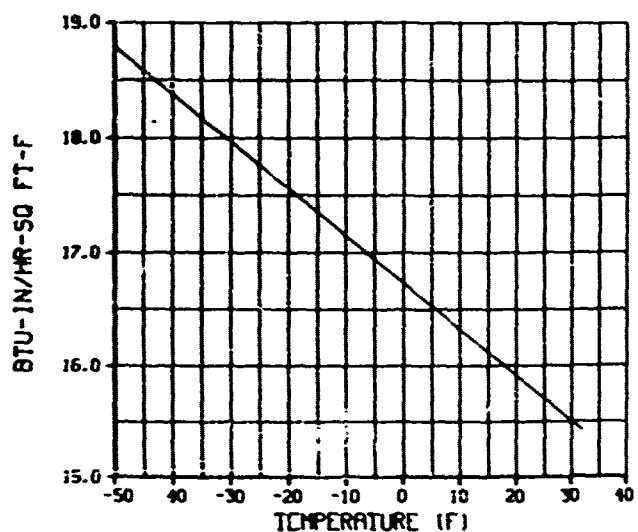


FIGURE 6.8 THERMAL CONDUCTIVITY OF ICE

6.7 VAPOR PRESSURE (See Figures 6.9 and 6.10)

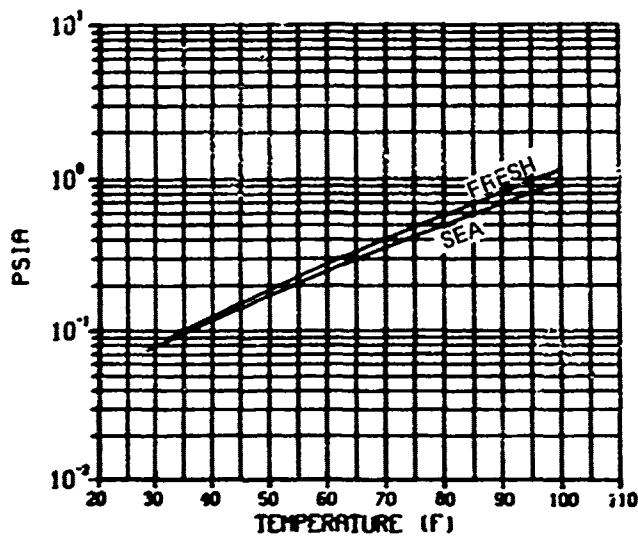


FIGURE 6.9 SATURATED VAPOR PRESSURE OF WATER

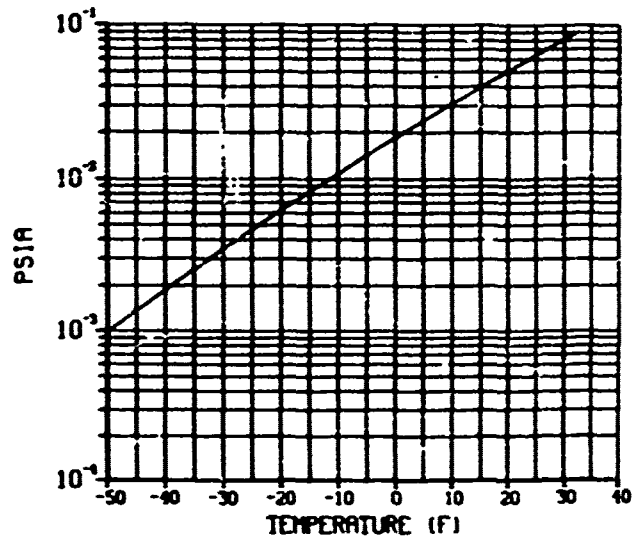


FIGURE 6.10 SATURATED VAPOR PRESSURE OF ICE

7. GUIDE TO COMPATIBILITY OF CHEMICALS

The Guide is based in part upon information provided to the Coast Guard by the National Academy of Sciences – U.S. Coast Guard Advisory Committee on Hazardous Materials and represents the latest information available to the Coast Guard on chemical compatibility.

The accidental mixing of one chemical cargo with another can in some cases be expected to result in a vigorous and hazardous chemical reaction. The generation of toxic gases, the heating, overflow, and rupture of cargo tanks, and fire and explosion are possible consequences of such reactions.

The purpose of the Compatibility Chart is to show chemical combinations believed to be dangerously reactive in the case of accidental mixing. It should be recognized, however, that the Chart provides a broad grouping of chemicals with an extensive variety of possible binary combinations. Although one group, generally speaking, can be considered dangerously reactive with another group where an "X" appears on the Chart, there may exist between the groups some combinations which would not dangerously react. The Chart should therefore not be used as an infallible guide. It is offered as an aid in the safe loading of bulk chemical cargoes, with the recommendation that proper safeguards be taken to avoid accidental mixing of binary mixtures for which an "X" appears on the Chart. Proper safeguards would include consideration of such factors as avoidance of the use of common cargo and vent lines and carriage in adjacent tanks having a common bulkhead.

The following procedure explains how the Guide should be used in determining compatibility information:

- (1) Determine the reactivity group of a particular product by referring to the alphabetical list in Table 7.1.
- (2) Enter the Chart with the reactivity group. Proceed across the page. An "X" indicates a reactivity group that forms an unsafe combination with the product in question.

For example, crotonaldehyde is listed in Table 7.1 as belonging in Group 19 (Aldehydes). The Chart shows that chemicals in this group should be segregated from sulfuric and nitric acids, caustics, ammonia, and all types of amines (aliphatic, alkanol, and aromatic). According to note A, crotonaldehyde is also incompatible with non-oxidizing mineral acids.

It is recognized there are wide variations in the reaction rates of individual chemicals within the broad groupings shown reactive by the Compatibility Chart. Some individual materials in one group will react violently with some of the materials in another group and cause great hazard; others will react slowly, or not at all. Accordingly, a useful addition to the Guide would be the identification of specific binary combinations which are found *not* to be dangerously reactive, even though an "X" appears on the chart for those two chemicals. A few such combinations are listed in Table 7.3; other safe combinations will be listed in subsequent revisions.

COMPATIBILITY CHART

CARGO GROUPS	REACTIVE GROUPS																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1. NON OXIDIZING MINERAL ACIDS																						
2. SULFURIC ACID	X																					
3. NITRIC ACID		X																				
4. ORGANIC ACIDS																						
5. CAUSTICS																						
6. AMMONIA																						
7. ALIPHATIC AMINES																						
8. ALKANOLAMINES																						
9. AROMATIC AMINES																						
10. AMIDES																						
11. ORGANIC ANHYDRIDES																						
12. ISOCYANATES																						
13. VINYL ACETATE																						
14. ACRYLATES																						
15. SUBSTITUTED ALLYLS																						
16. ALKYLENE OXIDES																						
17. EPICHLOROHYDRIN																						
18. KETONES																						
19. ALDEHYDES																						
20. ALCOHOLS, GLYCOLS																						
21. PHENOLS, CRESOLS																						
22. CAPROLACTAM SOLUTION																						
30. OLEFINS																						
31. PARAFFINS																						
32. AROMATIC HYDROCARBONS																						
33. MISCELLANEOUS HYDROCARBON MIXTURES																						
34. ESTERS																						
35. VINYL HALIDES																						
36. HALOGENATED HYDROCARBONS																						
37. NITRILES																						
38. CARBON DISULFIDE																						
39. SULFOLANE																						
40. GLYCOL ETHERS																						
41. ETHERS																						
42. NITROCOMPOUNDS																						
43. MISCELLANEOUS WATER SOLUTIONS																						

(Letters refer to notes on following page)

NOTE: COMPATIBILITY CHART:
REACTIVITY DIFFERENCE (DEVIATIONS) WITHIN CHEMICAL GROUPS

- A Acrolein (19), Crotonaldehyde (19), and 2-Ethyl-3-propyl acrolein (19) are not compatible with Group 1, Non-Oxidizing Mineral Acids.
- B Isophorone (18), and Mesityl Oxide (18) are not compatible with Group 8, Alkanolamines.
- C Acrylic Acid (4) is not compatible with Group 9, Aromatic Amines.
- D Allyl Alcohol (15) is not compatible with Group 12, Isocyanates.
- E Furfuryl Alcohol (20) is not compatible with Group 1, Non-oxidizing Mineral Acids.
- F Furfuryl Alcohol (20) is not compatible with Group 4, Organic Acids.
- G Dichloroethyl Ether (36) is not compatible with Group 2, Sulfuric Acid.
- H Trichloroethylene (36) is not compatible with Group 5, Caustics.
- I Ethylenediamine (7) is not compatible with Ethylene Dichloride (36).

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS

<u>Name</u>	<u>Group No.</u>	<u>Name</u>	<u>Group No.</u>
Acetaldehyde	19	Butyl Benzyl Phthalate	34
Acetic Acid	4	Butylene	30
Acetic Anhydride	11	1,3-Butylene Glycol	20
Acetone	18	Butylene Oxide	16
Acetonitrile	37	Butyl Ether	41
Acrolein (inhibited)	19	Butyl Methacrylate	
Acrylic Acid (inhibited)	4	(inhibited)	14
Acrylonitrile		Butyraldehyde	19
(inhibited)	15	Butyric Acid	4
Adiponitrile	37		
Allyl Alcohol	15	Camphor Oil (light)	18
Allyl Chloride	15	Caprolactam Solution	22
Aminoethylethanolamine	8	Carbolic Oil	21
Ammonia, Anhydrous	6	Carbon Disulfide	38
Ammonium Hydroxide		Carbon Tetrachloride	36
(28% or less)	6	Caustic Potash Solution	5
Ammonium Nitrate, Urea,		Caustic Soda Solution	5
Water Solutions		Chlorine	*
(containing Ammonia)	6	Chlorobenzene	36
Ammonium Nitrate, Urea,		Chloroform	36
Water Solutions (not		Chlorosulfonic Acid	*
containing Ammonia)	43	Corn Syrup	43
Amyl Acetate	34	Creosote, Coal Tar	21
Amyl Alcohol	20	Cresols	21
Amyl Tallate	34	Cresylate Spent Caustic	
Aniline	9	Solution	5
Asphalt	33	Crotonaldehyde	19
Asphalt Blending Stocks:		Cumene	32
Roofers Flux	33	Cycloaliphatic Resins	31
Straight Run Residue	33	Cyclohexane	31
		Cyclohexanol	20
Benzene	32	Cyclohexanone	18
Benzene, Toluene		Cyclohexylamine	7
Xylene (crude)	32	Cymene	32
Butadiene (inhibited)	30		
Butane	31	Decaldehyde	19
Butyl Acrylate		Decane	31
(inhibited)	14	Decene	30
Butyl Acetate	34	Decyl Alcohol	20
Butyl Alcohol	20	Decyl Acrylate	
Butylamine	7	(inhibited)	14

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS (Continued)

Decylbenzene	32	Distillates:	
Dextrose Solution	43	Straight Run	33
Diacetone Alcohol	20	Flashed Feed Stocks	33
Dibutylamine	7	Diundecyl Phthalate	34
Dibutyl Phthalate	34	Dodecane	31
Dichlorobenzene	36	Dodecanol	20
Dichlorodifluoromethane	36	Dodecene	30
1,1-Dichloroethane	36	Dodecylbenzene	32
Dichloroethyl Ether	41		
Dichloromethane	36	Epichlorohydrin	17
1,1-Dichloropropane	36	Ethane	31
1,2-Dichloropropane	36	Ethanolamine	8
1,3-Dichloropropene	15	Ethoxylated Alcohols	
Dicyclopentadiene	30	C11-C15	40
Diethanolamine	8	Ethoxy Triglycol	40
Diethylamine	7	Ethyl Acetate	34
Diethylbenzene	32	Ethyl Alcohol	20
Diethylene Glycol	40	Ethyl Acrylate	
Diethylene Glycol Mono-		(inhibited)	14
butyl Ether	40	Ethylamine	7
Diethylene Glycol Mono-		Ethyl Benzene	32
butyl Ether Acetate	34	Ethyl Butanol	20
Diethylene Glycol Mono-		Ethyl Chloride	36
ethyl Ether	40	Ethylene	30
Diethylene Glycol Mono-		Ethylene Chlorohydrin	20
methyl Ether	40	Ethylene Cyanohydrin	20
Diethylenetriamine	7	Ethylenediamine	7
Diethylethanolamine	8	Ethylene Dibromide	36
Diheptyl Phthalate	34	Ethylene Dichloride	36
Diisobutylene	30	Ethylene Glycol	20
Diisobutyl Carbinol	20	Ethylene Glycol Mono-	
Diisobutyl Ketone	18	butyl Ether	40
Diisodecyl Phthalate	34	Ethylene Glycol Mono-	
Diisopropanolamine	8	butyl Ether Acetate	34
Diisopropylamine	7	Ethylene Glycol Mono-	
Dimethylamine	7	ethyl Ether	40
Dimethylethanolamine	8	Ethylene Glycol Mono-	
Dimethylformamide	10	ethyl Ether Acetate	34
Dinonyl Phthalate	34	Ethylene Glycol Mono-	
Dioctyl Phthalate	34	methyl Ether	40
1,4-Dioxane	41	Ethylene Oxide	*
Diphenyl-Diphenyl Oxide	33	Ethyl Ether	41
Diphenylmethane Diiso-		Ethylhexaldehyde	19
cyanate	12	2-Ethyl Hexanol	20
Di-n-propylamine	7	2-Ethylhexyl Acrylate	
Dipropylene Glycol	40	(inhibited)	14

TABLE 7.1
ALPHABETICAL LISTING OF COMPOUNDS (Continued)

Ethyl Hexyl Tallate	34	Jet Fuels:	
Ethyl Methacrylate		JP-1 (Kerosene)	33
(inhibited)	14	JP-3	33
2-Ethyl-3-Propyl		JP-4	33
Acrolein	19	JP-5 (Kerosene, Heavy)	33
Formaldehyde Solution			
(37-50%)	19		
Formic Acid	4	Kerosene	33
Furfural	19		
Furfuryl Alcohol	20		
		Latex, Liquid Synthetic	43
Gas Oil:			
Cracked	33	Mesityl Oxide	18
Gasoline Blending Stocks:		Methane	31
Alkylates	33	Methyl Acetate	34
Reformats	33	Methyl Acetylene, Pro-	
Gasolines:		padiene Mixture	
Casinghead (natural)	33	(Stabilized)	30
Automotive (containing		Methyl Acrylate	
over 4.23 grams lead		(inhibited)	14
per gallon)	33	Methyl Alcohol	20
Aviation (containing		Methyl Amyl Acetate	34
not over 4.86 grams		Methyl Amyl Alcohol	20
lead per gallon)	33	Methyl Bromide	36
Polymer	33	3-Methyl Butyraldehyde	19
Straight Run	33	Methyl Chloride	36
Glutaraldehyde Solution	19	Methyl Ethyl Ketone	18
Glycerine	20	2-Methyl-5-Ethyl	
Glycol Diacetate	34	Pyridine	9
Glyoxal Solution	19	Methyl Formal (Dimethyl	
		Formal)	41
Heptane	31	Methyl Isobutyl Ketone	18
Hexamethyleneimine	7	Methyl Isobutyl Carbinol	20
Hexane	31	Methyl Methacrylate	
Hexanol	20	(inhibited)	14
Hexene	30	(alpha-) Methyl Styrene	
Hexylene Glycol	20	(inhibited)	30
Hydrochloric Acid	1	Mineral Spirits	33
Hydrofluoric Acid	1	Monochlorodifluoro-	
		methane	36
		Morpholine	7
Isophorone	18	Motor Fuel Antiknock Com-	
Isoprene (inhibited)	30	pounds Containing Lead	
		Alkyls	*

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS (Continued)

Naphtha:			
Coal Tar	33	Lard	34
Solvent	33	Olive	34
Stoddard Solvent	33	Palm	34
Varnish Markers' and		Peanut	34
Painters' (75%)	33	Safflower	34
Naphthalene (molten)	32	Soya Bean	34
Nitric Acid (70% or		Tucum	34
less)	3	Vegetable	34
Nitric Acid (95%)	*	Miscellaneous Oils,	
Nitrobenzene	43	including:	
1- or 2-Nitropropane	43	Absorption	33
Nitrotoluene	43	Aromatic	33
Nonane	31	Coal Tar	33
Nonene	30	Heartcut Distillate	33
Nonyl Alcohol	20	Linseed	33
Nonyl Phenol	21	Lubricating	33
Nonyl Phenol		Mineral	33
(ethoxylated)	40	Mineral Seal	33
		Motor	33
Octane	31	Neatsfoot	33
Octene	30	Penetrating	33
Octyl Alcohol	20	Range	33
Octyl Aldehyde	19	Resin	33
Octyl Epoxytallate	34	Resinous Petroleum	33
Oils:		Rosin	33
Clarified	33	Sperm	33
Coal Oil	33	Spindle	33
Crude Oil	33	Spray	33
Diesel Oil	33	Tall	34
Fuel Oils:		Tanner's	33
No. 1 (Kerosene)	33	Turbine	33
No. 1-D	33	Oleum	*
No. 2	33		
No. 2-D	33	Pentadecanol	22
No. 4	33	Pentane	31
No. 5	33	Pentene	30
No. 6	33	Pentyl Aldehyde	19
Residual	33	Perchloroethylene	36
Road	33	Petrolatum	33
Transformer	33	Petroleum Naphtha	33
Edible Oils, including:		Phenol	21
Castor	34	Pentachloroethane	36
Coconut	34	Phosphoric Acid	1
Cotton Seed	34	Phosphorus	*
Fish	34	Phthalic Anhydride	
		(molten)	11

TABLE 7.1

ALPHABETICAL LISTING OF COMPOUNDS (Continued)

Polybutene	30	Tetradecanol	20
Polyethylene Glycols	40	Tetradecene	30
Polymethylene Polyphenyl-		Tetradecylbenzene	32
isocyanate	12	Tetraethylene Glycol	40
Polypropylene	30	Tetraethylenepentamine	7
Polypropylene Glycol		Tetrahydrofuran	41
Methyl Ether	40	Tetrahydronaphthalene	32
Polypropylene Glycols	40	Tetrasodium Salt of	
Propane	31	EDTA Solution	43
Propanolamine	8	Toluene	32
Propionaldehyde	19	Toluene Diisocyanate	12
Propionic Acid	4	1,2,4-Trichlorobenzene	36
Propionic Anhydride	11	Trichloroethylene	36
Propyl Acetate	34	Tridecanol	20
Propyl Alcohol	20	Tridecene	30
Propylamine	7	Tridecylbenzene	32
Propylene	30	Triethanolamine	8
Propylene Butylene		Triethylamine	7
Polymer	30	Triethyl Benzene	32
Propylene Glycol	20	Triethylene Glycol	40
Propylene Oxide	16	Triethylenetetramine	7
Propylene Tetramer	30	Tripropylene Glycol	40
Propyl Ether	41	Turpentine	30
Pyridine	9		
		Undecanol	20
Sodium Hydrosulfide		Undecene	30
Solution (45% or less)	5	Undecylbenzene	32
Sorbitol	20		
Styrene (inhibited)	30	Valeraldehyde	19
Sulfolane	39	Vinyl Acetate	
Sulfur (molten)	*	(inhibited)	13
Sulfuric Acid	2	Vinyl Chloride	
Sulfuric Acid, Spent	2	(inhibited)	35
		Vinylidene Chloride	
Tallow	34	(inhibited)	35
Tallow Fatty Alcohol	20	Vinyl Toluene	
1,1,2,2-Tetrachloro-		(inhibited)	30
ethane	36		
		Xylene	32

* Because of very high reactivity or unusual conditions of carriage, this product is not included in the Compatibility Chart. If compatibility information is needed for a shipment, contact Commandant (G-MHM-1/83), U.S. Coast Guard, 400 Seventh Street, S.W., Washington, D. C. 20590.

TABLE 7.2
REACTIVITY GROUPS

1. Non-Oxidizing Mineral Acids

Hydrochloric Acid
Hydrofluoric Acid
Phosphoric Acid

2. Sulfuric Acids

Spent Sulfuric Acid
Sulfuric Acid (98% or less)

3. Nitric Acid

Nitric Acid (70% or less)

4. Organic Acids

Acetic Acid
Butyric Acid
Formic Acid
Propionic Acid
Acrylic Acid (inhibited)

5. Caustics

Caustic Potash Solution
Caustic Soda Solution
Cresylate Spent Caustic Solution
Sodium Hydrosulfide Solution
(45% or less)

6. Ammonia

Ammonia, Anhydrous
Ammonium Hydroxide (28% or less)
Ammonium Nitrate, Urea, Water
Solutions (containing Ammonia)

7. Aliphatic Amines

Butylamine
Cyclohexylamine
Dibutylamine
Diethylamine
Diethylenetriamine
Diisopropylamine
Dimethylamine
Di-n-propylamine
Ethylamine
Ethylenediamine
Hexamethyleneimine
Methylamine
Morpholine
Propylamine
Tetraethylenepentamine
Triethylamine
Triethylenetetramine

8. Alkanolamines

Aminoethylethanolamine
Diethanolamine
Diethylethanolamine
Diisopropanolamine
Dimethylethanolamine
Ethanolamine
Propanolamine
Triethanolamine

9. Aromatic Amines

Aniline
Pyridine
2-Methyl-5-Ethylpyridine

10. Amides

Dimethylformamide

TABLE 7.2
REACTIVITY GROUPS (Continued)

11. Organic Anhydrides

Acetic Anhydride
Phthalic Anhydride
Propionic Anhydride

12. Isocyanates

Diphenylmethane Diisocyanate
Polyphenyl Polymethylene-
isocyanate
Toluene Diisocyanate

13. Vinyl Acetate

Vinyl Acetate (inhibited)

14. Acrylates

Butyl Acrylate (inhibited)
Butyl Methacrylate (inhibited)
Decyl Acrylate (inhibited)
Ethyl Acrylate (inhibited)
2-Ethylhexyl Acrylate (inhibited)
Ethyl Methacrylate (inhibited)
Methyl Acrylate (inhibited)
Methyl Methacrylate (inhibited)

15. Substituted Allyls

Acrylonitrile (inhibited)
Allyl Alcohol
Allyl Chloride
1,3-Dichloropropene

16. Alkylenes Oxides

Propylene Oxide
Butylene Oxide

17. Epichlorohydrin

Epichlorohydrin

18. Ketones

Acetone
Camphor Oil
Cyclohexanone
Diisobutyl Ketone
Isophorone
Mesityl Oxide
Methyl Ethyl Ketone
Methyl Isobutyl Ketone

19. Aldehydes

Acetaldehyde
Acrolein (inhibited)
Butyraldehyde
Decaldehyde
Ethylhexaldehyde
Formaldehyde
Glutaraldehyde Solution
Glyoxal Solution
Methylbutyraldehyde
Octyl Aldehyde
Pentyl Aldehyde
Propionaldehyde
Valeraldehyde

20. Alcohols, Glycols

Amyl Alcohol
Butyl Alcohol
1,3-Butylene Glycol
Cyclohexanol
Decyl Alcohol
Diacetone Alcohol
Diisobutyl Carbinol
Dodecanol
Ethanol
Ethoxylated Alcohols
C₁₁-C₁₅

TABLE 7.2
REACTIVITY GROUPS (Continued)

Ethyl Alcohol
Ethylbutanol
Ethylene Chlorohydrin
Ethylene Cyanohydrin
Ethylene Glycol
2-Ethyl Hexanol
Furfuryl Alcohol
Glycerin
Hexanol
Hexylene Glycol
Methanol
Methyl Alcohol
Methylamyl Alcohol
Methylisobutyl Carbinol
Octyl Alcohol
Nonyl Alcohol
Pentadecanol
Propyl Alcohol
Propylene Glycol
Sorbitol
Tallow Fatty Alcohol
Tetradecanol
Tridecanol
Undecanol

21. Phenols and Cresols

Carbolic Oil
Creosote, Coal Tar
Cresols
Nonyl Phenol
Phenol

22. Caprolactam Solution

Caprolactam Solution

23 - 29. Unassigned

30. Olefins

Butadiene (inhibited)
Butene

Butylene
Decene
Dicyclopentadiene
Diisobutylene
Dodecene
Ethylene
Hexene
Isoprene (inhibited)
Methyl Acetylene, Propadiene
Mixture (stabilized)
(alpha-) Methyl Styrene
(inhibited)
Nonene
Octene
Pentene
Polybutene
Polypropylene
Propylene
Propylene Butylene Polymer
Propylene Tetramer
Styrene (inhibited)
Vinyl Toluene (inhibited)
Tetradecene
Tridecene
Turpentine
Undecene

31. Paraffins

Butane
Cycloaliphatic Resins
Cyclohexane
Decane
Dodecane
Ethane
Heptane
Hexane
Methane
Nonane
Octane
Pentane
Propane

TABLE 7.2

REACTIVITY GROUPS (Continued)

32. Aromatic Hydrocarbons

Benzene
Benzene, Toluene, Xylene (crude)
Cumene
Cymene
Decylbenzene
Diethylbenzene
Dodecylbenzene
Ethylbenzene
Naphthalene
Tetradecylbenzene
Tetrahydronaphthalene
Toluene
Tridecylbenzene
Triethylbenzene
Undecylbenzene
Xylene

33. Misc. Hydrocarbon Mixtures

Asphalt
Asphalt Blending Stocks
Diphenyl - Diphenyl Oxide
Distillates
Gas Oil, Cracked
Gasoline Blending Stocks
Gasolines
Jet Fuels
Kerosene
Mineral Spirits
Naphtha
Oils, Crude
Oils, Diesel
Oils, Coal
Oils, Fuel (No. 1 thru No. 6)
Oils, Residual
Oils, Road
Oils, Transformer
Petrolatum
Petroleum Naphtha

34. Esters

Amyl Acetate

Amyl Tallate
Butyl Acetate
Butyl Benzyl Phthalate
Castor Oil
Coconut Oil
Cottonseed Oil
Dibutyl Phthalate
Diethylene Glycol Monobutyl Ether Acetate
Diheptyl Phthalate
Diisodecyl Phthalate
Dinonyl Phthalate
Dioctyl Phthalate
Diundecyl Phthalate
Ethyl Acetate
Ethylene Glycol Monobutyl Ether Acetate
Ethylene Glycol Monoethyl Ether Acetate
Ethylhexyl Tallate
Fish Oil
Glycol Diacetate
Lard
Methyl Acetate
Methyl Amyl Acetate
Octyl Epoxy Tallate
Olive Oil
Palm Oil
Peanut Oil
Propyl Acetate
Safflower Oil
Soybean Oil
Tallow
Tucum Oil
Vegetable Oil

35. Vinyl Halides

Vinyl Chloride (inhibited)
Vinylidene Chloride (inhibited)

36. Halogenated Hydrocarbons

Carbon Tetrachloride
Chlorobenzene

TABLE 7.2
REACTIVITY GROUPS (Continued)

Chloroform
Dichlorobenzene
1,1-Dichloroethane
Dichloroethyl Ether
Dichloromethane
1,1-Dichloropropane
1,2-Dichloropropane
Ethyl Chloride
Ethylene Dibromide
Ethylene Dichloride
Methyl Bromide
Methyl Chloride
Pentachloroethane
Perchloroethylene
1,1,2,2-Tetrachloroethane
1,2,4-Trichlorobenzene
Trichloroethylene

37. Nitriles

Acetonitrile
Adiponitrile

38. Carbon Disulfide

39. Sulfolane

40. Glycol Ethers

Diethylene Glycol
Diethylene Glycol Monobutyl Ether
Diethylene Glycol Monoethyl Ether
Diethylene Glycol Monomethyl Ether
Dipropylene Glycol
Ethoxy Triglycol
Ethylene Glycol Monobutyl Ether
Ethylene Glycol Monethyl Ether

Ethylene Glycol Monomethyl Ether
Nonylphenol, Ethoxylated
Polyethylene Glycols
Polypropylene Glycols
Polypropylene Glycol Methyl Ether
Soybean Oil, Epoxidized
Tetraethylene Glycol
Triethylene Glycol
Tripropylene Glycol

41. Ethers

Butyl Ether
1,4-Dioxane
Ethyl Ether
Methyl Formal (Dimethyl Formal)
Propyl Ether
Tetrahydrofuran

42. Nitrocompounds

(mono-) Nitrobenzene
1- or 2-Nitropropane
Nitrotoluene

43. Miscellaneous Water Solutions

Ammonium Nitrate, Urea, Water Solutions (not containing Ammonia)
Corn Syrup
Dextrose Solution
Latex Solutions
Tetrasodium Salt of EDTA Solution

TABLE 7.3

COMBINATIONS NOT DANGEROUSLY REACTIVE
(as tested in accordance with procedure outlined in NVC 5-70)

Acetone (8)	Caustic soda solution (3)	Caustic soda solution (3)	Methyl ethyl ketone (8)
Acrylonitrile (inhibited) (14)	Methyl alcohol (6)	Caustic soda solution (3)	Methyl isobutyl ketone (8)
Acrylonitrile (inhibited) (14)	Niag polyol (6)*	Caustic soda solution (3)	Palm oil (13)*
Acrylonitrile (inhibited) (14)	Polyol 3030 (6)*	Caustic soda solution (3)	Perchloroethylene (5)*
Acrylonitrile (inhibited) (14)	Propylene glycol (6)	Caustic soda solution (3)	Propyl acetate (iso-, n-) (13)
Acrylonitrile (inhibited) (14)	Voranol CP 4100 (6)*	Caustic soda solution (3)	Oils, edible: soya bean (13)
Benzene (10)	Phosphoric acid (1)	Caustic soda solution (3)	Oils, miscellaneous: sperm
Butyl acetate (n-, iso-*) (13)	Caustic soda solution (3)	Caustic soda solution (3)	Styrene (inhibited) (14)
Butyl acrylate (inhibited) (14)	Methyl alcohol (6)	Caustic soda solution (3)	Tallow (13)
Butyl acrylate (inhibited) (14)	Voranol CP 4100 (6)*	Caustic soda solution (3)	Trichloroethane (5)
n-Butyl alc (6)	Styrene (inhibited) (14)	Dichloropropane (5)	Caustic soda solution (3)
n-Butyl alcohol (6)	Vinyl acetate (inhibited) (14)	Dichloropropane (5)	Caustic soda solution (3)
Carbon tetrachloride (5)	Caustic soda solution (3)	Diisodecyl phthalate (13)*	Caustic soda solution (3)
Caustic soda solution (3)	Acetone (8)	Di-normal-alkyl phthalate (13)*	Caustic soda solution (3)
Caustic soda solution (3)	Butyl acetate (iso-, n-) (13)	Dimethylformamide (4)	Furfural (7)
Caustic soda solution (3)	Carbon tetrachloride (5)	Dimethylformamide (4)	Phenol (15)
Caustic soda solution (3)	Oils, edible: coconut (13)*	Dioctyl phthalate (13)	Caustic soda solution (3)
Caustic soda solution (3)	Oils, edible: cottonseed (13)	Dioctyl phthalate (13)	Ethylenediamine (4)
Caustic soda solution (3)	Dichloropropane (5)	Diphenylmethanediisocyanate	Ethylene dichloride (5)
Caustic soda solution (3)	Dichloropropane (5)	Ethyl acetate (13)	Caustic soda solution (3)
Caustic soda solution (3)	Diisodecyl phthalate (13)*	Ethyl acrylate (inhibited) (14)	Ethylene glycol (6)
Caustic soda solution (3)	Di-normal-alkyl phthalate (13)*	Ethyl acrylate (inhibited) (14)	2-Ethyl hexanol (6)
Caustic soda solution (3)	Dioctyl phthalate (13)	Ethyl acrylate (inhibited) (14)	Voranol CP 4100 (6)*
Caustic soda solution (3)	Ethyl acetate (13)	Ethyl alcohol (6)	Methyl methacrylate (inhibited) (14)
Caustic soda solution (3)	Ethylene dichloride (5)	Ethylenediamine (4)	Dioctyl phthalate (13)
Caustic soda solution (3)	Oils, edible: fish (13)	Ethylene dichloride (5)	Caustic soda solution (3)
Caustic soda solution (3)	Grease (inedible, yellow) (13)*	Ethylene dichloride (5)	Diphenylmethanediisocyanate
Caustic soda solution (3)	Lard (edible) (13)*	Ethylene glycol (6)	Ethyl acrylate (inhibited) (14)
Caustic soda solution (3)	Linseed oil (raw) (13)*	Ethylene glycol (6)	Styrene (inhibited) (14)
Caustic soda solution (3)	Methylene chloride (5)*	Ethylene glycol (6)	Vinyl acetate (inhibited) (14)

*Not presently included in CHRIS.

TABLE 7.3

COMBINATIONS NOT DANGEROUSLY REACTIVE (Continued)

2-Ethyl hexanol (6)	Ethyl acrylate (inhibited) (14)	Oils, edible: cottonseed (13)	Caustic soda solution (3)
2-Ethyl hexanol (6)	Styrene (inhibited) (14)	Oils, edible: fish (13)	Caustic soda solution (3)
Furfural (7)	Dimethylformamide (4)	Oils, edible: soya bean (13)	Caustic soda solution (3)
Furfural (7)	Isopropyl alcohol (6)	Oils, miscellaneous: sperm	Caustic soda solution (3)
Furfural (7)	Methyl ethyl ketone (8)	Palm oil (13)*	Caustic soda solution (3)
Grease (inedible, yellow) (13)*	Caustic soda solution (3)	Perchloroethylene (5)*	Caustic soda solution (3)
Isobutyl alcohol (6)	Styrene (inhibited) (14)	Phenol (15)	Dimethyl formamide (4)
Isobutyl alcohol (6)	Vinyl acetate (inhibited) (14)	Phosphoric acid (1)	Benzene (10)
Isodecyl alcohol (6)	Vinyl acetate (inhibited) (14)	Phosphoric acid (1)	Toluene (10)
Isooctyl alcohol (6)	Methyl methacrylate (inhibited) (14)	Phosphoric acid (1)	Xylene (10)
Isooctyl alcohol (6)	Styrene (inhibited) (14)	Polyol 3030 (6)*	Acrylonitrile (inhibited) (14)
Isooctyl alcohol (6)	Vinyl acetate (inhibited) (14)	Propyl acetate (iso-, n-) (13)	Caustic soda solution (3)
Isopropyl alcohol (6)	Furfural (7)	Propylene glycol (6)	Acrylonitrile (inhibited) (14)
Isopropyl alcohol (6)	Styrene (inhibited) (14)	Propylene glycol (6)	Styrene (inhibited) (14)
Isopropyl alcohol (6)	Vinyl acetate (inhibited) (14)	Styrene (inhibited) (14)	n-Butyl alcohol (6)
Lard (edible) (13)*	Caustic soda solution (3)	Styrene (inhibited) (14)	Acrylonitrile (inhibited) (14)
Linseed oil (raw) (13)*	Caustic soda solution (3)	Styrene (inhibited) (14)	Caustic soda solution (3)
Methyl alcohol (6)	Acrylonitrile (inhibited) (14)	Styrene (inhibited) (14)	Ethylene glycol (6)
Methyl alcohol (6)	Butyl acrylate (inhibited) (14)	Styrene (inhibited) (14)	2-Ethyl hexanol (6)
Methyl alcohol (6)	Styrene (inhibited) (14)	Styrene (inhibited) (14)	Isobutyl alcohol (6)
Methyl alcohol (6)	Vinyl acetate (inhibited) (14)	Styrene (inhibited) (14)	Isooctyl alcohol (6)
Methyl alcohol (6)	Caustic soda solution (3)	Styrene (inhibited) (14)	Isopropyl alcohol (6)
Methyl alcohol (6)	Vinyl acetate (inhibited) (14)	Styrene (inhibited) (14)	Methyl alcohol (6)
Methyl alcohol (6)	Caustic soda solution (3)	Styrene (inhibited) (14)	Propylene glycol (6)
Methyl alcohol (6)	Furfural (7)	Styrene (inhibited) (14)	Trichloroethylene (5)
Methyl alcohol (6)	Caustic soda solution (3)	Styrene (inhibited) (14)	Caustic soda solution (3)
Methyl isobutyl ketone (8)	Ethyl alcohol (6)	Styrene (inhibited) (14)	Phosphoric acid (1)
Methyl methacrylate (inhibited) (14)	Isooctyl alcohol (6)	Styrene (inhibited) (14)	Caustic soda solution (3)
Methyl methacrylate (inhibited) (14)	Acrylonitrile (inhibited) (14)	Styrene (inhibited) (14)	Styrene (inhibited) (14)
Niax polyol (6)*	Vinyl acetate (inhibited) (14)	Styrene (inhibited) (14)	n-Butyl alcohol (6)
Niax polyol (6)*	Caustic soda solution (3)	Styrene (inhibited) (14)	Ethylene glycol (6)
Oils, edible: coconut (13)*		Styrene (inhibited) (14)	

*Not presently included in CHRIS.

TABLE 7.3

COMBINATIONS NOT DANGEROUSLY REACTIVE (Continued)

Vinyl acetate (inhibited) (14)	Isobutyl alcohol (6)	Voranol CP 4100 (6) *	Vinyl acetate (inhibited) (14)
Vinyl acetate (inhibited) (14)	Isodecyl alcohol (6)	Xylene (10)	Phosphoric acid (1)
Vinyl acetate (inhibited) (14)	Isocetyl alcohol (6)	Toluene 2,4-diisocyanate (TDI), diphenylmethanediisocyanate (MDI), and polymethylene polyphenyl isocyanate (PAPI) * are considered compatible with reactivity groups 9, 10, 11, 12, 18, and 21.	
Vinyl acetate (inhibited) (14)	Isopropyl alcohol (6)		
Vinyl acetate (inhibited) (14)	Methyl alcohol (6)		
	Niax polyol (6) *		
	Voranol CP 4100 (6) *		
	Acrylonitrile (inhibited) (14)		
	Butyl acrylate (inhibited) (14)		
	Ethyl acrylate (inhibited) (14)		
Vinyl acetate (inhibited) (14)			
Vinyl acetate (inhibited) (14)			
Voranol CP 4100 (6) *			
Voranol CP 4100 (6) *			
Voranol CP 4100 (6) *			

*Not presently included in CHRIS.

8. INDEX OF SYNONYMS

SYNONYM		COMPOUND NAME
AATREX HERBICIDE	-	ATRAZINE
ABSORBENT OIL	-	OIL: ABSORPTION
ACETALDEHYDE	-	ACETALDEHYDE
ACETIC ACID	-	ACETIC ACID
ACETIC ACID, AMMONIUM SALT	-	AMMONIUM ACETATE
ACETIC ACID, BUTYL ESTER	-	N-BUTYL ACETATE
ACETIC ACID, CUPRIC SALT	-	COPPER ACETATE
ACETIC ACID, DIMETHYLAMIDE	-	DIMETHYLACETAMIDE
ACETIC ACID, ETHYL ESTER	-	ETHYL ACETATE
ACETIC ACID, ISOBUTYL ESTER	-	ISOBUTYL ACETATE
ACETIC ACID, ISOPROPYL ESTER	-	ISOPROPYL ACETATE
ACETIC ACID, METHYL ESTER	-	METHYL ACETATE
ACETIC ACID, NICKEL (II) SALT	-	NICKEL ACETATE
ACETIC ACID, PROPYL ESTER	-	N-PROPYL ACETATE
ACETIC ACID, SEC-BUTYL ESTER	-	SEC-BUTYL ACETATE
ACETIC ACID, ZINC SALT	-	ZINC ACETATE
ACETIC ALDEHYDE	-	ACETALDEHYDE
ACETIC ANHYDRIDE	-	ACETIC ANHYDRIDE
ACETIC ESTER	-	ETHYL ACETATE
ACETIC ETHER	-	ETHYL ACETATE
ACETOACETIC ACID, ETHYL ESTER	-	ETHYL ACETOACETATE
ACETOACETIC ESTER	-	ETHYL ACETOACETATE
ACETONE	-	ACETONE
ACETONE CYANOHYDRIN	-	ACETONE CYANOHYDRIN
ACETONITRILE	-	ACETONITRILE
ACETOPHENONE	-	ACETOPHENONE
ACETYLACETONE	-	ACETYLACETONE
ACETYLBENZENE	-	ACETOPHENONE
ACETYL BROMIDE	-	ACETYL BROMIDE
ACETYL CHLORIDE	-	ACETYL CHLORIDE
ACETYLENE	-	ACETYLENE
ACETYLENE DICHLORIDE	-	1,2-DICHLOROETHYLENE
ACETYLENE TETRACHLORIDE	-	TETRACHLOROETHANE
ACETYLENOGEN	-	CALCIUM CARBIDE
ACETYL HYDROPEROXIDE	-	PERACETIC ACID
ACETYL PEROXIDE SOLUTION	-	ACETYL PEROXIDE SOLUTION
ACID AMMONIUM CARBONATE	-	AMMONIUM BICARBONATE
ACID AMMONIUM FLUORIDE	-	AMMONIUM BIFLUORIDE
ACID CALCIUM PHOSPHATE	-	CALCIUM PHOSPHATE
ACRALDEHYDE	-	ACROLEIN
ACRIDINE	-	ACRIDINE
ACROLEIN	-	ACROLEIN
ACRYLALDEHYDE	-	ACROLEIN
ACRYLAMIDE	-	ACRYLAMIDE
ACRYLIC ACID	-	ACRYLIC ACID
ACRYLIC ACID, BUTYL ESTER	-	N-BUTYL ACRYLATE
ACRYLIC ACID, ETHYL ESTER	-	ETHYL ACRYLATE
ACRYLIC ACID, 2-ETHYLHEXYL ESTER	-	2-ETHYLHEXYL ACRYLATE, INHIBITED
ACRYLIC ACID, ISOBUTYL ESTER	-	ISO-BUTYL ACRYLATE
ACRYLIC ACID, METHYL ESTER	-	METHYL ACRYLATE
ACRYLIC ALDEHYDE	-	ACROLEIN
ACRYLIC AMIDE 50 PER CENT	-	ACRYLAMIDE
ACRYLONITRILE	-	ACRYLONITRILE
ACTIVATED CHARCOAL	-	CHARCOAL
ADACENE-12	-	1-DODECENE
ADIPIC ACID	-	ADIPIC ACID
ADIPIC ACID, BIS(2-ETHYLHEXYL) ESTER	-	DIOCTYL ADIPATE
ADIPINIC ACID	-	ADIPIC ACID
ADIPOL 2 EH	-	DIOCTYL ADIPATE
ADIPONITRILE	-	ADIPONITRILE
ADRONAL	-	CYCLOHEXANOL
AEROSOL SURFACTANT	-	DIOCTYL SODIUM SULFOSUCCINATE
AEROTHENE	-	TRICHLOROETHANE

SYNONYM	COMPOUND NAME
AFICIDE	BENZENE HEXACHLORIDE
AGROCIDE	BENZENE HEXACHLORIDE
ALBONE	HYDROGEN PEROXIDE
ALBUS	MERCURIC AMMONIUM CHLORIDE
ALCOHOL	ETHYL ALCOHOL
ALCOHOL C-10	N-DECYL ALCOHOL
ALCOHOL C-8	CCTANOL
ALDEHYDE C-10	DECALDEHYDE
ALDEHYDE-COLLIDINE	METHYLETHYLPYRIDINE
ALDEHYDINE	METHYLETHYLPYRIDINE
ALCIFEN	2,4-DINITROPHENOL
ALCRIN	ALDRIN
ALFA-TOX	DIAZINON
ALGYLEN	TRICHLOROETHYLENE
ALKAWAY LIQUID ALKALINE DERUSTER	BOILER COMPOUND, LIQUID
ALKYLBENZENESULFONIC ACIDS	ALKYLBENZENESULFONIC ACIDS
ALKYLBENZENESULFONIC ACID, SODIUM SALT	SODIUM ALKYLBENZENESULFONATES
ALLEN-METHYLACETYLENE MIXTURE	METHYLACETYLENE - PROPADIENE MIXTURE
ALLOMALEIC ACID	FUMARIC ACID
ALLYL ALCOHOL	ALLYL ALCOHOL
ALLYL BROMIDE	ALLYL BROMIDE
ALLYL CHLORIDE	ALLYL CHLORIDE
ALLYL CHLOROCARBONATE	ALLYL CHLOROFORMATE
ALLYL CHLOROFORMATE	ALLYL CHLOROFORMATE
ALLYLSILICONE TRICHLORIDE	ALLYLTRICHLOROSILANE
ALLYLTRICHLOROSILANE	ALLYLTRICHLOROSILANE
ALOWET D65	DIOCTYL SODIUM SULFOSUCCINATE
ALUMINUM CHLORIDE	ALUMINUM CHLORIDE
ALUMINUM ETHYL DICHLORIDE EADC	ETHYLALUMINUM DICHLORIDE
ALUMINUM ETHYL DICHLORIDE	ETHYLALUMINUM DICHLORIDE
ALUMINUM FLUORIDE	ALUMINUM FLUORIDE
ALUMINUM NITRATE	ALUMINUM NITRATE
ALUMINUM NITRATE NONAHYDRATE	ALUMINUM NITRATE
ALUMINUM SULFATE	ALUMINUM SULFATE
ALUMINUM TRIETHYL	TRIETHYLALUMINUM
ALUMINUM TRIISOBUTYL	TRIISOBUTYLALUMINUM
AMCHLOR	AMMONIUM CHLORIDE
AMERICAN PALM KERNEL OIL	OILS EDIBLE: TUCUM
AMINO BENZENE	ANILINE
1-AMINO BUTANE	N-BUTYLAMINE
AMINOCAPROIC LACTAM	CAPROLACTAM, LIQUID
1-AMINO-4-CHLOROBENZENE	P-CHLOROANILINE
2-AMINO-5-CHLOROTOLUENE	4-CHLORO-O-TOLUIDINE
AMINOCYCLOHEXANE	CYCLOHEXYLAMINE
AMINOETHANE	ETHYLAMINE
2-AMINOETHANOL	MONOETHANOLAMINE
BETA-AMINOETHYL ALCOHOL	MONOETHANOLAMINE
2-((2-AMINOETHYL)AMINO)ETHANOL	AMINOETHYLETHANOLAMINE
N-(2-AMINOETHYL)ETHANOLAMINE	AMINOETHYLETHANOLAMINE
AMINOETHYLETHANOLAMINE	AMINOETHYLETHANOLAMINE
AMINOFORM	HEXAMETHYLENETETRAMINE
2-AMINOISOBUTANE	TERT-BUTYLAMINE
AMINOMERCURIC CHLORIDE	MERCURIC AMMONIUM CHLORIDE
AMINOMETHANE	METHYLAMINE
2-AMINO-1-METHYLBENZENE	O-TOLUIDINE
1-AMINO-2-METHYLPROPANE	ISOBUTYLAMINE
2-AMINO-2-METHYLPROPANE	TERT-BUTYLAMINE
1-AMINONAPHTHALENE	1-NAPHTHYLAMINE
1-AMINONAPHTHALENE ALPHA-NAPHTHYLAMINE	1-NAPHTHYLAMINE
1-AMINO-2-NITROBENZENE	2-NITROANILINE
1-AMINO-4-NITROBENZENE	4-NITROANILINE
2-AMINOPROPANE	ISOPROPYLAMINE
1-AMINO-2-PROPANOL	MONOISOPROPANOLAMINE
2-AMINOTOLUENE	O-TOLUIDINE
ALPHA-AMINOTOLUENE	BENZYLAMINE

SYNONYM

AMFATE
 AMMOFORM
 AMMONERIC
 AMMONIA ANHYDROUS
 AMMONIA SOAP
 AMMONIATED MERCURY
 AMMONIA WATER
 AMMONIOFORMALDEHYDE
 AMMONIUM ACETATE
 AMMONIUM ACID FLUORIDE
 AMMONIUM AMIDOSULFONATE
 AMMONIUM AMIDOSULPHATE
 AMMONIUM BENZOATE
 AMMONIUM BICARBONATE
 AMMONIUM BICHRONATE
 AMMONIUM BIFLUORIDE
 AMMONIUM CARBONATE
 AMMONIUM CHLORIDE
 AMMONIUM CITRATE
 AMMONIUM CITRATE, DIBASIC
 AMMONIUM DECABORATE OCTAHYDRATE
 AMMONIUM DICHROMATE
 AMMONIUM DISULFATO-NICKELATE (II)
 AMMONIUM FERRIC CITRATE
 AMMONIUM FERRIC OXALATE TRIHYDRATE
 AMMONIUM FERROUS SULFATE
 AMMONIUM FLUORIDE
 AMMONIUM FLUOSILICATE
 AMMONIUM FORMATE
 AMMONIUM GLUCONATE
 AMMONIUM HYDROGEN CARBONATE
 AMMONIUM HYDROGEN FLUORIDE
 AMMONIUM HYDROGEN SULFIDE SOLUTION
 AMMONIUM HYDROXIDE
 AMMONIUM HYPO
 AMMONIUM HYPOSULFITE
 AMMONIUM IODIDE
 AMMONIUM IRON SULFATE
 AMMONIUM LACTATE
 AMMONIUM LACTATE SYRUP
 AMMONIUM LAURYL SULFATE
 AMMONIUM MOLYBDATE
 AMMONIUM MURIATE
 AMMONIUM NICKEL SULFATE
 AMMONIUM NITRATE
 AMMONIUM NITRATE-PHOSPHATE MIXTURE
 AMMONIUM NITRATE-SULFATE MIXTURE
 AMMONIUM NITRATE-UREA SOLUTION
 AMMONIUM OLEATE
 AMMONIUM OXALATE
 AMMONIUM OXALATE HYDRATE
 AMMONIUM PENTABORATE
 AMMONIUM PENTABORATE TETRAHYDRATE
 AMMONIUM PENTACHLOROZINCATE
 AMMONIUM PERCHLORATE
 AMMONIUM PEROXYDISULFATE
 AMMONIUM PERSULFATE
 AMMONIUM PHOSPHATE
 AMMONIUM PHOSPHATE, DIBASIC
 AMMONIUM RHODANATE
 AMMONIUM RHODANIDE
 AMMONIUM SILICOFLUORIDE
 AMMONIUM STEARATE
 AMMONIUM STEARATE DISPERSION
 AMMONIUM SULFAMATE

COMPOUND NAME

AMMONIUM SULFAMATE
 HEXAMETHYLENETETRAHIME
 AMMONIUM CHLORIDE
 AMMONIA ANHYDROUS
 AMMONIUM OLEATE
 MERCURIC AMMONIUM CHLORIDE
 AMMONIUM HYDROXIDE
 HEXAMETHYLENETETRAMINE
 AMMONIUM ACETATE
 AMMONIUM BIFLUORIDE
 AMMONIUM SULFAMATE
 AMMONIUM SULFAMATE
 AMMONIUM BENZOATE
 AMMONIUM BICARBONATE
 AMMONIUM DICHROMATE
 AMMONIUM BIFLUORIDE
 AMMONIUM CARBONATE
 AMMONIUM CHLORIDE
 AMMONIUM CITRATE
 AMMONIUM CITRATE
 AMMONIUM PENTABORATE
 AMMONIUM DICHROMATE
 NICKEL AMMONIUM SULFATE
 FERRIC AMMONIUM CITRATE
 FERRIC AMMONIUM OXALATE
 FERROUS AMMONIUM SULFATE
 AMMONIUM FLUORIDE
 AMMONIUM SILICOFLUORIDE
 AMMONIUM FORMATE
 AMMONIUM GLUCONATE
 AMMONIUM BICARBONATE
 AMMONIUM BIFLUORIDE
 AMMONIUM SULFIDE
 AMMONIUM HYDROXIDE
 AMMONIUM THIOSULFATE
 AMMONIUM THIOSULFATE
 AMMONIUM IODIDE
 FERROUS AMMONIUM SULFATE
 AMMONIUM LACTATE
 AMMONIUM LACTATE
 AMMONIUM LAURYL SULFATE
 AMMONIUM MOLYBDATE
 AMMONIUM CHLORIDE
 NICKEL AMMONIUM SULFATE
 AMMONIUM NITRATE
 AMMONIUM NITRATE-PHOSPHATE MIXTURE
 AMMONIUM NITRATE-SULFATE MIXTURE
 AMMONIUM NITRATE-UREA SOLUTION
 AMMONIUM OLEATE
 AMMONIUM OXALATE
 AMMONIUM OXALATE
 AMMONIUM PENTABORATE
 AMMONIUM PENTABORATE
 ZINC AMMONIUM CHLORIDE
 AMMONIUM PERCHLORATE
 AMMONIUM PERSULFATE
 AMMONIUM PERSULFATE
 AMMONIUM PHOSPHATE
 AMMONIUM PHOSPHATE
 AMMONIUM THIOCYANATE
 AMMONIUM THIOCYANATE
 AMMONIUM SILICOFLUORIDE
 AMMONIUM STEARATE
 AMMONIUM STEARATE
 AMMONIUM SULFAMATE

SYNONYM		COMPOUND NAME
AMMONIUM SULFATE	■	AMMONIUM SULFATE
AMMONIUM SULFHYDRATE SOLUTION	■	AMMONIUM SULFIDE
AMMONIUM SULFIDE	■	AMMONIUM SULFIDE
AMMONIUM SULFIDE SOLUTION	■	AMMONIUM SULFIDE
AMMONIUM SULFITE	■	AMMONIUM SULFITE
AMMONIUM SULFOCYANATE	■	AMMONIUM THIOCYANATE
AMMONIUM SULFOCYANIDE	■	AMMONIUM THIOCYANATE
AMMONIUM TARTRATE	■	AMMONIUM TARTRATE
AMMONIUM THIOCYANATE	■	AMMONIUM THIOCYANATE
AMMONIUM THIOSULFATE	■	AMMONIUM THIOSULFATE
AMMONIUM TRIOXALATOFERRATE TRIHYDRATE	■	FERRIC AMMONIUM OXALATE
AMMONIUM ZINC CHLORIDE	■	ZINC AMMONIUM CHLORIDE
AMORPHOUS PHOSPHORUS	■	PHOSPHORUS, RED
AMS	■	AMMONIUM SULFAMATE
AMYL ACETATE	■	AMYL ACETATE
AMYL ACETATES, MIXED ISOMERS	■	AMYL ACETATE
N-AMYL ALCOHOL	■	N-AMYL ALCOHOL
1-AMYL ALCOHOL	■	N-AMYL ALCOHOL
AMYL ALDEHYDE	■	VALERALDEHYDE
AMYL CARBINOL	■	HEXANOL
AMYL CHLORIDE	■	N-AMYL CHLORIDE
N-AMYL CHLORIDE	■	N-AMYL CHLORIDE
ALPHA-N-AMYLENE	■	I-PENTENE
AMYL HYDROSULFIDE	■	N-AMYL MERCAPTAN
N-AMYL MERCAPTAN	■	N-AMYL MERCAPTAN
N-AMYL METHYL KETONE	■	N-AMYL METHYL KETONE
N-AMYL NITRATE	■	N-AMYL NITRATE
AMYL NITRITE	■	ISC-AMYL NITRITE
ISO-AMYL NITRITE	■	ISC-AMYL NITRITE
AMYL SULFHYDRATE	■	N-AMYL MERCAPTAN
AMYL THIOALCOHOL	■	N-AMYL MERCAPTAN
N-AMYLTRICHLOROSILANE	■	N-AMYLTRICHLOROSILANE
ANESTHESIA ETHER	■	ETHYL ETHER
ANHYDRONE	■	MAGNESIUM PERCHLORATE
ANHYDROUS ALUMINUM CHLORIDE	■	ALUMINUM CHLORIDE
ANILINE	■	ANILINE
ANILINE OIL	■	ANILINE
ANILINOBENZENE	■	DIPHENYLAMINE
ANILINOMETHANE	■	N-METHYLAMINE
ANIMAL CARBON	■	CHARCOAL
ANIMAL CHARCOAL	■	CHARCOAL
ANISOYL CHLORIDE	■	ANISOYL CHLORIDE
P-ANISOYL CHLORIDE	■	ANISOYL CHLORIDE
ANGL	■	CYCLOHEXANOL
ANONE	■	CYCLOHEXANONE
ANSAR	■	CACODYLIC ACID
ANSUL ETHER 121	■	ETHYLENE GLYCOL DIMETHYL ETHER
ANTHRACENE	■	ANTHRACENE
ANTHRACIN	■	ANTHRACENE
ANTIMONY BUTTER	■	ANTIMONY TRICHLORIDE
ANTIMONY (III) CHLORIDE	■	ANTIMONY TRICHLORIDE
ANTIMONY (V) CHLORIDE	■	ANTIMONY PENTACHLORIDE
ANTIMONY PENTACHLORIDE	■	ANTIMONY PENTACHLORIDE
ANTIMONY PENTAFLUORIDE	■	ANTIMONY PENTAFLUORIDE
ANTIMONY PERCHLORIDE	■	ANTIMONY PENTACHLORIDE
ANTIMONY POTASSIUM TARTRATE	■	ANTIMONY POTASSIUM TARTRATE
ANTIMONY TRICHLORIDE	■	ANTIMONY TRICHLORIDE
ANTIMONY TRIFLUORIDE	■	ANTIMONY TRIFLUORIDE
ANTIMONY TRIOXIDE	■	ANTIMONY TRIOXIDE
AQUARA OIL	■	OILS EDIBLE: TUCUM
APARASIN	■	BENZENE HEXACHLORIDE
APHTIRIA	■	BENZENE HEXACHLORIDE
APD	■	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
AQUEOUS AMMONIA	■	AMMONIUM HYDROXIDE
ARASAN	■	THIRAM

SYNONYM		COMPOUND NAME
ARCTON 9	-	TRICHLOROFLUOROMETHANE
ARGENTOUS FLUORIDE	-	SILVER FLUORIDE
ARGENTOUS OXIDE	-	SILVER OXIDE
AROCHLOR	-	POLYCHLORINATED BIPHENYL (PCB)
ARSECODILE	-	SODIUM CACODYLATE
ARSENIC ACID	-	ARSENIC ACID
ARSENIC CHLORIDE	-	ARSENIC TRICHLORIDE
ARSENIC DISULFIDE	-	ARSENIC DISULFIDE
ARSENIC PENTOXIDE	-	ARSENIC ACID
ARSENIC SESQUIOXIDE	-	ARSENIC TRIOXIDE
ARSENIC TRICHLORIDE	-	ARSENIC TRICHLORIDE
ARSENIC (III) TRICHLORIDE	-	ARSENIC TRICHLORIDE
ARSENIC TRIOXIDE	-	ARSENIC TRIOXIDE
ARSENIC TRISULFIDE	-	ARSENIC TRISULFIDE
ARSENIC YELLOW	-	ARSENIC TRISULFIDE
ARSENIOUS CHLORIDE	-	ARSENIC TRICHLORIDE
ARSENIOUS ACID	-	ARSENIC TRIOXIDE
ARSENGUS ACID ANHYDRIDE	-	ARSENIC TRIOXIDE
ARSENIOUS CHLORIDE	-	ARSENIC TRICHLORIDE
ARSENIOUS OXIDE	-	ARSENIC TRIOXIDE
ARSICODILE	-	SODIUM CACODYLATE
ARSYCODILE	-	SODIUM CACODYLATE
ARTIC	-	METHYL CHLORIDE
ARTIFICIAL CINNABAR	-	MERCURIC SULFIDE
ASPHALT	-	ASPHALT
ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE	-	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
ASPHALT BLENDING STOCK:ROOFERS FLUX	-	ASPHALT BLENDING STOCK:ROOFERS FLUX
ASPHALT CEMENTS	-	ASPHALT
ASPHALTIC BITUMEN	-	ASPHALT
ASPHALTUM OIL	-	ASPHALT BLENDING STOCK:ROOFERS FLUX
ATE	-	TRIETHYLALUMINUM
ATRAZINE	-	ATRAZINE
10-AZAANTHRACENE	-	ACRIDINE
AZACYCLOHEPTANE	-	HEXAMETHYLENEIMINE
1-AZANAPHTHALENE	-	QUINCLINE
AZINPHOSMETHYL	-	AZINPHOSMETHYL
AZIRANE	-	ETHYLENEIMINE
AZIRIDINE	-	ETHYLENEIMINE
TRIS (1-AZIRIDINYL) PHOSPHINE OXIDE	-	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
AZOIC DIAZO COMPONENT 6	-	2-NITROANILINE
AZOIC DIAZO COMPONENT 37	-	4-NITROANILINE
BARIUM BINOXIDE	-	BARIUM PEROXIDE
BARIUM CARBONATE	-	BARIUM CARBONATE
BARIUM CHLORATE	-	BARIUM CHLORATE
BARIUM CHLORATE MONOHYDRATE	-	BARIUM CHLORATE
BARIUM DIOXIDE	-	BARIUM PEROXIDE
BARIUM NITRATE	-	BARIUM NITRATE
BARIUM PERCHLORATE	-	BARIUM PERCHLORATE
BARIUM PERCHLORATE TRIHYDRATE	-	BARIUM PERCHLORATE
BARIUM PERMANGANATE	-	BARIUM PERMANGANATE
BARIUM PEROXIDE	-	BARIUM PEROXIDE
BARIUM SUPEROXIDE	-	BARIUM PEROXIDE
BASIC BISMUTH CHLORIDE	-	BISMUTH OXYCHLORIDE
BASIC ZIRCONIUM CHLORIDE	-	ZIRCONIUM OXYCHLORIDE
BATTERY ACID	-	SULFURIC ACID
B8H	-	BENZENE HEXACHLORIDE
BEARING OIL	-	OIL: SPINDLE
BEET SUGAR	-	SUCROSE
BEN-HEX	-	BENZENE HEXACHLORIDE
BENZALDEHYDE	-	BENZALDEHYDE
1-BENZAZINE	-	QUINCLINE
BENZENE	-	BENZENE
BENZENE, MIXTURE WITH TOLUENE AND XYLENES	-	NAPHTHA COAL TAR

SYNONYM		COMPOUND NAME
BENZENECARBINOL	-	BENZYL ALCOHOL
BENZENECARBONYL CHLORIDE	-	BENZYL CHLORIDE
BENZENECARBOXYLIC ACID	-	BENZOIC ACID
1,2-BENZENEDICARBOXYLIC ACID ANHYDRIDE	-	PHTHALIC ANHYDRIDE
1,2-BENZENEDICARBOXYLIC ACID, DIETHYL ESTER	-	DIETHYL PHTHALATE
BENZENE CHLORIDE	-	CHLOROBENZENE
BENZENE-1,3-DICARBOXYLIC ACID	-	ISOPHTHALIC ACID
1,4-BENZENEDIOL	-	HYDROQUINONE
1,3-BENZENEDIOL	-	RESORCINOL
1,2-BENZENEDIOL	-	CATECHOL
BENZENE HEXACHLORIDE	-	BENZENE HEXACHLORIDE
BENZENE PHOSPHORUS DICHLORIDE	-	BENZENE PHOSPHORUS DICHLORIDE
BENZENE PHOSPHORUS THIODICHLORIDE	-	BENZENE PHOSPHORUS THIODICHLORIDE
BENZENETHIOPHOSPHONYL CHLORIDE	-	BENZENE PHOSPHORUS THIODICHLORIDE
1,2,3-BENZENETRIOL	-	PYROGALLIC ACID
BENZINFORM	-	CARBON TETRACHLORIDE
BENZOIC ACID	-	BENZOIC ACID
BENZOIC ACID, AMMONIUM SALT	-	AMMONIUM BENZOATE
BENZOIC ACID NITRILE	-	BENZONITRILE
BENZOIC ALDEHYDE	-	BENZALDEHYDE
BENZOL	-	BENZENE
BENZOLE	-	BENZENE
BENZONITRILE	-	BENZONITRILE
BENZOPHENONE	-	BENZOPHENONE
BENZO(B)PYRIDINE	-	QUINOLINE
BENZO(B)QUINOLINE	-	ACRIDINE
BENZOYLBENZENE	-	BENZOPHENONE
BENZOYL CHLORIDE	-	BENZOYL CHLORIDE
BENZOYL PEROXIDE	-	DIBENZOYL PEROXIDE
BENZOYL SUPEROXIDE	-	DIBENZOYL PEROXIDE
BENZYL ALCOHOL	-	BENZYL ALCOHOL
BENZYLAMINE	-	BENZYLAMINE
BENZYL BROMIDE	-	BENZYL BROMIDE
BENZYL N-BUTYL PHTHALATE	-	BENZYL N-BUTYL PHTHALATE
BENZYL CARBONYL CHLORIDE	-	BENZYL CHLOROFORMATE
BENZYL CHLORIDE	-	BENZYL CHLORIDE
BENZYL CHLOROCARBONATE	-	BENZYL CHLOROFORMATE
BENZYL CHLOROFORMATE	-	BENZYL CHLOROFORMATE
BENZYL DIMETHYLOCTADECYLAMMONIUM CHLORIDE	-	BENZYL DIMETHYLOCTADECYLAMMONIUM CHLORIDE
BENZYL DIMETHYLSTEARYLAMMONIUM CHLORIDE	-	BENZYL DIMETHYLSTEARYLAMMONIUM CHLORIDE
BENZYLTRIMETHYLAMMONIUM CHLORIDE	-	BENZYLTRIMETHYLAMMONIUM CHLORIDE
BERYLLIA	-	BERYLLIUM OXIDE
BERYLLIUM CHLORIDE	-	BERYLLIUM CHLORIDE
BERYLLIUM FLUORIDE	-	BERYLLIUM FLUORIDE
BERYLLIUM, METALLIC	-	BERYLLIUM, METALLIC
BERYLLIUM NITRATE	-	BERYLLIUM NITRATE
BERYLLIUM NITRATE TRIHYDRATE	-	BERYLLIUM NITRATE
BERYLLIUM OXIDE	-	BERYLLIUM OXIDE
BERYLLIUM SULFATE	-	BERYLLIUM SULFATE
BERYLLIUM SULFATE TETRAHYDRATE	-	BERYLLIUM SULFATE
BETAPROF	-	BETA-PROPIOLACTONE
BFC	-	BENZENE HEXACHLORIDE
BICHROME	-	POTASSIUM DICHROMATE
BICYCLO (4.4.0) DECANE	-	DECAHYDRONAPHTHALENE
BIEBERITE	-	COBALT SULFATE
BIETHYLENE	-	BUTADIENE, INHIBITED
BIFORMAL	-	GLYOXAL, 40% SOLUTION
BIFORMYL	-	GLYOXAL, 40% SOLUTION
DIPHENYL-DIPHENYL ETHER	-	DOWTHERM
BIS(ACETATO)DIOXOURANIUM	-	URANYL ACETATE
BIS(2-AMINOETHYL)AMINE	-	DIETHYLENETRIAMINE
N,N -BIS(2-AMINOETHYL) ETHYLENEDIAMINE	-	TRIETHYLENETETRAMINE

SYNONYM		COMPOUND NAME
BIS(P-CHLOROBENZOYL) PEROXIDE	-	DI-(P-CHLOROBENZOYL) PEROXIDE
BIS-(P-CHLOROBENZOYL) PEROXIDE	-	DI-(P-CHLOROBENZOYL) PEROXIDE
BIS(2-CHLOROETHYL) ETHER	-	DICHLOROETHYL ETHER
BIS (2-CHLOROETHYL) ETHER	-	DICHLOROETHYL ETHER
1,1-BIS(P-CHLOROPHENYL)-2,2,2- TRICHLOROETHANOL	-	4,4 -DICHLORO-ALPHA- TRICHLOROMETHYLBENZHYDROL
BIS (DIMETHYLTHIOCARBAMOYL) DISULFIDE	-	THIRAM
BIS(DIMETHYLTHIOCARBAMYL) DISULFIDE	-	THIRAM
S-(1,2-BIS(ETHOXYCARBONYL)ETHYL)-O,O- DIMETHYL PHOSPHORODITHIOATE	-	MALATHION
BIS(2-ETHYLHEXYL) HYDROGEN PHOSPHATE	-	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
BIS-(2-ETHYLHEXYL) HYDROGEN PHOSPHATE	-	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
BIS(2-ETHYLHEXYL) PHTHALATE	-	DIOCTYL PHTHALATE
BIS(2-ETHYLHEXYL) SODIUM SULFOSUCCINATE	-	DIOCTYL SODIUM SULFOSUCCINATE
BIS(2-(2-HYDROXYETHOXY)ETHYL) ETHER	-	TETRAETHYLENE GLYCOL
BIS(2-HYDROXYETHYL) AMINE	-	DIETHANOLAMINE
BIS(2-HYDROXYETHYL) ETHER	-	DIETHYLENE GLYCOL
2,2-BIS(4-HYDROXYPHENYL) PROPANE	-	BISPHENOL A
BIS(2-METHOXYETHYL) ETHER	-	DIETHYLENE GLYCOL DIMETHYL ETHER
2,2-BIS(P-METHOXYPHENYL)-1,1,1 - TRICHLOROETHANE	-	METHOXYCHLOR
BISMUTH CHLORIDE OXIDE	-	BISMUTH OXYCHLORIDE
BISMUTH OXYCHLORIDE	-	BISMUTH OXYCHLORIDE
BISMUTH SULCHLORIDE	-	BISMUTH OXYCHLORIDE
BISMUTHYL CHLORIDE	-	BISMUTH OXYCHLORIDE
BISPHENOL A	-	BISPHENOL A
BISPHENOL A DIGLYCIDYL ETHER	-	BISPHENOL A DIGLYCIDYL ETHER
BISPHENOL A EPICHLOROHYDRIN CONDENSATE	-	BISPHENOL A DIGLYCIDYL ETHER
BITUMEN	-	ASPHALT
BIVINYL	-	BUTADIENE, INHIBITED
BLACK LEAF 40 (40 PER CENT WATER SOLUTION)	-	NICOTINE SULFATE
BLACK OIL	-	ASPHALT BLENDING STOCK:ROCFERS FLUX
BLADAN	-	TETRAETHYL PYROPHOSPHATE
BLUE OIL	-	ANILINE
BLUE VITRIOL	-	COPPER SULFATE
BOILER COMPOUND, LIQUID	-	BOILER COMPOUND, LIQUID
BOLLETIC ACID	-	FUMARIC ACID
BORACIC ACID	-	BORIC ACID
BORAX, ANHYDROUS	-	SODIUM BORATE
BORIC ACID	-	BORIC ACID
BORON CHLORIDE	-	BORON TRICHLORIDE
BORON TRIBROMIDE	-	BORON TRIBROMIDE
BORON TRICHLORIDE	-	BORON TRICHLORIDE
BOTTLED GAS	-	LIQUEFIED PETROLEUM GAS (LPG)
BOX TOE GUM	-	CCELLGION
BP	-	DIPENZOYL PEROXIDE
BPC	-	DIBENZOYL PEROXIDE
BRIMSTONE (LIQUID)	-	SULFUR (LIQUID)
BROCID	-	ETHYLENE DICHLORIDE
BROMALLYLENE	-	ALLYL BROMIDE
BROMELLITE	-	BERYLLIUM OXIDE
BROMINE	-	BROMINE
BROMINE PENTAFLUORIDE	-	BROMINE PENTAFLUORIDE
BROMINE TRIFLUORIDE	-	BROMINE TRIFLUORIDE
BROMOBENZENE	-	BROMCBENZENE
BROMOPENZOL	-	BROMCBENZENE
BROMOFUME	-	ETHYLENE DIBROMIDE
BROMOMETHANE	-	METHYL BROMIDE
3-BROMOPROPENE	-	ALLYL BROMIDE
3-BROMOPROPYLENE	-	ALLYL BROMIDE
ALPHA-BROMOTOLUENE	-	BENZYL BROMIDE
BROMOTOLUENE, ALPHA	-	BENZYL BROMIDE
OMEGA-BROMOTOLUENE	-	BENZYL BROMIDE
BRUCINE	-	BRUCINE

SYNONYM		COMPOUND NAME
BRUCINE DIHYDRATE	-	BRUCINE
BTMAC	-	BENZYLTRIMETHYLAMMONIUM CHLORIDE
BUNKER C OIL	-	FUEL OIL: 6
1,3-BUTADIENE	-	BUTADIENE, INHIBITED
BUTADIENE, INHIBITED	-	BUTADIENE, INHIBITED
BUTAL	-	N-BUTYRALDEHYDE
BUTALDEHYDE	-	N-BUTYRALDEHYDE
BUTANAL	-	N-BUTYRALDEHYDE
1-BUTANAMINE, N-BUTYL	-	DI-N-BUTYLAMINE
BUTANE	-	BUTANE
N-BUTANE	-	BUTANE
1,4-BUTANEDICARBOXYLIC ACID	-	ADIPIC ACID
1,4-BUTANEDIOL	-	1,4-BUTANEDIOL
1-BUTANETHIOL	-	N-BUTYL MERCAPTAN
BUTANIC ACID	-	N-BUTYRIC ACID
BUTANOIC ACID	-	N-BUTYRIC ACID
BUTANOL	-	N-BUTYL ALCOHOL
1-BUTANOL	-	N-BUTYL ALCOHOL
2-BUTANOL	-	SEC-BUTYL ALCOHOL
2-BUTANONE	-	METHYL ETHYL KETONE
TRANS-2-BUTENAL	-	CROTONALDEHYDE
1-BUTENE	-	BUTYLENE
CIS-BUTENEDIOIC ACID	-	MALEIC ACID
TRANS-BUTENEDIOIC ACID	-	FUMARIC ACID
CIS-BUTENEDIOIC ANHYDRIDE	-	MALEIC ANHYDRIDE
1,4-BUTENEDIOL	-	1,4-BUTENEDIOL
CIS-2-BUTENE-1,4-DIOL	-	1,4-BUTENEDIOL
3-BUTEN-2-ONE	-	METHYL VINYL KETONE
1-BUTENE OXIDE	-	BUTYLENE OXIDE
BUTENE RESINS	-	POLYBUTENE
1-BUTOXYBUTANE	-	DI-N-BUTYL ETHER
BUTOXYDIETHYLENE GLYCOL	-	DIETHYLENE GLYCOL MONOBUTYL ETHER
BUTOXYDIGLYCOL	-	DIETHYLENE GLYCOL MONOBUTYL ETHER
2-BUTOXYETHANOL	-	ETHYLENE GLYCOL MONOBUTYL ETHER
2-BUTOXYETHANOL, ACETATE	-	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
2-(2-BUTOXYETHOXY)ETHYL ACETATE	-	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
2-BUTOXYETHYL ACETATE	-	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
BUTOXYETHYL 2,4-DICHLOROPHENOXYACETATE	-	2,4-D ESTERS
BUTOXYPROPYL TRICHLOROPHENOXYACETATE	-	2,4,5-T(ESTERS)
BUTTERCUP YELLOW	-	ZINC CHROMATE
BUTTER OF ANTIMONY	-	ANTIMONY TRICHLORIDE
BUTTER OF ARSENIC	-	ARSENIC TRICHLORIDE
BUTYL ACETATE	-	N-BUTYL ACETATE
N-BUTYL ACETATE	-	N-BUTYL ACETATE
SEC-BUTYL ACETATE	-	SEC-BUTYL ACETATE
BUTYL ACRYLATE	-	N-BUTYL ACRYLATE
ISO-BUTYL ACRYLATE	-	ISO-BUTYL ACRYLATE
N-BUTYL ACRYLATE	-	N-BUTYL ACRYLATE
BUTYL ALCOHOL	-	N-BUTYL ALCOHOL
N-BUTYL ALCOHOL	-	N-BUTYL ALCOHOL
SEC-BUTYL ALCOHOL	-	SEC-BUTYL ALCOHOL
TERT-BUTYL ALCOHOL	-	TERT-BUTYL ALCOHOL
BUTYL ALDEHYDE	-	N-BUTYRALDEHYDE
N-BUTYL ALPHA-METHYL ACRYLATE	-	N-BUTYL METHACRYLATE
BUTYLAMINE	-	N-BUTYLAMINE
N-BUTYLAMINE	-	N-BUTYLAMINE
SEC-BUTYLAMINE	-	SEC-BUTYLAMINE
TERT-BUTYLAMINE	-	TERT-BUTYLAMINE
BUTYL BENZYL PHTHALATE	-	BENZYL N-BUTYL PHTHALATE
N-BUTYL CARBINOL	-	N-AMYL ALCOHOL
N-BUTYL CARBINYL CHLORIDE	-	N-AMYL CHLORIDE
BUTYL CARBITOL	-	DIETHYLENE GLYCOL MONOBUTYL ETHER

SYNONYM	COMPOUND NAME
BUTYL CARBITOL ACETATE	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
BUTYL CELLOSOLVE	ETHYLENE GLYCOL MONOBUTYL ETHER
BUTYL (CELLOSOLVE) ACETATE	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
BUTYL 2,4-DICHLOROPHENOXYACETATE	2,4-D ESTERS
BUTYLENE	BUTYLENE
2-BUTYLENE DICHLORIDE	DICHLOROBUTENE
BUTYLENE HYDRATE	SEC-BUTYL ALCOHOL
BUTYLENE OXIDE	BUTYLENE OXIDE
ALPHA-BUTYLENE OXIDE	BUTYLENE OXIDE
1,2-BUTYLENE OXIDE	BUTYLENE OXIDE
BUTYL ETHANOATE	N-BUTYL ACETATE
BUTYL ETHER	DI-N-BUTYL ETHER
N-BUTYLETHYR	DI-N-BUTYL ETHER
BUTYLETHYLACETALDEHYDE	ETHYLHEXALDEHYDE
TERT-BUTYL HYDROPEROXIDE	TERT-BUTYL HYDROPEROXIDE
N-BUTYL MERCAPTAN	N-BUTYL MERCAPTAN
BUTYL METHACRYLATE	N-BUTYL METHACRYLATE
N-BUTYL METHACRYLATE	N-BUTYL METHACRYLATE
BUTYL 2-METHACRYLATE	N-BUTYL METHACRYLATE
N-BUTYL METHYL KETONE	METHYL N-BUTYL KETONE
BUTYL 2-METHYL-2-PROPENOATE	N-BUTYL METHACRYLATE
P-TERT-BUTYLPHENOL	P-TERT-BUTYLPHENOL
BUTYL PHTHALATE	DIBUTYL PHTHALATE
BUTYL 2-PROPENOATE	N-BUTYL ACRYLATE
BUTYL TITANATE	TETRABUTYL TITANATE
BUTYL TITANATE MONOMER	TETRABUTYL TITANATE
BUTYL 2,4,5-TRICHLOROPHENOXYACETATE	2,4,5-T (ESTERS)
BUTYLTRICHLOROSILANE	BUTYLTRICHLOROSILANE
N-BUTYLTRICHLOROSILANE	BUTYLTRICHLOROSILANE
1,4-BUTYNE-1,4-DIOL	1,4-BUTYNE-1,4-DIOL
BUTYRAL	1,4-BUTYNE-1,4-DIOL
BUTYRALDEHYDE	N-BUTYRALDEHYDE
ISO-BUTYRALDEHYDE	N-BUTYRALDEHYDE
N-BUTYRALDEHYDE	ISO-BUTYRALDEHYDE
BUTYRIC ACID	N-BUTYRALDEHYDE
N-BUTYRIC ACID	N-BUTYRIC ACID
BUTYRIC ACID, ETHYL ESTER	N-BUTYRIC ACID
BUTYRIC ALDEHYDE	ETHYL BUTYRATE
BUTYRIC ETHER	N-BUTYRIC ACID
CACODYLIC ACID	ETHYL BUTYRATE
CADMIUM ACETATE	CACODYLIC ACID
CADMIUM ACETATE DIHYDRATE	CADMIUM ACETATE
CADMIUM BROMIDE	CADMIUM ACETATE
CADMIUM BROMIDE TETRAHYDRATE	CADMIUM BROMIDE
CADMIUM CHLORIDE	CADMIUM BROMIDE
CADMIUM FLUOROBORATE	CADMIUM CHLORIDE
CADMIUM FLUOROBORATE	CADMIUM FLUOROBORATE
CADMIUM FUME	CADMIUM FLUOROBORATE
CADMIUM NITRATE	CADMIUM OXIDE
CADMIUM NITRATE TETRAHYDRATE	CADMIUM NITRATE
CADMIUM OXIDE	CADMIUM NITRATE
CADMIUM SULFATE	CADMIUM OXIDE
CADOX HDP	CADMIUM SULFATE
CADOX PS	CYCLOHEXANONE PEROXIDE
CADOX TEP	DI-(P-CHLOROBENZOYL) PEROXIDE
CAKE ALUM	TERT-BUTYL HYDROPEROXIDE
CALCIUM	ALUMINUM SULFATE
CALCIUM ABIETATE	CALCIUM PHOSPHATE
CALCIUM ALKYLAROMATIC SULFONATE	CALCIUM RESINATE
CALCIUM ALKYL BENZENESULFONATE	DODECYLBENZENESULFONIC ACID, CALCIUM SALT
	DODECYLBENZENESULFONIC ACID, CALCIUM SALT

SYNONYM		COMPOUND NAME
CALCIUM ARSENATE	"	CALCIUM ARSENATE
CALCIUM BIPHOSPHATE	"	CALCIUM PHOSPHATE
CALCIUM CARBIDE	"	CALCIUM CARBIDE
CALCIUM CHLORATE	"	CALCIUM CHLORATE
CALCIUM CHLORIDE	"	CALCIUM CHLORIDE
CALCIUM CHLORIDE HYDRATES	"	CALCIUM CHLORIDE
CALCIUM CHLORIDE, ANHYDROUS	"	CALCIUM CHLORIDE
CALCIUM CHROMATE	"	CALCIUM CHROMATE
CALCIUM CHROMATE DIHYDRATE	"	CALCIUM CHROMATE
CALCIUM CHROMATE (VI)	"	CALCIUM CHROMATE
CALCIUM CYANIDE	"	CALCIUM CYANIDE
CALCIUM DIOXIDE	"	CALCIUM PEROXIDE
CALCIUM FLUORIDE	"	CALCIUM FLUORIDE
CALCIUM HYDROXIDE	"	CALCIUM HYDROXIDE
CALCIUM HYPOCHLORITE	"	CALCIUM HYPOCHLORITE
CALCIUM MONOHYDROGEN PHOSPHATE	"	CALCIUM PHOSPHATE
CALCIUM, METALLIC	"	CALCIUM, METALLIC
CALCIUM NITRATE	"	CALCIUM NITRATE
CALCIUM NITRATE TETRAHYDRATE	"	CALCIUM NITRATE
CALCIUM OXIDE	"	CALCIUM OXIDE
CALCIUM PEROXIDE	"	CALCIUM PEROXIDE
CALCIUM PHOSPHATE	"	CALCIUM PHOSPHATE
CALCIUM	"	CALCIUM PHOSPHATE
PHOSPHATE, MONOBASIC, MONOHYDRATE	"	
CALCIUM PHOSPHIDE	"	CALCIUM PHOSPHIDE
CALCIUM RESINATE	"	CALCIUM RESINATE
CALCIUM RESINATE, FUSED	"	CALCIUM RESINATE
CALCIUM ROSIN	"	CALCIUM RESINATE
CALCIUM SUPERPHOSPHATE	"	CALCIUM PHOSPHATE
CALOCHELO	"	MERCURIC CHLORIDE
CALOMEL	"	MERCUROUS CHLORIDE
CAMPHENE	"	CAMPHENE
CAMPHOR OIL	"	CAMPHOR OIL
CANE SUGAR	"	SUCROSE
CAPRALDEHYDE	"	DECALDEHYDE
CAPRIC ALCOHOL	"	N-DECYL ALCOHOL
CAPRIC ALDEHYDE	"	DECALDEHYDE
CAPROALDEHYDE	"	N-HEXALDEHYDE
CAPROIC ALDEHYDE	"	N-HEXALDEHYDE
EPSILON-CAPROLACTAM	"	CAPROLACTAM, LIQUID
CAPROLACTAM, LIQUID	"	CAPROLACTAM, LIQUID
CAPRONALDEHYDE	"	N-HEXALDEHYDE
N-CAPROYLALDEHYDE	"	N-HEXALDEHYDE
CAPRYLENE	"	1-OCTENE
CAPTAN	"	CAPTAN
CARBAMIDE	"	UREA
CARBAMIDE PEROXIDE	"	UREA PEROXIDE
CARBARYL	"	CARBARYL
CARBIDE	"	CALCIUM CARBIDE
CARBINOL	"	PETHYL ALCOHOL
CARBITOL	"	DIETHYLENE GLYCOL MONOETHYL ETHER
CARBONENZOXY CHLORIDE	"	BENZYL CHLOROFORMATE
CARBOLIC ACID	"	PHENOL
CARBOLIC OIL	"	CARBOLIC OIL
CARBON BISULFIDE	"	CARBON BISULFIDE
CARBON DIOXIDE	"	CARBON DIOXIDE
CARBON DISULFIDE	"	CARBON BISULFIDE
CARBONIC ACID DIETHYL ESTER	"	DIETHYL CARBONATE
CARBONIC ACID GAS	"	CARBON DIOXIDE
CARBONIC ACID, MONAMMONIUM SALT	"	AMMONIUM BICARBONATE
CARBONIC ANHYDRIDE	"	CARBON DIOXIDE
CARBON MONOXIDE	"	CARBON MONOXIDE
CARBON TETRACHLORIDE	"	CARBON TETRACHLORIDE
CARBONYL CHLORIDE	"	PHOSGENE
CARENYLDIAMIDE	"	UREA

SYNONYM		COMPOUND NAME
CARBONYL DIAMINE PEROXIDE	-	UREA PEROXIDE
CARBOXYBENZENE	-	BENZIC ACID
CARENE	-	CARENE
3-CARENE	-	CARENE
CARPETING MATERIAL	-	ARSENIC ACID
CARPETING MEDIUM	-	ASPHALT BLEND STOCK=STRAIGHT RUN RESIDUE
CARTHAMUS TINCTORIUS OIL	-	OILS EDIBLE: SAFFLOWER
CARMINATE 125M	-	DIPHENYLMETHANEDIISOCYANATE (MDI)
CATECHIN	-	CATECHOL
CATECHOL	-	CATECHOL
CAUSTIC ARSENIC CHLORIDE	-	ARSENIC TRICHLORIDE
CAUSTIC OIL OF ARSENIC	-	ARSENIC TRICHLORIDE
CAUSTIC POTASH	-	POTASSIUM HYDROXIDE
CAUSTIC POTASH SOLUTION	-	CAUSTIC POTASH SOLUTION
CAUSTIC SODA	-	SODIUM HYDROXIDE
CAUSTIC SODA SOLUTION	-	CAUSTIC SODA SOLUTION
CD-68	-	CHLORDANE
CELLOSOLVE	-	ETHYLENE GLYCOL MONOETHYL ETHER
CELLOSOLVE ACETATE	-	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
CELLULOSE NITRATE SOLUTION	-	CELLULOSION
CETYL SODIUM SULFATE	-	HEXADECYL SULFATE, SODIUM SALT
CETYLTRIMETHYLAMMONIUM CHLORIDE SOLUTION	-	HEXADECYLTRIMETHYLAMMONIUM CHLORIDE
CHAMBER ACID	-	SULFURIC ACID
CHARCOAL	-	CHARCOAL
CHEM BAM	-	NABAM
CHINESE TANNIN	-	TANNIC ACID
CHINOLINE	-	QUINOLINE
CHLORACETIC ACID	-	MONOCHLOROACETIC ACID
CHLORACETYL CHLORIDE	-	CHLORACETYL CHLORIDE
CHLORATE OF POTASH	-	POTASSIUM CHLORATE
CHLORATE OF POTASSIUM	-	POTASSIUM CHLORATE
CHLORATE OF SODA	-	SODIUM CHLORATE
CHLORDAN	-	CHLORDANE
CHLORDANE	-	CHLORDANE
2-CHLORETHANOL	-	ETHYLENE CHLOROHYDRIN
CHLOREX	-	DICHLOROETHYL ETHER
CHLORIDE OF AMYL	-	N-AMYL CHLORIDE
CHLORINATED BIPHENYL	-	POLYCHLORINATED BIPHENYL (PCB)
CHLORINE	-	CHLORINE
CHLORINE TRIFLUORIDE	-	CHLORINE TRIFLUORIDE
CHLOROACETIC ACID	-	MONOCHLOROACETIC ACID
CHLOROACETIC ACID, ETHYL ESTER	-	ETHYL CHLOROACETATE
CHLOROACETOPHENONE	-	CHLOROACETOPHENONE
ALPHA-CHLOROACETOPHENONE	-	CHLOROACETOPHENONE
OMEGA-CHLOROACETOPHENONE	-	CHLOROACETOPHENONE
CHLOROACETYL CHLORIDE	-	CHLOROACETYL CHLORIDE
5-CHLORO-2-AMINOTOLUENE	-	4-CHLORO-O-TOLUICINE
4-CHLOROANILINE	-	P-CHLOROANILINE
P-CHLOROANILINE	-	P-CHLOROANILINE
CHLOROBENZENE	-	CHLOROBENZENE
P-CHLOROBENZOYL PEROXIDE	-	DI-(P-CHLOROBENZOYL) PEROXIDE
DI-(4-CHLOROBENZOYL) PEROXIDE	-	DI-(P-CHLOROBENZOYL) PEROXIDE
4-CHLOROBUTYRONITRILE	-	4-CHLOROBUTYRONITRILE
4-CHLOROBUTYRONITRILE (PRACTICAL MIXTURE WITH 4- BROMOBUTYRONITRILE)	-	4-CHLOROBUTYRONITRILE
CHLOROCARBONIC ACID, METHYL ESTER	-	METHYL CHLOROCARBONATE
CHLORODIFLUOROMETHANE	-	MONOCHLORODIFLUOROMETHANE
1-CHLORO-2,3-EPOXYPROPANE	-	EPICHLOROHYDRIN
CHLORETHANE	-	ETHYL CHLORIDE
2-CHLOROTHANOL	-	ETHYLENE CHLOROHYDRIN
CHLOROTHENE	-	VINYL CHLORIDE

SYNONYM	COMPOUND NAME
2-CHLOROETHYL ALCOHOL	ETHYLENE CHLOROHYDRIN
2-CHLORO-4-ETHYLAMINO-6-ISOPROPYLAMINO-5-TRIAZINE	ATRAZINE
CHLOROETHYLENE	VINYL CHLORIDE
CHLOROFORM	CHLOROFORM
CHLOROFORMIC ACID, BENZYL ESTER	BENZYL CHLOROFORMATE
CHLOROFORMIC ACID, ETHYL ESTER	ETHYL CHLOROFORMATE
CHLOROFORMIC ACID, METHYL ESTER	METHYL CHLOROFORMATE
CHLOROFORMYL CHLORIDE	PHOSGENE
CHLOROHYDRINS (CRUDE)	CHLOROHYDRINS (CRUDE)
GAMMA-CHLOROISOBUTYLENE	METHALLYL CHLORIDE
CHLOROMETHANE	METHYL CHLORIDE
4-CHLORO-2-METHYLANILINE	4-CHLORO-O-TOLUIDINE
CHLOROMETHYL METHYL ETHER	CHLOROMETHYL METHYL ETHER
CHLOROMETHYLOXIRANE	EPICHLOROHYDRIN
O-(3-CHLORO-4-METHYL-2-OXO-(2H)-1-BENZOPYRAN-7-YL)PHOSPHOROTHIOATE	COUMAPHOS
4-CHLORO-O-TOLUIDINE	4-CHLORO-O-TOLUIDINE
CHLOROMETHYL PHENYL KETONE	CHLOROACETOPHENONE
3-CHLORO-2-METHYLPROPENE	METHALLYL CHLORIDE
1-CHLOROPENTANE	N-AMYL CHLORIDE
4-CHLOROPHENOL	P-CHLOROPHENOL
P-CHLOROPHENOL	P-CHLOROPHENOL
4-CHLOROPHENYLAMINE	P-CHLOROANILINE
DI-(P-CHLOROPHENYL)TETRACHLOROMETHYLCARBONOL	4,4-DICHLORO-ALPHA-TRICHLOROMETHYLBENZHYDROL
CHLOROPICRIN, LIQUID	CHLOROPICRIN, LIQUID
3-CHLOROPROPENE	ALLYL CHLORIDE
3-CHLOROPROPYLENE	ALLYL CHLORIDE
GAMMA-CHLOROPROPYLENE OXIDE	EPICHLOROHYDRIN
3-CHLORO-1,2-PROPYLENE OXIDE	EPICHLOROHYDRIN
CHLOROSULFONIC ACID	CHLOROSULFONIC ACID
CHLOROTHENE	TRICHLOROETHANE
CHLOROTOLUENE, ALPHA	BENZYL CHLORIDE
ALPHA-CHLOROTOLUENE	BENZYL CHLORIDE
OMEGA-CHLOROTOLUENE	BENZYL CHLORIDE
CHLOROTRIFLUOROETHYLENE	TRIFLUOROCHLOROETHYLENE
CHLOROTRIMETHYLSILANE	TRIMETHYLCHLOROSILANE
CHLOROSULFONIC ACID	CHLOROSULFONIC ACID
CHLORYLEN	TRICHLOROETHYLENE
CHP	CUMENE HYDROPEROXIDE
CHROMIC ACID	CHROMIC ANHYDRIDE
CHROMIC ANHYDRIDE	CHROMIC ANHYDRIDE
CHROMIC OXIDE	CHROMIC ANHYDRIDE
CHROMIUM (VI) DIOXYCHLORIDE	CHROMYL CHLORIDE
CHROMIUM OXYCHLORIDE	CHROMYL CHLORIDE
CHROMIUM TRIOXIDE	CHROMIC ANHYDRIDE
CHROMYL CHLORIDE	CHROMYL CHLORIDE
CIANURINA	MERCURIC CYANIDE
CITRIC ACID	CITRIC ACID
CITRIC ACID, DIAMMONIUM SALT	AMMONIUM CITRATE
CLARIFIED OIL	OIL: CLARIFIED
CLOROX	SODIUM HYPOCHLORITE
CC RAL	COUMAPHOS
COAL TAR OIL	OIL: COAL TAR
COBALT ACETATE	COBALT ACETATE
COBALT ACETATE TETRAHYDRATE	COBALT ACETATE
COBALT (II) ACETATE	COBALT ACETATE
COBALT CHLORIDE	COBALT CHLORIDE
COBALT (II) CHLORIDE	COBALT CHLORIDE
COBALTOUS ACETATE	COBALT ACETATE
COBALTOUS CHLORIDE	COBALT CHLORIDE
COBALTOUS CHLORIDE DIHYDRATE	COBALT CHLORIDE
COBALTOUS CHLORIDE HEXAHYDRATE	COBALT CHLORIDE
COBALTOUS NITRATE	COBALT NITRATE

SYNONYM

COBALTOUS NITRATE HEXAHYDRATE
 COBALTOUS SULFATE HEPTAHYDRATE
 COBALT NITRATE
 COBALT (II) NITRATE
 COBALT SULFATE
 COBALT (II) SULFATE
 COCONUT BUTTER
 COCONUT OIL
 COCOIL
 CODOIL
 COLLODION
 COLOGNE SPIRIT
 COLONIAL SPIRIT
 COLUMBIAN SPIRIT
 COMBUSTION IMPROVER C12

CONDENSED PHOSPHORIC ACID
 COPPER ACETATE
 COPPER ACETOARSENITE
 COPPER ARSENITE
 COPPERAS
 COPPER BORON FLUORIDE SOLUTION
 COPPER BROMIDE
 COPPER CHLORIDE
 COPPER CYANIDE
 COPPER FLUOROBORATE
 COPPER(II)FLUOROBORATE SOLUTION
 COPPER IODIDE
 COPPER NAPHTHENATE
 COPPER NITRATE
 COPPER ORTHOARSENITE
 COPPER OXALATE
 COPPER SULFATE
 COPPER SULFATE PENTAHYDRATE
 COPRA OIL
 CORN SUGAR SOLUTION
 CORN SYRUP
 CORN SYRUP SOLUTION
 CORROSIVE MERCURY CHLORIDE
 CORROSIVE SUBLIMATE
 COTTONSEED OIL
 COUMAPHOS
 CRANKCASE OIL
 CRANKCASE OIL
 CREOSOTE, COAL TAR
 CREOSOTE OIL
 CRESOL, EPOXYPROPYL ETHER
 CRESOLS
 CRESYL GLYCIDYL ETHER
 CRESYLIC ACID
 CRESYLIC ACIDS
 CROPLAS EH
 CROTONALDEHYDE
 CROTONALDEHYDE
 CROTONIC ALDEHYDE
 CROTONOL
 CROTON TIGLIUM L. OIL
 CRUDE EPICHLOROHYDRIN
 CRUDE OIL
 CRYSTALLIZED VERDIGRIS
 CTF
 CUCUMBER DUST
 CUMENE
 CUMENE HYDROPEROXIDE
 CUMOL

COMPOUND NAME

COBALT NITRATE
 COBALT SULFATE
 COBALT NITRATE
 COBALT NITRATE
 COBALT SULFATE
 COBALT SULFATE
 OILS EDIBLE: COCONUT
 OILS EDIBLE: COCONUT
 OIL: RESIN
 OIL: ROSIN
 COLLODION
 ETHYL ALCOHOL
 METHYL ALCOHOL
 METHYL ALCOHOL
 METHYLALCYCLOPENTADIENYLMANGANESE
 TRICARBONYL
 POLYPHOSPHORIC ACID
 COPPER ACETATE
 COPPER ACETOARSENITE
 COPPER ARSENITE
 FERROUS SULFATE
 COPPER FLUOROBORATE
 COPPER BROMIDE
 COPPER CHLORIDE
 COPPER CYANIDE
 COPPER FLUOROBORATE
 COPPER FLUOROBORATE
 COPPER IODIDE
 COPPER NAPHTHENATE
 COPPER NITRATE
 COPPER ARSENITE
 COPPER OXALATE
 COPPER SULFATE
 COPPER SULFATE
 OILS EDIBLE: COCONUT
 DEXTROSE SOLUTION
 CORN SYRUP
 DEXTROSE SOLUTION
 MERCURIC CHLORIDE
 MERCURIC CHLORIDE
 OIL: COTTONSEED
 COUMAPHOS
 OIL: MOTOR
 OIL: LUBRICATING
 CREOSOTE, COAL TAR
 CREOSOTE, COAL TAR
 CRESYL GLYCIDYL ETHER
 CRESOLS
 CRESYL GLYCIDYL ETHER
 XYLENOL
 CRESOLS
 ETHYL HEXYL TALLATE
 CROTONALDEHYDE
 CROTONALDEHYDE
 CROTONALDEHYDE
 OILS MISCELLANEOUS: CROTON
 OILS MISCELLANEOUS: CROTON
 CHLOROHYDRINS (CRUDE)
 OIL: CRUDE
 COPPER ACETATE
 CHLORINE TRIFLUORIDE
 CALCIUM ARSENATE
 CUMENE
 CUMENE HYDROPEROXIDE
 CUMENE

SYNONYM		COMPOUND NAME
CUMYL HYDROPEROXIDE	"	CUMENE HYDROPEROXIDE
CUPRIC ACETATE MONOHYDRATE	"	COPPER ACETATE
CUPRIC ARSENITE	"	COPPER ARSENITE
CUPRIC BROMIDE, ANHYDROUS	"	COPPER BROMIDE
CUPRIC CHLORIDE DIHYDRATE	"	COPPER CHLORIDE
CUPRIC FLUOBORATE SOLUTION	"	COPPER FLUOROBORATE
CUPRIC GREEN	"	COPPER ARSENITE
CUPRICIN	"	COPPER CYANIDE
CUPRIC NITRATE TRIHYDRATE	"	COPPER NITRATE
CUPRIC OXALATE HEMIHYDRATE	"	COPPER OXALATE
CUPRIC SULFATE	"	COPPER SULFATE
CUPRIETHYLENEDIAMINE SOLUTION	"	CUPRIETHYLENEDIAMINE SOLUTION
CUPRIETHYLENEDIAMINE HYDROXIDE SOLUTION	"	CUPRIETHYLENEDIAMINE SOLUTION
CUPROUS CYANIDE	"	COPPER CYANIDE
CUPROUS IODIDE	"	COPPER IODIDE
CYANACETIC ACID	"	CYANOACETIC ACID
CYANIDE	"	POTASSIUM CYANIDE
CYANIDE OF CALCIUM	"	CALCIUM CYANIDE
CYANOACETIC ACID	"	CYANOACETIC ACID
CYANOBENZENE	"	BENZONITRILE
2-CYANOETHANOL	"	ETHYLENE CYANHYDRIN
CYANOETHYLENE	"	ACRYLONITRILE
CYANOGAS A-DUST	"	CALCIUM CYANIDE
CYANOGAS G-FUMIGANT	"	CALCIUM CYANIDE
CYANOGEN	"	CYANGEN
CYANOGEN BROMIDE	"	CYANOGEN BROMIDE
CYANOGEN CHLORIDE	"	CYANOGEN CHLORIDE
CYANOMETHANE	"	ACETONITRILE
CYCLOHEXANE	"	CYCLOHEXANE
CYCLOHEXANOL	"	CYCLOHEXANOL
CYCLOHEXANONE	"	CYCLOHEXANONE
CYCLOHEXANONE PEROXIDE	"	CYCLOHEXANONE PEROXIDE
CYCLOHEXYLTRICHLOROSILANE	"	CYCLOHEXYLTRICHLOROSILANE
CYCLOHEXYL ALCOHOL	"	CYCLOHEXANOL
CYCLOHEXYLAMINE	"	CYCLOHEXYLAMINE
CYCLOHEXYL KETONE	"	CYCLOHEXANONE
CYCLOPENTANE	"	CYCLOPENTANE
CYCLOPENTANE, METHYL	"	METHYLCYCLOPENTANE
CYCLOPROPANE	"	CYCLOPROPANE
P-CYMENE	"	P-CYMENE
CYMOL	"	P-CYMENE
CYSTOGEN	"	HEXAMETHYLENETETRAHINE
CYTHION INSECTICIDE	"	MALATHION
2,4-D	"	2,4-DICHLOROPHOXYACETIC ACID
DALAPON	"	DALAPON
DBP	"	DIBUTYL PHTHALATE
DCEE	"	DICHLOROETHYL ETHER
DCP	"	CALCIUM PHOSPHATE
DDD	"	DDD
DCT	"	DDT
P,P -DDT	"	DDT
D.C. TURPENTINE	"	TURPENTINE
DEA	"	DIETHANOLAMINE
DEAD OIL	"	CREOSOTE, COAL TAR
DEC	"	DECAHYDRONAPHTHALENE
DECABORANE	"	DECABORANE
DECAHYDRONAPHTHALENE	"	DECAHYDRONAPHTHALENE
CIS-OR TRANS-	"	DECAHYDRONAPHTHALENE
DECAHYDRONAPHTHALENE	"	DECAHYDRONAPHTHALENE
DECALDEHYDE	"	DECALDEHYDE
DECALIN	"	DECAHYDRONAPHTHALENE
DECANAL	"	DECALDEHYDE
1-DECANOL	"	N-DECYL ALCOHOL

SYNONYM		COMPOUND NAME
1-DECENE	-	1-DECENE
ALPHA-DECENE	-	1-DECENE
N-DECYL ALCOHOL	-	N-DECYL ALCOHOL
N-DECYL ALDEHYDE	-	DECALDEHYDE
DECYLBENZENE	-	N-DECYLBENZENE
N-DECYLBENZENE	-	N-DECYLBENZENE
DEG	-	DIETHYLENE GLYCOL
DEMO	-	DIOCTYL PHTHALATE
DEHPA	-	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
DEHYDRITE	-	MAGNESIUM PERCHLORATE
DE KALIN	-	DECAHYDRONAPHTHALENE
DEMETON	-	DEMETON
DEN	-	DIETHYLAMINE
DENATURED ALCOHOL	-	ETHYL ALCOHOL
2,4-D ESTERS	-	2,4-D ESTERS
DETERGENT ALKYLATE #2	-	CODECYLBENZENE
DEXTROSE SOLUTION	-	DEXTROSE SOLUTION
DIACETIC ETHER	-	ETHYL ACETOACETATE
DIACETONE	-	DIACETONE ALCOHOL
DIACETONE ALCOHOL	-	DIACETONE ALCOHOL
DIACETYLMETHANE	-	ACETYLACETONE
DIACETYL PEROXIDE SOLUTION	-	ACETYL PEROXIDE SOLUTION
1,2-DIAMINOETHANE	-	ETHYLENEDIAMINE
2,2-DIAMINODIETHYLAMINE	-	DIETHYLENEDIAMINE
1,6-DIAMINOHEXANE	-	HEXAMETHYLENEDIAMINE
1,11-DIAMINO-3,6,9-TRIAZAUNDECANE	-	TETRAETHYLENEPENTAMINE
DIAMMONIUM CITRATE	-	AMMONIUM CITRATE
DIAMMONIUM HYDROGEN PHOSPHATE	-	AMMONIUM PHOSPHATE
DIAMMONIUM CRITHCOPHOSPHATE	-	AMMONIUM PHOSPHATE
DIAMMONIUM OXALATE	-	AMMONIUM OXALATE
DIAMYL PHTHALATE	-	DI-N-AMYL PHTHALATE
DI-N-AMYL PHTHALATE	-	DI-N-AMYL PHTHALATE
2,2-DI-(P-ANISYL)-1,1,1-TRICHLOROETHANE	-	METHOXYCHLOR
DIANTIMONY TRIOXIDE	-	ANTIMONY TRIOXIDE
DIAZINON	-	DIAZINON
DIBASIC CALCIUM PHOSPHATE	-	CALCIUM PHOSPHATE
DIBENZO(B,E)PYRIDINE	-	ACRIDINE
DIBENZOYL PEROXIDE	-	DIBENZOYL PEROXIDE
DIBK	-	DIISOBUTYL KETONE
1,2-DIBROMOETHANE	-	ETHYLENE DIBROMIDE
SYM-DIBROMOETHANE	-	ETHYLENE DIBROMIDE
DIBUTYLAMINE	-	DI-N-BUTYLAMINE
DI-N-BUTYLAMINE	-	DI-N-BUTYLAMINE
DIBUTYL ETHER	-	DI-N-BUTYL ETHER
N-DIBUTYL ETHER	-	DI-N-BUTYL ETHER
DI-N-BUTYL ETHER	-	DI-N-BUTYL ETHER
DI-N-BUTYL KETONE	-	DI-N-BUTYL KETONE
DIBUTYL OXIDE	-	DI-N-BUTYL ETHER
DIBUTYLPHENOL	-	DIBUTYLPHENOL
2,6-DI-TERT-BUTYLPHENOL	-	DIBUTYLPHENOL
DIBUTYL PHTHALATE	-	DIBUTYL PHTHALATE
DICALCIUM PHOSPHATE (ANHYDROUS OR DIHYDRATE)	-	CALCIUM PHOSPHATE
S-(1,2-DICARBETHOXYETHYL)-O,O-DIMETHYL DITHIOPHOSPHATE	-	MALATHION
DICARBOMETHOXYZINC	-	ZINC ACETATE
DICHLORIDE	-	P-DICHLOROBENZENE
1,2-DICHLOROBENZENE	-	O-DICHLOROBENZENE
O-DICHLOROBENZENE	-	O-DICHLOROBENZENE
P-DICHLOROBENZENE	-	P-DICHLOROBENZENE
DI-(P-CHLOROBENZOYL) PEROXIDE	-	DI-(P-CHLOROBENZOYL) PEROXIDE
DI-(4-CHLOROBENZOYL) PEROXIDE	-	DI-(P-CHLOROBENZOYL) PEROXIDE
P,P-DICHLOROBENZOYL PEROXIDE	-	DI-(P-CHLOROBENZOYL) PEROXIDE
1,1-DICHLORO-2,2-BIS(P-CHLOROPHENYL)ETHANE	-	DDO

SYNONYM		COMPOUND NAME
DICHLOROBUTENE	*	DICHLOROBUTENE
1,4-DICHLORO-2-BUTENE	*	DICHLOROBUTENE
CIS-1,4-DICHLORO-2-BUTENE	*	DICHLOROBUTENE
TRANS-1,4-DICHLORO-2-BUTENE	*	DICHLOROBUTENE
1,4-DICHLORO-2-BUTYLENE	*	DICHLOROBUTENE
DICHLORODIETHYL ETHER	*	DICHLOROETHYL ETHER
DICHLORODIFLUOROMETHANE	*	DICHLOROCIFLUOROMETHANE
DICHLORODIPHENYLDICHLOROETHANE	*	DDO
DICHLORODIPHENYLSILANE	*	DIPHENYLDICHLOROSILANE
DICHLORODIPHENYLSILICANE	*	DIPHENYLDICHLOROSILANE
DICHLORODIPHENYLTRICHLOROETHANE	*	DDT
1,2-DICHLOROETHANE	*	ETHYLENE DICHLORIDE
DI-(2-CHLOROETHYL) ETHER	*	DICHLOROETHYL ETHER
DI-(2-CHLOROETHYL) ETHER	*	DICHLOROETHYL ETHER
DICHLOROETHYL ETHER	*	DICHLOROETHYL ETHER
1,1-DICHLOROETHYLENE	*	VINYLDIENECHLORIDE, INHIBITED
1,2-DICHLOROETHYLENE	*	1,2-DICHLOROETHYLENE
SYM-DICHLOROETHYLENE	*	1,2-DICHLOROETHYLENE
UNSYM-DICHLOROETHYLENE	*	VINYLDIENECHLORIDE, INHIBITED
CIS-OR TRANS-1,2-	*	1,2-DICHLOROETHYLENE
DICHLOROETHYLENE	*	
2,2 -DICHLOROETHYL ETHER	*	DICHLOROETHYL ETHER
BETA, BETA -	*	DICHLOROETHYL ETHER
DICHLOROETHYL ETHER	*	
DICHLOROMETHANE	*	DICHLOROMETHANE
2,4-DICHLOROPHENOL	*	2,4-DICHLOROPHENOL
2,4-DICHLOROPHENOXYACETIC ACID	*	2,4-DICHLOROPHENOXYACETIC ACID
2,4-DICHLOROPHENOXYACETIC ACID,	*	2,4-D ESTERS
BUTOXYETHYL ESTER	*	
2,4-DICHLOROPHENOXYACETIC ACID, BUTYL	*	2,4-D ESTERS
ESTER	*	
2,4-DICHLOROPHENOXYACETIC ACID, ISOPROPYL	*	2,4-D ESTERS
ESTER	*	
DICHLOROPHENYLPHOSPHINE	*	BENZENE PHOSPHORUS DICHLORIDE
DI-(P-CHLOROPHENYL)	*	4,4 -DICHLORO-ALPHA-
TRICHLOROMETHYL CARBINOL	*	TRICHLOROMETHYLBENZHYDROL
1,2-DICHLOROPROPANE	*	DICHLOROPROPANE
DICHLOROPROPANE	*	DICHLOROPROPANE
2,2-DICHLOROPROPANOIC ACID	*	DALAPON
ALPHA, ALPHA	*	DALAPON
-DICHLOROPROPIONIC ACID	*	
1,3-DICHLOROPROPENE	*	DICHLOROPROPENE
DICHLOROPROPENE	*	DICHLOROPROPENE
2,2-DICHLOROPROPIONIC ACID	*	DALAPON
4,4 -DICHLORO-ALPHA-	*	4,4 -DICHLORO-ALPHA-
TRICHLOROMETHYLBENZHYDROL	*	TRICHLOROMETHYLBENZHYDROL
DICOFOL	*	4,4 -DICHLORO-ALPHA-
	*	TRICHLOROMETHYLBENZHYDROL
DICY	*	DICYCLOPENTADIENE
DICYAN	*	CYANOGEN
1,4-DICYANOBUTANE	*	ADIPONITRILE
DICYANOGEN	*	CYANOGEN
DICYCLOHEXANONE DIPEROXIDE	*	CYCLOHEXANONE PEROXIDE
DICYCLOPENTADIENE	*	DICYCLOPENTADIENE
DIELDRIN	*	DIELDRIN
DIESEL IGNITION IMPROVER	*	N-AMYL NITRATE
DIESEL OIL, LIGHT	*	FUEL OIL: 1-D
DIESEL OIL, MEDIUM	*	FUEL OIL: 2-D
DIETHANOLAMINE	*	DIETHANOLAMINE
DIETHANOLAMINE, LAURYL SULFATE	*	CODECYL SULFATE, DIETHANOLAMINE SALT
SOLUTION--LAURYL	*	
SULFATE, DIETHANOLAMINE SALT SOLUTION	*	
DIETHANOLAMINE LAURYL SULFATE	*	CODECYL SULFATE, DIETHANOLAMINE SALT
SOLUTION LAURYL SULFATE,	*	
DIETHANOLAMINE SALT	*	

SYNONYM		COMPOUND NAME
1,2-DIETHOXYETHANE	-	ETHYLENE GLYCOL DIETHYL ETHER
DIETHYLAMINE	-	DIETHYLAMINE
DIETHYLBENZENE	-	DIETHYLBENZENE
DIETHYL CARBONATE	-	DIETHYL CARBONATE
DIETHYL CELLOSOLVE	-	ETHYLENE GLYCOL DIETHYL ETHER
O,O-DIETHYL O-(3-CHLORO-4-METHYL-2-OXO-(2H)-1-BENZOPYRAN-7-YL)PHOSPHOROTHIOPATE	-	COUMAPHOS
DIETHYLENEDIAMINE	-	PIPERAZINE
DIETHYLENE GLYCOL	-	DIETHYLENE GLYCOL
DIETHYLENE GLYCOL DIMETHYL ETHER	-	DIETHYLENE GLYCOL DIMETHYL ETHER
DIETHYLENE GLYCOL ETHYL ETHER	-	DIETHYLENE GLYCOL MONOETHYL ETHER
DIETHYLENE GLYCOL METHYL ETHER	-	DIETHYLENE GLYCOL MONOMETHYL ETHER
DIETHYLENE GLYCOL MONOBUTYL ETHER	-	DIETHYLENE GLYCOL MONOBUTYL ETHER
DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE	-	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
DIETHYLENE GLYCOL MONOETHYL ETHER	-	DIETHYLENE GLYCOL MONOETHYL ETHER
DIETHYLENE GLYCOL MONOMETHYL ETHER	-	DIETHYLENE GLYCOL MONOMETHYL ETHER
DIETHYLENEIMIDE OXIDE	-	MORPHOLINE
DIETHYLENE IMIDOXIDE	-	MORPHOLINE
DI(ETHYLENE OXIDE)	-	1,4-DIOXANE
DIETHYLENE OXIMIDE	-	MORPHOLINE
DIETHYLENETRIAMINE	-	DIETHYLENETRIAMINE
DIETHYL ETHER	-	ETHYL ETHER
DI-(2-ETHYLHEXYL) ACID PHOSPHATE	-	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
DI-(2-ETHYLHEXYL) ADIPATE	-	DIOCTYL ADIPATE
DI-(2-ETHYLHEXYL) PHOSPHATE	-	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
DI-(2-ETHYLHEXYL) PHOSPHORIC ACID	-	DI-(2-ETHYLHEXYL) PHOSPHORIC ACID
DI-(2-ETHYLHEXYL) PHTHALATE	-	DIOCTYL PHTHALATE
DI-(2-ETHYLHEXYL) SULFOSUCCINATE, SODIUM SALT	-	DIOCTYL SODIUM SULFOSUCCINATE
O,O-DIETHYL O-(2-ISOPROPYL-6-METHYL-4-PYRIMIDINYL) PHOSPHOROTHIOATE	-	DIAZINON
O,O-DIETHYL O-(2-ISOPROPYL-6-METHYL-4-PYRIMIDINYL)PHOSPHOROTHIOATE	-	DIAZINON
O,O-DIETHYL O-2-ISOPROPYL-4-METHYL-6-PYRIMIDYL THIO-PHOSPHATE	-	DIAZINON
O,O-DIETHYL O-(2-ISOPROPYL-6-METHYL-4-PYRIMIDINYL)THIOPHOSPHATE	-	DIAZINON
DIETHYL 2-ISOPROPYL-4-METHYL-6-PYRIMIDYL THIO-PHOSPHATE	-	DIAZINON
O,O-DIETHYL O-(P-NITROPHENYL) PHOSPHOROTHIOATE	-	PARATHION, LIQUID
O,O-DIETHYL O-(P-NITROPHENYL) THIOPHOSPHATE	-	PARATHION, LIQUID
O,O-DIETHYL O-(AND S-)(1-(ETHYLTHIO)ETHYL)PHOSPHOROTHIOATES	-	DEMETON
DIETHYL OXIDE	-	ETHYL ETHER
DIETHYL PHTHALATE	-	DIETHYL PHTHALATE
DIETHYLZINC	-	DIETHYLZINC
1,1-DIFLUOROETHANE	-	1,1-DIFLUOROETHANE
DIFLUOROPHOSPHORUS ACID	-	DIFLUOROPHOSPHORIC ACID, ANHYDROUS
DIFLUOROPHOSPHORIC ACID, ANHYDROUS	-	DIFLUOROPHOSPHORIC ACID, ANHYDROUS
DIFORMYL	-	GLYOXAL, 40% SOLUTION
DIGLYCOL	-	DIETHYLENE GLYCOL
DIGLYCOL MONOBUTYL ETHER	-	DIETHYLENE GLYCOL MONOBUTYL ETHER
DIGLYCOL MONOBUTYL ETHER ACETATE	-	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
DIGLYME	-	DIETHYLENE GLYCOL DIMETHYL ETHER
DIHEPTYL PHTHALATE	-	DIHEPTYL PHTHALATE
DIHYDRATE	-	CADMIUM ACETATE
2,5-DIHYDROPEROXY-2,5-DIMETHYLHEXANE	-	DIMETHYLHEXANE DIHYDROPEROXIDE, WET
1,2-DIHYDRO-3,6-PYRIDAZINE, UME	-	MALEIC HYDRAZIDE
1,2-DIHYDROXYBENZENE	-	CATECHOL
1,3-DIHYDROXYBENZENE	-	RESORCINOL

SYNONYM	COMPOUND NAME
M-DIHYDROXYBENZENE	RESORCINOL
P-DIHYDROXYBENZENE	HYDROQUINONE
DIHYDROXYBENZOL	RESORCINOL
1,4-DIHYDROXYBUTANE	1,4-BUTANEDIOL
1,4-DIHYDROXY-2-BUTENE	1,4-BUTENEDIOL
1,4-DIHYDROXY-2-BUTYNE	1,4-BUTYNEDIOL
2,2-DIHYDROXYDIETHYL AMINE	DIETHANOLAMINE
BETA, BETA -	DIETHYLENE GLYCOL
DIHYDROXYDIETHYL ETHER	
P,P -DIHYDROXYDIPHENYLDIMETHYLMETHANE	BISPHENOL A
2,2 -DIHYDROXYDIPROPYLAMINE	DIISOPROPANOLAMINE
1,2-DIHYDROXYETHANE	ETHYLENE GLYCOL
DI-BETA-HYDROXYETHOXYETHANE	TRIETHYLENE GLYCOL
DI(2-HYDROXYETHYL)AMINE	DIETHANOLAMINE
DIHYDROXYETHYL ETHER	DIETHYLENE GLYCOL
1,2-DIHYDROXYPROPANE	PROPYLENE GLYCOL
DIISOBUTYLENE	DIISOBUTYLENE
DIISOBUTYL CARBINOL	DIISOBUTYL CARBINOL
DIISOBUTYL KETONE	DIISOBUTYL KETONE
1,3-DIISOCYANATOTOLUENE	TOLUENE 2,4-DIISOCYANATE (TDI)
DIISODECYL PHTHALATE	DIISODECYL PHTHALATE
DIISOPROPANOLAMINE	DIISOPROPANOLAMINE
DIISOPROPYL ETHER	ISOPROPYL ETHER
DIISOPROPYL OXIDE	ISOPROPYL ETHER
DIISOPROPYL PERCARBONATE	ISOPROPYL PERCARBONATE
DIISOPROPYL PEROXYDICARBONATE	ISOPROPYL PERCARBONATE
SYM-DIISOPROPYLACETONE	DIISOBUTYL KETONE
DIISOPROPYLAMINE	DIISOPROPYLAMINE
DIISOPROPYLBENZENE HYDROPEROXIDE	DIISOPROPYLBENZENE HYDROPEROXIDE
DILAURYL PEROXIDE	LAURYL PEROXIDE
DIMAZINE	1,1-DIMETHYLHYDRAZINE
5,8-DIMETHANAPHTHALENE	ENDRIN
1,2-DIMETHOXYETHANE	ETHYLENE GLYCOL DIMETHYL ETHER
DIMETHOXYETHANE	METHYL FORMAL
10,11-DIMETHOXYSKATOL	BRUCINE
DIMETHYLACETAMIDE	DIMETHYLACETAMIDE
N,N-DIMETHYLACETAMIDE	DIMETHYLACETAMIDE
N,N-DIMETHYLACETAMIDE ACETIC ACID,	DIMETHYLACETAMIDE
DIMETHYLAMIDE	
DIMETHYLACETIC ACID	ISOBUTYRIC ACID
DIMETHYLAMINE	DIMETHYLAMINE
DIMETHYLARSINIC ACID	CACODYLIC ACID
1,3-DIMETHYLBENZENE	m-XYLENE
1,4-DIMETHYLBENZENE	p-XYLENE
1,2-DIMETHYLBENZENE	o-XYLENE
ALPHA, ALPHA-	CUMENE HYDROPEROXIDE
DIMETHYLBENZENE HYDROPEROXIDE	
DIMETHYLBENZYL HYDROPEROXIDE	CUMENE HYDROPEROXIDE
DIMETHYLBENZYLOCTADECYLAMMONIUM	BENZYLDIETHYLOCTADECYLAMMONIUM
CHLORIDE	CHLORIDE
2,2-DIMETHYLBUTANE	NEOHXANE
DIMETHYL CARBINOL	ISOPROPYL ALCOHOL
DIMETHYL CELLOSOLVE	ETHYLENE GLYCOL DIMETHYL ETHER
DIMETHYLDICHLOROSILANE	DIMETHYLDICHLOROSILANE
DIMETHYL ETHER	DIMETHYL ETHER
1,1-DIMETHYLETHYLAMINE	TERT-BUTYLAMINE
DIMETHYL FORMAL	METHYL FORMAL
DIMETHYLFORMAMIDE	DIMETHYLFORMAMIDE
N,N-DIMETHYLFORMAMIDE	DIMETHYLFORMAMIDE
2,6-DIMETHYL-4-HEPTANONE	DIISOBUTYL KETONE
2,6-DIMETHYL-4-HEPTANOL	DIISOBUTYL CARBINOL
DIMETHYLHEXANALS	ISOCETALDEHYDE
DIMETHYLHEXANE DIHYDROPEROXIDE, WET	DIMETHYLHEXANE DIHYDROPEROXIDE, WET
2,5-DIMETHYLHEXANE-2,5-DIHYDROPEROXIDE	DIMETHYLHEXANE DIHYDROPEROXIDE, WET

SYNONYM	COMPOUND NAME
DIMETHYL-1-HEXANOLS	ISOCTYL ALCOHOL
1,1-DIMETHYLHYDRAZINE	1,1-DIMETHYLHYDRAZINE
UNSYM-DIMETHYLHYDRAZINE	1,1-DIMETHYLHYDRAZINE
DIMETHYL KETONE	ACETONE
DIMETHYLMETHANE	PROPANE
2,2-DIMETHYL-3-METHYLENENORBORNANE	CAMPHENE
3,3-DIMETHYL-2-METHYLENENORCAMPHENE	CAMPHENE
DIMETHYLOCTADECYLBENZYLAMMONIUM CHLORIDE	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE
O,O-DIMETHYL-C-(P- NITROPHENYL)PHOSPHOROTHIOATE	METHYL PARATHION
O,O-DIMETHYL-C-(P- NITROPHENYL)THIOPHOSPHATE	METHYL PARATHION
O, O-DIMETHYL S-114-OXO-1,2,3- BENZOTRIAZINE-314H'-YL-METHYL PHOSPHORODITHIOATE	AZINPHOSMETHYL
2,6-DIMETHYLPHENOL	XYLENOL
DIMETHYL POLYSILOXANE	DIMETHYL POLYSILOXANE
DIMETHYL SILICONE FLUIDS	DIMETHYL POLYSILOXANE
DIMETHYLSILICONE OIL	DIMETHYL POLYSILOXANE
DIMETHYL SULFATE	DIMETHYL SULFATE
DIMETHYL SULFIDE	DIMETHYL SULFIDE
DIMETHYL SULFOXIDE	DIMETHYL SULFOXIDE
DIMETHYL TEREPHTHALATE	DIMETHYL TEREPHTHALATE
DIMETHYLZINC	DIMETHYLZINC
2,4-DINITRANILINE	2,4-DINITROANILINE
2,4-DINITROANILINE	2,4-DINITROANILINE
1,3-DINITROBENZENE	M-DINITROBENZENE
M-DINITROBENZENE	M-DINITROBENZENE
META-DINITROBENZENE	M-DINITROBENZENE
DINITROBENZOL	M-DINITROBENZENE
1,3-DINITROBENZOL	M-DINITROBENZENE
DINITROCRESOLS	DINITROCRESOLS
3,5-DINITRO-O-CRESOL	DINITROCRESOLS
4,6-DINITRO-O-CRESOL	DINITROCRESOLS
2,6-DINITRO-P-CRESOL	DINITROCRESOLS
2,6-DINITRO-N,N-DIPROPYL-4- TRIFLUOROMETHYLANILINE	TRIFLURALIN
2,6-DINITRO-N,N-DIPROPYL- ALPHA,ALPHA,ALPHA-TRIFLUORO-P- TOLUIDINE	TRIFLURALIN
DINITROGEN MONOXIDE	NITROUS OXIDE
DINITROGEN TETROXIDE	NITROGEN TETROXIDE
ALPHA-DINITROPHENOL	2,4-DINITROPHENOL
2,4-DINITROPHENOL	2,4-DINITROPHENOL
2,4-DINITROTOLUENE	2,4-DINITROTOLUENE
2,4-DINITROTOLUOL	2,4-DINITROTOLUENE
DIOCTYL ADIPATE	DIOCTYL ADIPATE
DIOCTYL PHTHALATE	DIOCTYL PHTHALATE
DIOCTYL SODIUM SULFOSUCCINATE	DIOCTYL SODIUM SULFOSUCCINATE
DICFORM	1,2-DICHLOROETHYLENE
DIOXAN	1,4-DIOXANE
1,4-DIOXANE	1,4-DIOXANE
P-DIOXANE	1,4-DIOXANE
DICXONIUM PERCHLORATE SOLUTION	PERCHLORIC ACID
1,3-DIOXUPHTHALAN	PHTHALIC ANHYDRIDE
DIPENTENE	DIPENTENE
DIPENTYL PHTHALATE	DI-N-AMYL PHTHALATE
DIPHENYLAMINE	DIPHENYLAMINE
DIPHENYLDICHLOROSILANE	DIPHENYLDICHLOROSILANE
DIPHENYL ETHER	DIPHENYL ETHER
DIPHENYL KETONE	BENZOPHENONE
DIPHENYLMETHANEDIISOCYANATE (MDI)	DIPHENYLMETHANEDIISOCYANATE (MDI)
DIPHENYLMETHANE-4,4 -DIISOCYANATE	DIPHENYLMETHANEDIISOCYANATE (MDI)
DIPHENYL METHANONE	BENZOPHENONE

SYNONYM		COMPOUND NAME
DIPHENYL OXIDE	-	DIPHENYL ETHER
DIPHENYLSILICON DICHLORIDE	-	DIPHENYLCICHLGROSILANE
DI-N-PROPYLAMINE	-	DI-N-PROPYLAMINE
N,N-DIPROPYL-2,6-DINITRO-4-TRIFLUORO- METHYLANILINE	-	TRIFLURALIN
DIPROPYLENE GLYCOL	-	DIPROPYLENE GLYCOL
DISODIUM ARSENATE HEPTAHYDRATE	-	SODIUM ARSENATE
DISODIUM ETHYLENEBIS (DITHIOCARBAMATE)	-	NABAM
DISODIUM METHANEARSONATE	-	METHANEARSONIC ACID, SODIUM SALTS
DISODIUM METHYL ARSONATE	-	METHANEARSONIC ACID, SODIUM SALTS
DISODIUM NITRILTRIACETATE	-	NITRILOTRIACETIC ACID AND SALTS
DISTILLATE=FLASHED FEED STOCKS	-	DISTILLATE=FLASHED FEED STOCKS
DISTILLATE=STRAIGHT RUN	-	DISTILLATE=STRAIGHT RUN
DISULFATOZIRCONIC ACID	-	ZIRCONIUM SULFATE
DITHANE	-	KABAM
DITHIOPYROPHOSPHORIC ACID,0,0,0,0- TETRAETHYL ESTER	-	TETRAETHYL DITHIOPYROPHOSPHATE
DIVINYL	-	BUTADIENE, INHIBITED
DMCT	-	METHOXYCHLOR
DMF	-	DIMETHYLFORMAMIDE
DMS	-	DIMETHYL SULFIDE
DMSO	-	DIMETHYL SULFOXIDE
DNT	-	2,4-DINITROTOLUENE
DCA	-	DIOCTYL ADIPATE
1-DODECANETHIOL	-	LAURYL MERCAPTAN
DODECANOL	-	LINEAR ALCOHOLS (12-15 CARBONS)
DODECANOL	-	DODECANOL
DODECANOYL PEROXIDE	-	LAURYL PEROXIDE
DODECENE	-	DODECENE
1-DODECENE	-	1-DODECENE
DODECENE (NON-LINEAR)	-	PROPYLENE TETRAMER
DODECENE (NON-LINEAR)	-	DODECENE
DODECYL ALCOHOL	-	DODECANOL
DODECYLBENZENE	-	DODECYLBENZENE
N-DODECYLBENZENE	-	DODECYLBENZENE
DODECYLBENZENESULFONIC ACID	-	ALKYLBENZENESULFONIC ACIDS
DODECYLBENZENE (LINEAR)	-	DODECYLBENZENE
DODECYLBENZENESULFONIC ACID,CALCIUM SALT	-	DODECYLBENZENESULFONIC ACID,CALCIUM SALT
DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT	-	DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT
DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT	-	DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT
ALPHA-DODECYLENE	-	1-DODECENE
DODECYLETHYLENE	-	1-TETRADECENE
DODECYL MERCAPTAN	-	LAURYL MERCAPTAN
DODECYL SULFATE, AMMONIUM SALT	-	AMMONIUM LAURYL SULFATE
DODECYL SULFATE, DIETHANOLAMINE SALT	-	DODECYL SULFATE, DIETHANOLAMINE SALT
DODECYL SULFATE, MAGNESIUM SALT	-	DODECYL SULFATE, MAGNESIUM SALT
DODECYL SULFATE, SODIUM SALT	-	DODECYL SULFATE, SODIUM SALT
DODECYL SULFATE, TRIETHANOLAMINE SALT	-	DODECYL SULFATE, TRIETHANOLAMINE SALT
DODECYLTRICHLOROSILANE	-	DODECYLTRICHLOROSILANE
DCP	-	DIOCTYL PHTHALATE
DORMANT OIL	-	OIL: SPRAY
DOWANOL DB	-	DIETHYLENE GLYCOL MONOBUTYL ETHER
DOWANOL DE	-	DIETHYLENE GLYCOL MONOETHYL ETHER
DOWANOL DM	-	DIETHYLENE GLYCOL MONOMETHYL ETHER
DOWANOL EB	-	ETHYLENE GLYCOL MONOBUTYL ETHER
DOWANOL EE	-	ETHYLENE GLYCOL MONOETHYL ETHER
DOWANOL EM	-	ETHYLENE GLYCOL MONOMETHYL ETHER
DOWANOL PM	-	PROPYLENE GLYCOL METHYL ETHER
DOWANOL TE	-	ETHOXY TRIGLYCOL
DOWANOL 33B	-	PROPYLENE GLYCOL METHYL ETHER
DOWFUME 40, W-10, W-15, W-40	-	ETHYLENE DIBROMIDE
DOWICIDE 2	-	TRICHLOROPHENOL

SYNONYM		COMPOUND NAME
DOWICIDE 7	-	PENTACHLOROPHENOL
DOWTHERM	-	DOWTHERM
DOWTHERM E	-	C-DICHLOROBENZENE
DRACYCLIC ACID	-	BENZOIC ACID
DRYCLEANERS NAPHTHA	-	NAPHTHA STODCARD SOLVENT
DRYING OIL EPOXIDES	-	EPOXIDIZED VEGETABLE OILS
DSMA	-	METHANEARSONIC ACID, SODIUM SALTS
DUST-LAYING OIL	-	ASPHALT BLENDING STOCK:ROOFERS FLUX
DUTCH LIQUID	-	ETHYLENE DICHLORIDE
DYTOL S-91	-	N-DECYL ALCOHOL
E 3314	-	HEPTACHLOR
EAA	-	ETHYL ACETOACETATE
EADC	-	ETHYLALUMINUM DICHLORIDE
EASC	-	ETHYLALUMINUM SESQUICHLORIDE
EB	-	ETHYLBENZENE
EBDC,SODIUM SALT	-	NABAM
EDC	-	ETHYLENE DICHLORIDE
EDIBLE TALLOW	-	TALLOW
EDTA	-	ETHYLENEDIAMINE TETRACETIC ACID
EKTASOLVE DB ACETATE	-	DIETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
ELECTRICAL INSULATING OIL	-	OIL: TRANSFORMER
EMBAFUME	-	METHYL BROMIDE
ENANTHIC ALCOHOL	-	HEPTANOL
ENDRATE	-	ETHYLENEDIAMINE TETRACETIC ACID
ENDRIN	-	ENDRIN
EPICHLOROHYDRIN	-	EPICHLOROHYDRIN
EPOXIDIZED DRYING OILS	-	EPOXIDIZED VEGETABLE OILS
EPOXIDIZED OILS	-	EPOXIDIZED VEGETABLE OILS
EPOXIDIZED TALL OIL, OCTYL ESTER	-	OCTYL EPOXY TALLATE
EPOXIDIZED VEGETABLE OILS	-	EPOXIDIZED VEGETABLE OILS
1,2-EPOXYBUTANE	-	BUTYLENE OXIDE
1,2-EPOXYETHANE	-	ETHYLENE OXIDE
1,2-EPOXYPROPANE	-	PROPYLENE OXIDE
ERINITRIT	-	SODIUM NITRITE
ERIOCHALCITE (ANHYDROUS)	-	COPPER CHLORIDE
ESKIMON 11	-	TRICHLOROFLUOROMETHANE
ESKIMON 12	-	DICHLORODIFLUOROMETHANE
ESKIMON 22	-	MONOCHLORODIFLUOROMETHANE
ESSENCE OF MIRBANE	-	NETROBENZENE
ETHANAL	-	ACETALDEHYDE
ETHANE	-	ETHANE
ETHANECARBOXYLIC ACID	-	PROPIONIC ACID
ETHANEDIAL	-	GLYOXAL, 40% SOLUTION
1,2-ETHANEDIAMINE	-	ETHYLENEDIAMINE
ETHANEDINITRILE	-	CYANOGEN
ETHANEDIOIC ACID	-	OXALIC ACID
ETHANEDIOIC ACID,DISODIUM SALT	-	SODIUM OXALATE
1,2-ETHANEDIOL	-	ETHYLENE GLYCOL
ETHANENITRILE	-	ACETONITRILE
ETHANETHIOL	-	ETHYL MERCAPTAN
ETHANOIC ACID	-	ACETIC ACID
ETHANOIC ANHYDRIDE	-	ACETIC ANHYDRIDE
ETHANOL	-	ETHYL ALCOHOL
ETHANOLAMINE	-	MONOETHANOLAMINE
ETHENE	-	ETHYLENE
ETHER	-	ETHYL ETHER
ETHINE	-	ACETYLENE
ETHOXYDIHYDROPYRAN	-	ETHOXYDIHYDROPYRAN
2-ETHOXY-3,4-DIHYDRO-2H-PYRAN	-	ETHOXYDIHYDROPYRAN
ETHOXYETHANE	-	ETHYL ETHER
2-ETHOXYETHANOL	-	ETHYLENE GLYCOL MONOETHYL ETHER
2-ETHOXYETHANOL, ACETATE	-	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE

SYNONYM

2-(2-ETHOXYETHOXY)ETHANOL
2-ETHOXYETHYL ACETATE

ETHOXY DIGLYCOL
ETHOXYLATED DODECANOL
ETHOXYLATED DODECYL ALCOHOL
ETHOXYLATED LAURYL ALCOHOL
ETHOXYLATED MYRISTYL ALCOHOL
ETHOXYLATED NONYLPHENOL
ETHOXYLATED PENTACECANOL
ETHOXYLATED PENTADECYL ALCOHOL
ETHOXYLATED TETRADECANOL
ETHOXYLATED TETRADECYL ALCOHOL
ETHOXYLATED TRIDECANOL
ETHOXYLATED TRIDECYL ALCOHOL
ETHOXYTRIETHYLENE GLYCOL
ETHOXY TRIGLYCOL
ETHYL ACETATE
ETHYLACETIC ACID
ETHYL ACETOACETATE
ETHYL ACRYLATE
ETHYL ALCOHOL
ETHYL ALDEHYDE
ETHYLALUMINUM DICHLORIDE
ETHYLALUMINUM SESQUICHLORIDE
ETHYLAMINE
ETHYLBENZENE
ETHYL BUTANGATE
ETHYL BUTANOL
2-ETHYL-1-BUTANOL
2-ETHYLBUTYL ALCOHOL
ETHYL BUTYRATE
2-ETHYLCAPROALDEHYDE
ETHYLCARBINDOL
ETHYL CARBONATE
ETHYL CHLORACETATE
ETHYL CHLORIDE
ETHYL CHLOROACETATE
ETHYL CHLOROCARBONATE
ETHYL CHLOROTHANATE
ETHYL CHLOROFORMATE
ETHYL DICHLOROPHOSPHATE
ETHYLDICHLOROSILANE
ETHYLENE
ETHYLENE ACETATE
ETHYLENEBIS (DITHIOCARBAMIC ACID), DISODIUM SALT
ETHYLENE BROMIDE
ETHYLENE CHLOROHYDRIN
ETHYLENE CHLORIDE
ETHYLENE CHLOROHYDRIN
ETHYLENE CYANOHYDRIN
ETHYLENE DIACETATE
ETHYLENEDIAMINE
ETHYLENEDIAMINE TETRACETIC ACID
ETHYLENE DIBROMIDE
CIS-1,2-ETHYLENEDICARBOXYLIC ACID
TRANS-1,2-ETHYLENEDICARBOXYLIC ACID
ETHYLENE DICHLORIDE
ETHYLENE DIGLYCOL
ETHYLENE DIHYDRATE
(ETHYLENEDINITRILE)TETRAACETIC ACID
2,2-ETHYLENEDIOXYDIETHANOL
ETHYLENE GLYCOL
ETHYLENE GLYCOL DIACETATE

COMPOUND NAME

DIETHYLENE GLYCOL MONOETHYL ETHER
ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
DIETHYLENE GLYCOL MONOETHYL ETHER
ETHOXYLATED CODECANOL
ETHOXYLATED CODECANOL
ETHOXYLATED CODECANOL
ETHOXYLATED TETRADECANOL
ETHOXYLATED NONYLPHENOL
ETHOXYLATED PENTADECANOL
ETHOXYLATED PENTADECANOL
ETHOXYLATED TETRADECANOL
ETHOXYLATED TETRADECANOL
ETHOXYLATED TRIDECANOL
ETHOXYLATED TRIDECANOL
ETHOXY TRIGLYCOL
ETHOXY TRIGLYCOL
ETHYL ACETATE
N-BUTYRIC ACID
ETHYL ACETOACETATE
ETHYL ACRYLATE
ETHYL ALCOHOL
ACETALDEHYDE
ETHYLALUMINUM DICHLORIDE
ETHYLALUMINUM SESQUICHLORIDE
ETHYLAMINE
ETHYLBENZENE
ETHYL BUTYRATE
ETHYL BUTANOL
ETHYL BUTANOL
ETHYL BUTANOL
ETHYL BUTYRATE
ETHYLHEXALDEHYDE
N-PROPYL ALCOHOL
DIETHYL CARBONATE
ETHYL CHLOROACETATE
ETHYL CHLORIDE
ETHYL CHLOROACETATE
ETHYL CHLOROFORMATE
ETHYL CHLOROACETATE
ETHYL CHLOROFORMATE
ETHYL PHOSPHORODICHLORIDATE
ETHYLDICHLOROSILANE
ETHYLENE
ETHYLENE GLYCOL DIACETATE
NABAP
ETHYLENE DIBROMIDE
ETHYLENE CHLOROHYDRIN
ETHYLENE DICHLORIDE
ETHYLENE CHLOROHYDRIN
ETHYLENE CYANOHYDRIN
ETHYLENE GLYCOL DIACETATE
ETHYLENEDIAMINE
ETHYLENEDIAMINE TETRACETIC ACID
ETHYLENE DIBROMIDE
MALEIC ACID
FUMARIC ACID
ETHYLENE DICHLORIDE
DIETHYLENE GLYCOL
ETHYLENE GLYCOL
ETHYLENEDIAMINE TETRACETIC ACID
TRIETHYLENE GLYCOL
ETHYLENE GLYCOL
ETHYLENE GLYCOL DIACETATE

SYNONYM	COMPOUND NAME
ETHYLENE GLYCOL DIETHYL ETHER	ETHYLENE GLYCOL DIETHYL ETHER
ETHYLENE GLYCOL DIHYDROXYDIETHYL ETHER	TRIETHYLENE GLYCOL
ETHYLENE GLYCOL DIMETHYL ETHER	ETHYLENE GLYCOL DIMETHYL ETHER
ETHYLENE GLYCOL ETHYL ETHER	ETHYLENE GLYCOL MONOETHYL ETHER
ETHYLENE GLYCOL MONOBUTYL ETHER	ETHYLENE GLYCOL MONOBUTYL ETHER
ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
ETHYLENE GLYCOL MONOETHYL ETHER	ETHYLENE GLYCOL MONOETHYL ETHER
ETHYLENE GLYCOL MONOETHYL ETHER ACETATE	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
ETHYLENE GLYCOL MONOMETHYL ETHER	ETHYLENE GLYCOL MONOMETHYL ETHER
ETHYLENEIMINE	ETHYLENEIMINE
ETHYLENEPIS(MINODIACETIC ACID)	ETHYLENEPIS(MINODIACETIC ACID)
ETHYLENE OXIDE	ETHYLENE OXIDE
ETHYL ETHANOATE	ETHYL ACETATE
ETHYL ETHER	ETHYL ETHER
ETHYL FORMATE	ETHYL FORMATE
ETHYL FORMIC ESTER	ETHYL FORMATE
ETHYLHEXALDEHYDE	ETHYLHEXALDEHYDE
2-ETHYLHEXALDEHYDE	ETHYLHEXALDEHYDE
2-ETHYLHEXANAL	ETHYLHEXALDEHYDE
2-ETHYL HEXANOL	2-ETHYL HEXANOL
2-ETHYL-1-HEXANOL	2-ETHYL HEXANOL
2-ETHYL-2-HEXANOL	2-ETHYL-3-PROPYLACROLEIN
2-ETHYLHEXYL ACRYLATE, INHIBITED	2-ETHYLHEXYL ACRYLATE, INHIBITED
2-ETHYLHEXYL ALCOHOL	2-ETHYL HEXANOL
2-ETHYLHEXYL 2-PROPENOATE	2-ETHYLHEXYL ACRYLATE, INHIBITED
ETHYL HEXYL TALLATE	ETHYL HEXYL TALLATE
2-ETHYLHEXYL TRICHLOROPHENOXYACETATE	2,4,5-T(ESTERS)
ETHYL 2-HYDROXYPROPANOATE	ETHYL LACTATE
ETHYL ALPHA-HYDROXY-PROPIONATE	ETHYL LACTATE
5-ETHYLIDENEBICYCLO(2.2.1)HEPT-2-ENE	ETHYLIDENENORBORNENE
ETHYLIDENE DIFLUORIDE	1,1-DIFLUOROETHANE
ETHYLIDENE FLUORIDE	1,1-DIFLUOROETHANE
ETHYLIDENENORBORNENE	ETHYLIDENENORBORNENE
ETHYLIDENENORBORNYLENE	ETHYLIDENENORBORNENE
ETHYLIDENENORCAMPHENE	ETHYLIDENENORBORNENE
ETHYL DL-LACTATE	ETHYL LACTATE
ETHYL LACTATE	ETHYL LACTATE
ETHYL MERCAPTAN	ETHYL MERCAPTAN
ETHYL METHACRYLATE	ETHYL METHACRYLATE
ETHYL 2-METHACRYLATE	ETHYL METHACRYLATE
ETHYL METHACRYLATE INHIBITED	ETHYL METHACRYLATE
ETHYL METHANOATE	ETHYL FORMATE
ETHYL METHYL KETONE	METHYL ETHYL KETONE
ETHYL ALPHAMETHYLMETHACRYLATE	ETHYL METHACRYLATE
ETHYL 2-METHYL-2-PROPENOATE	ETHYL METHACRYLATE
5-ETHYL-2-METHYLPYRIDINE	METHYLETHYLPYRIDINE
ETHYL NITRILE	ACETONITRILE
ETHYL NITRITE	ETHYL NITRITE
ETHYL ORTHOSILICATE	ETHYL SILICATE
ETHYL OXIDE	ETHYL ETHER
ETHYL 3-OXOBUTANOATE	ETHYL ACETOACETATE
ETHYL PARATHION	PARATHION, LIQUID
ETHYL PHENYLDCICHLOROSILANE	ETHYL PHENYLDCICHLOROSILANE
ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS
ETHYL PHOSPHORODICHLORIDO-THIONATE	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS
ETHYL PHOSPHORODICHLORIDATE	ETHYL PHOSPHORODICHLORIDATE
ETHYL PHTHALATE	DIETHYL PHTHALATE
5-ETHYL-2-PICOLINE	METHYLETHYLPYRIDINE
ETHYL 2-PROPENOATE	ETHYL ACRYLATE
2-ETHYL-3-PROPYLACROLEIN	2-ETHYL-3-PROPYLACROLEIN
2-ETHYL-3-PROPYLACRYLALDEHYDE	2-ETHYL-3-PROPYLACROLEIN

SYNONYM

ETHYL PYROPHOSPHATE
 ETHYL SILICATE
 ETHYL SILICATE CONDENSED
 ETHYL SILICATE 40
 ETHYL SILICON TRICHLORIDE
 ETHYL SILICONE TRICHLORIDE
 ETHYL SULFHYDRATE
 ETHYL T. IONOPHOSPHONYL DICHLORIDE
 ETHYLTRICHLOROSILANE
 ETHYL ZINC
 ETHYNE
 EUFIN
 EUNATROL
 EXITELITE
 F-11
 F-12
 F-22
 FAST RED GG BASE
 FAST RED TR BASE
 FAST RED 2G BASE
 FERMENTATION ALCOHOL
 FERMENTATION AMYL ALCOHOL
 FERMENTATION BUTYL ALCOHOL
 FERRIC AMMONIUM CITRATE
 FERRIC AMMONIUM CITRATE, BROWN
 FERRIC AMMONIUM CITRATE, GREEN
 FERRIC AMMONIUM OXALATE
 FERRIC CHLORIDE
 FERRIC CHLORIDE, ANHYDROUS
 FERRIC CHLORIDE, HEXAHYDRATE
 FERRIC GLYCEROPHOSPHATE
 FERRIC NITRATE
 FERRIC NITRATE NONAHYDRATE
 FERRIC SULFATE
 FERROUS AMMONIUM SULFATE
 FERROUS AMMONIUM SULFATE HEXAHYDRATE
 FERROUS BOROFLUORIDE
 FERROUS CHLORIDE
 FERROUS CHLORIDE TETRAHYDRATE
 FERROUS FLUOROBORATE
 FERROUS OXALATE
 FERROUS OXALATE DIHYDRATE
 FERROUS SULFATE
 FERROX
 FERTILIZER ACID
 FILMERINE
 FISH OIL
 FLAXSEED OIL
 FLOWERS OF ANTIMONY
 FLUORINE
 FLUOROETHYLENE
 FLUOSILICIC ACID
 FLUOSULFONIC ACID
 FLUOSULFURIC ACID
 FLUORSPAR
 FLUOSILICIC ACID
 FLUDSPAR
 FLUOSULFONIC ACID
 FLUX
 FLUXING OIL
 FLUX OIL
 FOLIAGE OIL
 FORMALDEHYDE DIMETHYLACETAL
 FORMALDEHYDE POLYMER

COMPOUND NAME

TETRAETHYL PYROPHOSPHATE
 ETHYL SILICATE
 ETHYL SILICATE
 ETHYL SILICATE
 ETHYLTRICHLOROSILANE
 ETHYLTRICHLOROSILANE
 ETHYL MERCAPTAN
 ETHYL PHOSPHONETHIOIC DICHLORIDE,
 ANHYDROUS
 ETHYLTRICHLOROSILANE
 DIETHYLZINC
 ACETYLENE
 DIETHYL CARBONATE
 GLACIC ACID, SODIUM SALT
 ANTIMONY TRIOXIDE
 TRICHLOROFLUOROMETHANE
 DICHLORODIFLUOROMETHANE
 MONOCHLORODIFLUOROMETHANE
 4-NITROANILINE
 4-CHLORO-O-TOLUICINE
 4-NITROANILINE
 ETHYL ALCOHOL
 ISOBUTYL ALCOHOL
 ISOBUTYL ALCOHOL
 FERRIC AMMONIUM CITRATE
 FERRIC AMMONIUM CITRATE
 FERRIC AMMONIUM CITRATE
 FERRIC AMMONIUM OXALATE
 FERRIC CHLORIDE
 FERRIC CHLORIDE
 FERRIC CHLORIDE
 FERRIC GLYCEROPHOSPHATE
 FERRIC NITRATE
 FERRIC NITRATE
 FERRIC SULFATE
 FERROUS AMMONIUM SULFATE
 FERROUS AMMONIUM SULFATE
 FERROUS FLUOROBORATE
 FERROUS CHLORIDE
 FERROUS CHLORIDE
 FERROUS FLUOROBORATE
 FERROUS OXALATE
 FERROUS OXALATE
 FERROUS SULFATE
 FERROUS OXALATE
 SULFURIC ACID
 SODIUM NITRITE
 OIL: FISH
 OILS MISCELLANEOUS: LINSEED
 ANTIMONY TRIOXIDE
 FLUORINE
 VINYL FLUORIDE, INHIBITED
 FLUOSILICIC ACID
 FLUOSULFONIC ACID
 FLUOSULFONIC ACID
 CALCIUM FLUORIDE
 FLUOSILICIC ACID
 CALCIUM FLUORIDE
 FLUOSULFONIC ACID
 ASPHALT BLENDING STOCK: RECFERS FLUX
 ASPHALT BLENDING STOCK: RECFERS FLUX
 ASPHALT BLENDING STOCK: RECFERS FLUX
 OIL: SPRAY
 POLYMER FORMAL
 PARA FORMALDEHYDE

SYNONYM	COMPOUND NAME
FORMALDEHYDE SOLUTION	FORMALDEHYDE SOLUTION
FORMALIN	FORMALDEHYDE SOLUTION
FORMALITH	FORMALDEHYDE SOLUTION
FORMIC ACID	FORMIC ACID
FORMIC ACID, AMMONIUM SALT	AMMONIUM FORMATE
FORMIC ACID, ETHYL ESTER	ETHYL FORMATE
FORMIC ACID, METHYL ESTER	METHYL FORMATE
FORMIC ALDEHYDE	FORMALDEHYDE SOLUTION
FORMIC ETHER	ETHYL FORMATE
FORMIN	HEXAMETHYLENETETRAAMINE
FORMYLIC ACID	FORMIC ACID
FREON 11	TRICHLOROFLUOROMETHANE
FREON 12	DICHLORODIFLUOROMETHANE
FREON 22	MONOCHLORODIFLUOROMETHANE
FRIGEN 11	TRICHLOROFLUOROMETHANE
FRIGEN 12	DICHLORODIFLUOROMETHANE
NO. 1 FUEL OIL	KEROSENE
NO. 1 FUEL OIL	CIL: RANGE
FUEL OIL NO. 1	JET FUEL: JP-1 (KEROSENE)
FUEL OIL 1-D	CIL: DIESEL
FUEL OIL: 1-D	FUEL OIL: 1-D
FUEL OIL NO. 2	FUEL OIL: 2
FUEL OIL: NO 1 (KEROSENE)	FUEL OIL: NO 1 (KEROSENE)
FUEL OIL: 2	FUEL OIL: 2
FUEL OIL 2-D	CIL: DIESEL
FUEL OIL: 2-D	FUEL OIL: 2-D
FUEL OIL: 4	FUEL OIL: 4
FUEL OIL NO. 4	FUEL OIL: 4
FUEL OIL NO. 5	FUEL OIL: 5
FUEL OIL: 5	FUEL OIL: 5
FUEL OIL NO. 6	FUEL OIL: 6
FUEL OIL: 6	FUEL OIL: 6
FLMARIC ACID	FUMARIC ACID
FUMIGRAIN	ACRYLONITRILE
FUMING LIQUID ARSENIC	ARSENIC TRICHLORIDE
FLHING SULFURIC ACID	CLEUM
FURAL	FURFURAL
2-FURALDEHYDE	FURFURAL
2-FURANCARBINOL	FURFURYL ALCOHOL
2,5-FURANEDIONE	MALEIC ANHYDRIDE
FURFUPAL	FURFURAL
FURFURALCCHCL	FURFURYL ALCOHOL
FURFURALDEHYDE	FURFURAL
FURFUROLE	FURFURAL
FURFURYL ALCOHOL	FURFURYL ALCOHOL
2-FURYL CARBINOL	FURFURYL ALCOHOL
ALPHA-FURYL CARBINOL	FURFURYL ALCOHOL
FUEL OIL	ISOPYRIL ALCOHOL
FYCE	FORMALDEHYDE SOLUTION
GALLIC ACID	GALLIC ACID
GALLIC ACID MONOHYDRATE	GALLIC ACID
GALLOTANNIC ACID	TANNIC ACID
GALLOTANNIN	TANNIC ACID
GAMMEXANE	BENZENE HEXACHLORIDE
GAS OIL: CRACKED	CAS OIL: CRACKED
GASOLINE, AUTOMOTIVE (LESS THAN 4.23 G LEAD/GAL)	GASOLINE, AUTOMOTIVE (LESS THAN 4.23 G LEAD/GAL)
GASOLINE, AVIATION (LESS THAN 4.86 G LEAD/GAL)	GASOLINE, AVIATION (LESS THAN 4.86 G LEAD/GAL)
GASOLINE BLENDING STOCKS: ALKYLATES	GASOLINE BLENDING STOCKS: ALKYLATES
GASOLINE BLENDING STOCKS: REFORMATES	GASOLINE BLENDING STOCKS: REFORMATES
GASOLINE: CASINGHEAD	GASOLINE: CASINGHEAD
GASOLINE: POLYMER	GASOLINE: POLYMER
GASOLINE: STRAIGHT RUN	GASOLINE: STRAIGHT RUN
GELBIN YELLOW ULTRAMARINE	CALCIUM CHROMATE

SYNONYM		COMPOUND NAME
GENETRON 11	-	TRICHLOROFLUOROMETHANE
GENETRON 12	-	DICHLORODIFLUOROPETHANE
GENETRON 22	-	PERCHLORODIFLUOROMETHANE
GERHARDITE	-	COPPER NITRATE
GEXANE	-	BENZENE HEXACHLORIDE
GLACIAL ACETIC ACID	-	ACETIC ACID
D-GLUCITOL	-	SORBITOL
GLUCOSE SOLUTION	-	DEXTROROSE SOLUTION
GLUTARALDEHYDE SOLUTION	-	GLUTARALDEHYDE SOLUTION
GLYCERINE	-	GLYCERINE
GLYCERITE	-	TANNIC ACID
GLYCEROL	-	GLYCERINE
GLYCIDYL METHACRYLATE	-	GLYCIDYL METHACRYLATE
GLYCIDYL ALPHA-METHYL ACRYLATE	-	GLYCIDYL METHACRYLATE
GLYCOL	-	ETHYLENE GLYCOL
GLYCOL BUTYL ETHER	-	ETHYLENE GLYCOL MONOBUTYL ETHER
GLYCOL CHLOROHYDRIN	-	ETHYLENE CHLOROHYDRIN
GLYCOL CYANOHYDRIN	-	ETHYLENE CYANOHYDRIN
GLYCOL DIACETATE	-	ETHYLENE GLYCOL DIACETATE
GLYCOL DIBROMIDE	-	ETHYLENE DIBROMIDE
GLYCOL DICHLORIDE	-	ETHYLENE DICHLORIDE
GLYCOL ETHYL ETHER	-	ETHYLENE
GLYCOL MONOBUTYL ETHER ACETATE	-	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
GLYCOL MONOETHYL ETHER	-	ETHYLENE GLYCOL MONOETHYL ETHER
GLYCOL MONOMETHYL ETHER	-	ETHYLENE GLYCOL MONOMETHYL ETHER
GLYCOL MONOETHYL ETHER ACETATE	-	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
GLYOXAL, 40% SOLUTION	-	GLYOXAL, 40% SOLUTION
GRAIN ALCOHOL	-	ETHYL ALCOHOL
GRAPE SUGAR SOLUTION	-	DEXTROROSE SOLUTION
GREEN OIL	-	ANTHRACENE
GREEN VITRIOL	-	FERRIC SULFATE
GREMASCENE	-	TRICHLOROETHYLENE
GUM TURPENTINE	-	TURPENTINE
GUSATHION INSECTICIDE	-	AZINPHOSMETHYL
GUTHION INSECTICIDE	-	AZINPHOSMETHYL
HALOGENATED WAXES	-	POLYCHLORINATED BIPHENYL (PCB)
HALON 122	-	DICHLORODIFLUOROPETHANE
HARTSHORN	-	AMMONIUM CARBONATE
HCH	-	BENZENE HEXACHLORIDE
HENDECANOIC ALCOHOL	-	UNDECANOL
1-HENDECANOL	-	UNDECANOL
N-HENDECYLENIC ALCOHOL	-	UNDECANOL
HEOD	-	DIELDRIN
HEPTACHLOR	-	HEPTACHLOR
1,4,5,6,7,8,8A-	-	HEPTACHLOR
HEPTACHLORODICYCLOPENTADIENE	-	HEPTACHLOR
1,4,5,6,7,8,8-	-	HEPTACHLOR
HEPTACHLORO-3A,4,7,7A-TETRAHYDRO-4,7-METHANOINDENE	-	HEPTACHLOR
1-HEPTADECANECARBOXYLIC ACID	-	STEARIC ACID
CIS-8-HEPTADECYLENE-CARBOXYLIC ACID	-	OLEIC ACID
HEPTANE	-	HEPTANE
N-HEPTANE	-	HEPTANE
HEPTANOL	-	HEPTANOL
1-HEPTANOL	-	HEPTANOL
2-HEPTANONE	-	N-AMYL METHYL KETONE
1-HEPTENE	-	1-HEPTENE
HEPTYL ALCOHOL	-	HEPTANOL
HEPTYLCARBINOL	-	1-HEPTENE
HEPTYLENE	-	1-HEPTENE
N-HEPTYLETHYLENE	-	1-HEPTENE
MERCOFLEX 260	-	DICCTYL PHTHALATE
HEXA	-	HEXAMETHYLENETETRAMINE

SYNONYM	COMPOUND NAME
1,2,3,4,5,6-	
HEXACHLOROCYCLOHEXANE	BENZENE HEXACHLORIDE
HEXACHLOROCYCLOPENTADIENE	
ENDO, EXO-1,2,3,4,10,10-	HEXACHLOROCYCLOPENTADIENE
HEXACHLORO-6,7-EPOXY-	CIELDRIN
1,4,4A,5,6,7,8,8A-OCTAHYDRO-	
1,4:5,8-DIMETHANONAPHTHALENE	
1,2,3,4,10,10-	
HEXACHLORO-6,7-EPOXY-	ENDRIN
1,4,4A,5,6,7,8,8A-OCTAHYDRO-	
ENDU, ENDO-1	
ENDO, EXO-1,2,3,4,10-	ALDRIN
HEXACHLORO-1,4,4A,5,8,8A-HEXAHYDRO-	
1,4:5,8-DIMETHANONAPHTHALENE	
HEXADECYL SULFATE, SODIUM SALT	HEXADECYL SULFATE, SODIUM SALT
HEXADECYLBENZENESULFONIC ACID	ALKYLBENZENESULFONIC ACIDS
HEXADECYLTRIMETHYLAMMONIUM CHLORIDE	HEXADECYLTRIMETHYLAMMONIUM CHLORIDE
HEXADRIN	ENDRIN
HEXAFLUOSILICIC ACID	FLUOSILICIC ACID
HEXAHYDRIC ALCOHOL	SORBITOL
HEXAHYDROANILINE	CYCLOHEXYLAMINE
HEXAHYDRO-2H-AZEPIN-2-ONE	CAPROLACTAM, LIQUID
HEXAHYDROAZEPINE	HEXAMETHYLENEDIAMINE
HEXAHYDROBENZENE	CYCLOHEXANE
HEXAHYDRO-1,4-DIAZINE	PIPERAZINE
HEXAHYDROPHENOL	CYCLOHEXANOL
HEXAHYDROPIRAZINE	PIPERAZINE
N-HEXALDEHYDE	N-HEXALDEHYDE
HEXALIN	CYCLOHEXANOL
HEXAMETHYLENE	CYCLOHEXANE
HEXAMETHYLENEAMINE	HEXAMETHYLENETETRAHINE
HEXAMETHYLENEDIAMINE	HEXAMETHYLENEDIAMINE
HEXAMETHYLENEIMINE	HEXAMETHYLENEIMINE
HEXAMETHYLENETETRAHINE	HEXAMETHYLENETETRAHINE
HEXAMINE	HEXAMETHYLENETETRAHINE
HEXANAL	N-HEXALDEHYDE
HEXANAPHTHENE	CYCLOHEXANE
HEXANE	HEXANE
1,6-HEXANEDIAMINE	HEXAMETHYLENEDIAMINE
HEXANEDIOIC ACID	ADIPIC ACID
1,2,3,4,5,6-	SORBITOL
HEXANEHEXOL	
HEXANOL	HEXANOL
1-HEXANOL	HEXANOL
2-HEXANONE	METHYL N-BUTYL KETONE
ALPHA-HEXENE	1-HEXENE
1-HEXENE	1-HEXENE
HEXONE	METHYL ISOBUTYL KETONE
HEXYL ACETATE	METHYL AMYL ACETATE
HEXYL ALCOHOL	HEXANOL
SEC-HEXYL ALCOHOL	ETHYL BUTANOL
HEXYLENE GLYCOL	HEXYLENE GLYCOL
HGI	BENZENE HEXACHLORIDE
HPDN	ALDRIN
HI-DRY	TETRAETHYLENE GLYCOL
HIGH-SPEED BEARING OIL	OIL: SPINDLE
HIGHER FATTY ALCOHOL	TALL OIL FATTY ALCOHOL
HMDA	HEXAMETHYLENEDIAMINE
HOME HEATING OIL	FUEL OIL: 2
HOMOPIPERIDINE	HEXAMETHYLENEIMINE
HOUSEHOLD AMMONIA	AMMONIUM HYDROXIDE
HTH	CALCIUM HYPOCHLORITE
HTH DRY CHLORINE	CALCIUM HYPOCHLORITE
HYDRACRYLIC ACID, BETA-LACTONE	BETA-PROPIOLACTONE

SYNONYM		COMPOUND NAME
HYDRACRYLONITRILE	-	ETHYLENE CYANOHYDRIN
HYDRAZINE	-	HYDRAZINE
HYDRAZOIC ACID, SODIUM SALT	-	SODIUM AZIDE
HYDROBROMIC ACID, ANHYDROUS	-	HYDROGEN BROMIDE
HYDROCHLORIC ACID	-	HYDROCHLORIC ACID
HYDROCHLORIC ACID, ANHYDROUS	-	HYDROGEN CHLORIDE
HYDROCYANIC ACID	-	HYDROGEN CYANIDE
HYDROCYANIC ACID, SODIUM SALT	-	SODIUM CYANIDE
HYDROFLUORIC ACID	-	HYDROFLUORIC ACID
HYDROFLUORIC ACID, ANHYDROUS	-	HYDROGEN FLUORIDE
HYDROFLUOSILICIC ACID	-	FLUOSILICIC ACID
HYDROGEN BROMIDE	-	HYDROGEN BROMIDE
HYDROGEN BROMIDE, ANHYDROUS	-	HYDROGEN BROMIDE
HYDROGEN CHLORIDE	-	HYDROGEN CHLORIDE
HYDROGEN CYANIDE	-	HYDROGEN CYANIDE
HYDROGEN FLUORIDE	-	HYDROGEN FLUORIDE
HYDROGEN HEXAFLUOROSILICATE	-	FLUOSILICIC ACID
HYDROGEN PEROXIDE	-	HYDROGEN PEROXIDE
HYDROGEN PEROXIDE CARBAMIDE	-	UREA PEROXIDE
HYDROGEN SULFIDE	-	HYDROGEN SULFIDE
HYDROGEN, LIQUEFIED	-	HYDROGEN, LIQUEFIED
HYDROPEROXYCYCLOHEXYL	-	CYCLOHEXANONE PEROXIDE
HYDROXYCYCLOHEXYL PEROXIDE	-	CYCLOHEXANONE PEROXIDE
1-HYDROPEROXYCYCLOHEXYL 1-HYDROXYCYCLOHEXYL PEROXIDE	-	
HYDROQUINOL	-	HYDROQUINONE
HYDROQUINONE	-	HYDROQUINONE
HYDROXY ETHER	-	ETHYLENE GLYCOL MONOETHYL ETHER
HYDROXYBENZENE	-	PHENOL
P-HYDROXYBENZENSULFONIC ACID, ZINC SALT	-	ZINC PHENOLSULFONATE
O-HYDROXYBENZOIC ACID	-	SALICYLIC ACID
1-HYDROXYBUTANE	-	N-BUTYL ALCOHOL
2-HYDROXYBUTANE	-	SEC-BUTYL ALCOHOL
1-HYDROXY-2-CYANOETHANE	-	ETHYLENE CYANOHYDRIN
HYDROXYCYCLOHEXANE	-	CYCLOHEXANOL
HYDROXYDIMETHYLARSINE OXIDE	-	CACODYLIC ACID
1-HYDROXY-2,4-DINITROBENZENE	-	2,4-DINITROPHENOL
BETA-HYDROXYETHYL ACRYLATE	-	2-HYDROXYETHYL ACRYLATE, INHIBITED
2-HYDROXYETHYL ACRYLATE, INHIBITED	-	2-HYDROXYETHYL ACRYLATE, INHIBITED
2-HYDROXYETHYLAMINE	-	MONOETHANOLAMINE
N-HYDROXYETHYL-1,2-ETHANEDIAMINE	-	AMINOETHYLETHANOLAMINE
N-BETA-HYDROXYETHYLETHYLENEIDIAMINE	-	AMINOETHYLETHANOLAMINE
2-HYDROXYETHYL 2-PROPENOATE	-	2-HYDROXYETHYL ACRYLATE, INHIBITED
1-HYDROXYHEPTANE	-	HEPTANOL
1-HYDROXYHEXANE	-	HEXANOL
ALPHA-HYDROXYISOBUTYRONITRILE	-	ACETONE CYANOHYDRIN
HYDROXYLAMINE SULFATE	-	HYDROXYLAMINE SULFATE
2-HYDROXYMETHYLFURAN	-	FURFURYL ALCOHOL
TETRAKIS (HYDROXYMETHYL) METHANE	-	PENTAERYTHRITOL
4-HYDROXY-4-METHYL-2-PENTANONE	-	DIACETONE ALCOHOL
4-HYDROXYNITROBENZENE	-	4-NITROPHENOL
2-HYDROXYNITROBENZENE	-	2-NITROPHENOL
2,2-BIS(P-HYDROXYPHENYL)PROPANE, DIGLYCIDYL ETHER	-	BISPHENOL A DIGLYCIDYL ETHER
3-HYDROXYPROPANENITRILE	-	ETHYLENE CYANOHYDRIN
2-HYDROXY-1,2,3-PROPANECARBOXYLIC ACID	-	CITRIC ACID
2-HYDROXYPROPANOIC ACID	-	LACTIC ACID
ALPHA-HYDROXYPROPIONIC ACID	-	LACTIC ACID
HYDROXYPROPYL ACRYLATE	-	HYDROXYPROPYL ACRYLATE
2-HYDROXYPROPYLAMINE	-	MONOISOPROPANOLAMINE
HYDROXYPROPYL METHACRYLATE	-	HYDROXYPROPYL METHACRYLATE
6-HYDROXY-3-(2H)-PYRIDAZINONE	-	MALEIC HYDRAZIDE
HYDROXYTOLUENES	-	CRESOLS

SYNONYM

ALPHA-HYDROXYTOLUENE
 BETA-HYDROXYTRICARBALLYLIC ACID
 BETA-HYDROXYTRICARBOXYLIC ACID
 2-HYDROXY-M-XYLENE
 HYLENE M50
 HYLENE T
 MYTROL O
 IBN
 ILLUMINATING OIL
 2,2 -IMINODIETHANOL
 1,1 -IMINODI-2-PROPANOL
 IMPERIAL GREEN
 INEDIBLE TALLOW
 INSULATING OIL
 IRON AMMONIUM SULFATE
 IRON (III) CHLORIDE
 IRON DICHLORIDE
 IRON(OUS)SULFATE
 IRON PERCHLORIDE
 IRON PROTOCHLORIDE
 IRON PROTOXALATE
 IRON SESQUISULFATE
 IRON (III) SULFATE
 IRON TERSULFATE
 IRON TRICHLORIDE
 IRON VITRIOL
 ISCEON 11
 ISOMYL ALCOHOL
 ISOBUTANE
 ISOBUTANOL
 ISOBUTENE
 ISOBUTENYL METHYL KETONE
 ISOBUTYL ACETATE
 ISOBUTYL ALCOHOL
 ISOBUTYLALDEHYDE
 ISO-BUTYLAMINE
 ISOBUTYLAMINE
 ISOBUTYL CARBINOL
 ISOBUTYLENE
 ISOBUTYL METHYL CARBINOL
 ISOBUTYLMETHYL CARBINOL
 ISOBUTYL METHYL KETONE
 ISOBUTYLMETHYLMETHANOL
 ISOBUTYRALDEHYDE
 ISOBUTYRIC ACID
 ISOBUTYRIC ALDEHYDE
 ISOBUTYRONITRILE
 ISOCYANIC ACID, 4-METHYL-M-PHENYLENE
 ESTER
 ISODECALDEHYDE
 ISODECALDEHYDE, MIXED ISOMERS
 ISO-DECYL ACRYLATE
 ISODECYL ACRYLATE, INHIBITED
 ISODECYL ALCOHOL
 ISODIPRENE
 ISOHEXANE
 ISONITROPROPANE
 ISOOCTALDEHYDE
 ISOOCTYL ALCOHOL
 ISOOCTYL ALDEHYDE
 ISOOCTYL TRICHLOROPHENOXYACETATE
 ISOPENTANE
 ISOPENTYL ALCOHOL
 ISOPENTYL NITRITE
 ISOPHORONE

COMPOUND NAME

BENZYL ALCOHOL
 CITRIC ACID
 CITRIC ACID
 XYLENOL
 DIPHENYLMETHANEDIISOCYANATE (MDI)
 TOLUENE 2,4-DIISOCYANATE (TDI)
 CYCLOHEXANONE
 ISOBUTYRONITRILE
 KEROSENE
 DIETHANOLAMINE
 DIISOPROPANOLAMINE
 COPPER ACETOARSENITE
 TALLOW
 OIL: TRANSFORMER
 FERROCUS AMMONIUM SULFATE
 FERRIC CHLORIDE
 FERROUS CHLORIDE
 FERROUS SULFATE
 FERRIC CHLORIDE
 FERROUS CHLORIDE
 FERROUS OXALATE
 FERRIC SULFATE
 FERRIC SULFATE
 FERRIC SULFATE
 FERRIC CHLORIDE
 FERROUS SULFATE
 TRICHLOROFLUOROMETHANE
 ISOMYL ALCOHOL
 ISOBUTANE
 ISOBUTYL ALCOHOL
 ISOBUTYLENE
 PESITYL OXIDE
 ISOBUTYL ACETATE
 ISOBUTYL ALCOHOL
 ISO-BUTYRALDEHYDE
 ISOBUTYLAMINE
 ISOBUTYLAMINE
 ISOMYL ALCOHOL
 ISOBUTYLENE
 METHYL ISOBUTYL CARBINOL
 METHYL AMYL ALCOHOL
 METHYL ISOBUTYL KETONE
 METHYL AMYL ALCOHOL
 ISO-2UTYRALDEHYDE
 ISOBUTYRIC ACID
 ISO-BUTYRALDEHYDE
 ISOBUTYRONITRILE
 TOLUENE 2,4-DIISOCYANATE (TDI)
 ISODECALDEHYDE
 ISODECALDEHYDE
 ISODECYL ACRYLATE, INHIBITED
 ISODECYL ACRYLATE, INHIBITED
 ISODECYL ALCOHOL
 CARENE
 ISOHEXANE
 2-NITROPROPANE
 ISOOCTALDEHYDE
 ISOOCTYL ALCOHOL
 ISOOCTALDEHYDE
 2,4,5-T(ESTERS)
 ISOPENTANE
 ISOMYL ALCOHOL
 ISO-AMYL NITRITE
 ISOPHORONE

SYNONYM		COMPOUND NAME
ISOPHTHALIC ACID	-	ISOPHTHALIC ACID
ISOPRENE	-	ISOPRENE
ISOPROPANOL	-	ISOPROPYL ALCOHOL
ISOPROPANOLAMINE	-	MONOISOPROPANOLAMINE
ISOPROPENYLBENZENE	-	ALPHA-METHYLSTYRENE
ISOPROPENYL METHYL KETONE	-	METHYL ISOPROPENYL KETONE, INHIBITED
2-ISOPROPOXYPROPANE	-	ISOPROPYL ETHER
ISOPROPYL ACETATE	-	ISOPROPYL ACETATE
ISOPROPYLACETONE	-	METHYL ISOBUTYL KETONE
ISOPROPYL ALCOHOL	-	ISOPROPYL ALCOHOL
ISG-PROPYLAMINE	-	ISOPROPYLAMINE
ISOPROPYLAMINE	-	ISOPROPYLAMINE
ISOPROPYLAMINE CODECYLBENZENESULFONATE	-	CODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT
ISOPROPYLBENZENE	-	CUMENE
ISOPROPYLBENZENE HYDROPEROXIDE	-	CUMENE HYDROPEROXIDE
ISOPROPYLCARBINOL	-	ISOBUTYL ALCOHOL
ISOPROPYLCUMYL HYDROPEROXIDE	-	DIISOPROPYLBENZENE HYDROPEROXIDE
ISOPROPYL CYANIDE	-	ISOBUTYRONITRILE
ISOPROPYL 2,4-DICHLOROPHENOXY ACETATE	-	2,4-D ESTERS
ISOPROPYL ETHER	-	ISOPROPYL ETHER
ISOPROPYLFORMIC ACID	-	ISOBUTYRIC ACID
ISOPROPYLIDENEACETONE	-	MESITYL OXIDE
4,4 -ISOPROPYLIDENEDIPHENOL	-	BISPHENOL A
4,4 -ISOPROPYLIDENEDIPHENOLEPICHLOROHYDRIN	-	BISPHENOL A DICLICYDYL ETHER
RESIN		
ISOPROPYL MERCAPTAN	-	ISOPROPYL MERCAPTAN
ISOPROPYL PERCARBONATE	-	ISOPROPYL PERCARBONATE
ISOPROPYL PEROXYDICARBONATE	-	ISOPROPYL PERCARBONATE
P-ISOPROPYLTOLUENE	-	P-CYMENE
ISOPROPYLTOLUOL	-	P-CYMENE
ISOTRIDECANOL	-	TRIDECANOL
ISOTRIDECYL ALCOHOL	-	TRIDECANOL
ISOTRON 11	-	TRICHLOROFLUOROMETHANE
ISOTRON 12	-	DICHLORODIFLUOROMETHANE
ISOTRON 22	-	MONOCHLORODIFLUOROMETHANE
ISVALERAL	-	ISOVALERALDEHYDE
ISOVALERALDEHYDE	-	ISOVALERALDEHYDE
ISOVALERIC ALDEHYDE	-	ISOVALERALDEHYDE
ISOVALERONE	-	DIISOBUTYL KETONE
JP-1	-	CIL: RANGE
JP-1	-	FUEL OIL: NO 1 (KEROSENE)
JP-1	-	KEROSENE
JET FUEL: JP-1 (KEROSENE)	-	JET FUEL: JP-1 (KEROSENE)
JET FUEL: JP-3	-	JET FUEL: JP-3
JET FUEL: JP-4	-	JET FUEL: JP-4
JET FUEL: JP-5 (KEROSENE, HEAVY)	-	JET FUEL: JP-5 (KEROSENE, HEAVY)
JOCUTIN	-	BENZENE HEXACHLORIDE
KEL F MONOMER	-	TRIFLUOROCYCLOETHYLENE
KELTHANE	-	4,4 -DICHLORO-ALPHA- TRICHLOROMETHYLBENZHYDRCL
KELTHANETHANOL	-	4,4 -DICHLORO-ALPHA- TRICHLOROMETHYLBENZHYDRCL
KEROSENE	-	CIL: RANGE
KEROSENE	-	JET FUEL: JP-1 (KEROSENE)
KEROSENE	-	FUEL OIL: NO 1 (KEROSENE)
KEROSENE	-	KEROSENE
KEROSENE, HEAVY	-	JET FUEL: JP-5 (KEROSENE, HEAVY)
KEROSENE, HEAVY	-	OIL: SPRAY
KEROSINE	-	KEROSENE
KEROSINE	-	CIL: RANGE
KEROSINE	-	FUEL OIL: NO 1 (KEROSENE)
KEROSINE	-	JET FUEL: JP-1 (KEROSENE)
2-KETOHEPTANE	-	N-AMYL METHYL KETONE

SYNONYM

2-KETOHEXAMETHYLENIMINE
KETTLE-RENDERED LARD
KILLAX
KINGS GOLD
KINGS GREEN
KINGS YELLOW
KNELL
LACTIC ACID
DL-LACTIC ACID, AMMONIUM SALT
LACTIC ACID, ETHYL ESTER
LAH
LATEX, LIQUID SYNTHETIC
LAUGHING GAS
LAUROYL PEROXIDE
LAURYL ALCOHOL
LAURYL AMMONIUM SULFATE
LAURYL BENZENE
LAURYL MAGNESIUM SULFATE
LAURYL MERCAPTAN
LAURYL SODIUM SULFATE
LAURYL SULFATE, MAGNESIUM SALT
LAURYL SULFATE, SODIUM SALT
LAURYL SULFATE, TRIETHANOLAMINE SALT
LEAD (IV) ACETATE
LEAD ACETATE
LEAD ACETATE TRIHYDRATE
LEAD ARSENATE
LEAD ARSENATE, ACID
LEAD DIFLUORIDE
LEAD FLUOBORATE
LEAD FLUORIDE
LEAD FLUOROBORATE
LEAD FLUOROBORATE SOLUTION
LEAD IODIDE
LEAD MONOXIDE
LEAD NITRATE
LEAD OXIDE, YELLOW
LEAD PROTOXIDE
LEAD SULFOCYANATE
LEAD TETRAACETATE
LEAD TETRAETHYL
LEAD TETRAMETHYL
LEAD THIOCYANATE
LEAF LARD
LEUCOL
LICHENIC ACID
LIGHT NAPHTHA
LIGHT NAPHTHA
LIGHT OIL
LIMED WOOD ROSIN
LIMONENE
LINDANE
LINEAR ALCOHOLS (12-15 CARBONS)
LIQUEFIED NATURAL GAS (LNG)
LIQUEFIED PETROLEUM GAS (LPG)
LIQUID AMMONIA
LIQUID ASPHALT
LIQUID ASPHALT
LIQUID BLEACH
LIQUID GUM CAMPHOR
LIQUID HYDROGEN
LIQUID IMPURE CAMPHOR
LIQUID NITROGEN
LIQUID NITROGEN DIOXIDE
LIQUID OXYGEN

COMPOUND NAME

CAPROLACTAM, LIQUID
CILS EDIBLE, LARD
TETRAETHYL PYROPHOSPHATE
ARSENIC TRISULFIDE
COPPER ACETOARSENITE
ARSENIC TRISULFIDE
BENZENE HEXACHLORIDE
LACTIC ACID
AMMONIUM LACTATE
ETHYL LACTATE
LITHIUM ALUMINUM HYDRIDE
LATEX, LIQUID SYNTHETIC
NITROUS OXIDE
LAUROYL PEROXIDE
COCOCANOL
AMMONIUM LAURYL SULFATE
CODECYLBENZENE
CODECYL SULFATE, MAGNESIUM SALT
LAURYL MERCAPTAN
CODECYL SULFATE, SODIUM SALT
CODECYL SULFATE, MAGNESIUM SALT
CODECYL SULFATE, SODIUM SALT
CODECYL SULFATE, TRIETHANOLAMINE SALT
LEAD TETRAACETATE
LEAD ACETATE
LEAD ACETATE
LEAD ARSENATE
LEAD ARSENATE
LEAD FLUORIDE
LEAD FLUOROBORATE
LEAD FLUORIDE
LEAD FLUOROBORATE
LEAD IODIDE
LITHARGE
LEAD NITRATE
LITHIUM
LITHARGE
LEAD THIOCYANATE
LEAD TETRAACETATE
TETRAETHYL LEAD
TETRAMETHYL LEAD
LEAD THIOCYANATE
OILS EDIBLE, LARD
QUINOLINE
FUMARIC ACID
NAPHTHA SOLVENT
NAPHTHA VM + P (75 PER CENT NAPHTHA)
GIL: COAL TAR
CALCIUM RESINATE
CIPENTENE
BENZENE HEXACHLORIDE
LINEAR ALCOHOLS (12-15 CARBONS)
LIQUEFIED NATURAL GAS (LNG)
LIQUEFIED PETROLEUM GAS (LPG)
AMMONIA ANHYDROUS
ASPHALT BLENDING STOCK=ROCKERS FLX
GIL: ROAD
SODIUM HYPOCHLORITE
CAMPHOR OIL
HYDROGEN, LIQUEFIED
CAMPHOR OIL
NITROGEN, LIQUEFIED
NITROGEN TETROXIDE
OXYGEN, LIQUEFIED

SYNONYM

LIQUID PETROLATUM
 LIQUIFIED PHENOL
 LITHARGE
 LITHIUM ALUMINUM HYDRIDE
 LITHIUM HYDRIDE
 LITHIUM, METALLIC
 LNG
 LONG-TIME BURNING OIL
 LONG-TIME BURNING OIL
 LOROL-22
 LDX
 LPG
 LUBRICATING OIL
 LUCIDOL-70
 LUMBRICAL
 LUNAR CAUSTIC
 LUPERCO JCB-50-T
 LYE
 LYE
 MAAC
 MACQUEERS SALT
 M-B-C FUMIGANT
 M-DNB
 MAGNESIUM
 MAGNESIUM DODECYL SULFATE
 MAGNESIUM LAURYL SULFATE
 MAGNESIUM PERCHLORATE
 MAGNESIUM PERCHLORATE, ANHYDROUS
 MAGNESIUM PERCHLORATE HEXAHYDRATE
 MALATHION
 MALAZIDE
 MALEIC ACID
 MALEIC ACID HYDRAZIDE
 MALEIC ANHYDRIDE
 MALEIC HYDRAZIDE
 MALEINIC ACID
 MALENIC ACID
 MALONIC MONONITRILE
 MACH
 MAOH
 MAPP GAS
 MARLATE 50
 MARSH GAS
 MARSHITE
 MASSICOT
 MCB
 MCP
 MCI
 MEADOW GREEN
 ME CB
 MEK
 MENDRIN
 MEP
 MERCAPTOETHANE
 MERCAPTOMETHANE
 MERCAPTOSUCCINIC ACID, S-ESTER WITH
 O,O-DIMETHYL DITHIOPHOSPHATE
 MERCURIALIN
 MERCURIC ACETATE
 MERCURIC AMMONIUM CHLORIDE
 MERCURIC CHLORIDE
 MERCURIC CHLORIDE, AMMONIATED
 MERCURIC CYANIDE
 MERCURIC IODIDE

COMPOUND NAME

CIL: MINERAL
 CARBOLIC OIL
 LITHARGE
 LITHIUM ALUMINUM HYDRIDE
 LITHIUM HYDRIDE
 LITHIUM, METALLIC
 LIQUEFIED NATURAL GAS (LNG)
 BENZENE HEXACHLORIDE
 CIL: MINERAL SEAL
 N-DECYL ALCOHOL
 OXYGEN, LIQUEFIED
 LIQUEFIED PETROLEUM GAS (LPG)
 OIL: MOTOR
 DIBENZOYL PEROXIDE
 PIPERAZINE
 SILVER NITRATE
 CYCLOHEXANONE PEROXIDE
 CAUSTIC SODA SOLUTION
 CAUSTIC POTASH SOLUTION
 METHYL AMYL ACETATE
 POTASSIUM ARSENATE
 METHYL BROMIDE
 M-CINITROBENZENE
 MAGNESIUM
 DODECYL SULFATE, MAGNESIUM SALT
 LAURYL SULFATE, MAGNESIUM SALT
 MAGNESIUM PERCHLORATE
 MAGNESIUM PERCHLORATE
 MAGNESIUM PERCHLORATE
 MALATHION
 MALEIC HYDRAZIDE
 MALEIC ACID
 MALEIC HYDRAZIDE
 MALEIC ANHYDRIDE
 MALEIC HYDRAZIDE
 MALEIC ACID
 MALEIC ACID
 CYANOACETIC ACID
 METHYL ISOBUTYL CARBINOL
 METHYL AMYL ALCOHOL
 METHYLACETYLENE - PROPAGIENE MIXTURE
 METHOXYCHLOR
 METHANE
 COPPER IODIDE
 LITHARGE
 CHLOROBENZENE
 CALCIUM PHOSPHATE
 DIPHENYLMETHANEDIISOCYANATE (MDI)
 COPPER ACETOARSENITE
 DIETHYLENE GLYCOL MONOMETHYL ETHER
 METHYL ETHYL KETONE
 ENDRIN
 METHYLETHYLPIRIDINE
 ETHYL MERCAPTAN
 METHYL MERCAPTAN
 MALATHION
 METHYLAMINE
 MERCURIC ACETATE
 MERCURIC AMMONIUM CHLORIDE
 MERCURIC CHLORIDE
 MERCURIC AMMONIUM CHLORIDE
 MERCURIC CYANIDE
 MERCURIC IODIDE

SYNONYM		COMPOUND NAME
MERCURIC IODIDE, RED	-	MERCURIC IODIDE
MERCURIC NITRATE	-	MERCURIC NITRATE
MERCURIC NITRATE MONOHYDRATE	-	MERCURIC NITRATE
MERCURIC OXIDE	-	MERCURIC OXIDE
MERCURIC OXIDE, RED (RED PRECIPITATE[])	-	MERCURIC OXIDE
MERCURIC OXIDE, YELLOW (YELLOW PRECIPITATE[])	-	MERCURIC OXIDE
MERCURIC SULFIDE	-	MERCURIC SULFIDE
MERCURIC SULFIDE, BLACK (ETHIOPS MINERAL)	-	MERCURIC SULFIDE
MERCURIC SULFIDE, RED (VERMILLION, ARTIFICIAL CINNABAR, CHINESE RED)	-	MERCURIC SULFIDE
MERCURIUS CHLORIDE	-	MERCURIUS CHLORIDE
MERCURIUS NITRATE	-	MERCURIUS NITRATE
MERCURIUS NITRATE MONOHYDRATE	-	MERCURIUS NITRATE
MERCURY	-	MERCURY
MERCURY AMMONIUM CHLORIDE	-	MERCURIC AMMONIUM CHLORIDE
MERCURY BICHLORIDE	-	MERCURIC CHLORIDE
MERCURY BINIODE	-	MERCURIC IODIDE
MERCURY (II) CHLORIDE	-	MERCURIC CHLORIDE
MERCURY (II) CHLORIDE AMMONOBASE	-	MERCURIC AMMONIUM CHLORIDE
MERCURY CYANIDE	-	MERCURIC CYANIDE
MERCURY (II) CYANIDE	-	MERCURIC CYANIDE
MERCURY MONOCHLORIDE	-	MERCURIUS CHLORIDE
MERCURY (II) NITRATE	-	MERCURIC NITRATE
MERCURY OXIDE	-	MERCURIC OXIDE
MERCURY PERCHLORIDE	-	MERCURIC CHLORIDE
MERCURY PERNITRATE	-	MERCURIC NITRATE
MERCURY PROTOCHLORIDE	-	MERCURIUS CHLORIDE
MERCURY PROTONITRATE	-	MERCURIUS NITRATE
MERCURY SUBCHLORIDE	-	MERCURIUS CHLORIDE
MESITYL OXIDE	-	MESITYL OXIDE
METALLIC RESINATE	-	CALCIUM RESINATE
METHACRYLATE MONOMER	-	METHYL METHACRYLATE
METHACRYLIC ACID, BUTYL ESTER	-	N-BUTYL METHACRYLATE
METHACRYLIC ACID, 2,3-EPOXYPROPYL ESTER	-	GLYCIDYL METHACRYLATE
METHACRYLIC ACID, ETHYL ESTER	-	ETHYL METHACRYLATE
METHACRYLIC ACID, METHYL ESTER	-	METHYL METHACRYLATE
BETA-METHALLYL CHLORIDE	-	METHALLYL CHLORIDE
METHALLYL CHLORIDE	-	METHALLYL CHLORIDE
METHANAL	-	FORMALDEHYDE SOLUTION
METHANE	-	METHANE
METHANEARSONIC ACID, SODIUM SALTS	-	METHANEARSONIC ACID, SODIUM SALTS
2-METHOXYETHANOL	-	ETHYLENE GLYCOL MONOMETHYL ETHER
2-(2-METHOXYETHOXY)ETHANOL	-	DIETHYLENE GLYCOL MONOMETHYL ETHER
METHOXYETHYLENE	-	VINYL METHYL ETHER, INHIBITED
1-METHOXY-2-PROPANOL	-	PROPYLENE GLYCOL METHYL ETHER
METHYLACETALDEHYDE	-	PROPIONALDEHYDE
METHYL ACETATE	-	METHYL ACETATE
METHYLACETIC ACID	-	PROPIONIC ACID
METHYLACETIC ANHYDRIDE	-	PROPIONIC ANHYDRIDE
METHANETHIOL	-	METHYL MERCAPTAN
METHANETHIOMETHANE	-	DIMETHYL SULFIDE
METHANOIC ACID	-	FORMIC ACID
METHANOL	-	METHYL ALCOHOL
METHENAMINE	-	HEXAMETHYLENETETRAMINE
METHOXYCHLOR	-	METHOXYCHLOR
METHOXY-DDT	-	METHOXYCHLOR
METHOXYDIGLYCOL	-	DIETHYLENE GLYCOL MONOMETHYL ETHER
METHYLACETYLENE-ALLENE MIXTURE	-	METHYLACETYLENE - PROPADIENE MIXTURE
METHYLACETYLENE - PROPADIENE MIXTURE	-	METHYLACETYLENE - PROPADIENE MIXTURE
BETA-METHYLACROLEIN	-	CROTONALDEHYDE
METHYL ACRYLATE	-	METHYL ACRYLATE

SYNONYM		COMPOUND NAME
METHYLAL	-	METHYL FORMAL
METHYL ALCOHOL	-	METHYL ALCOHOL
BETA-METHYLALLYL CHLORIDE	-	METHALLYL CHLORIDE
METHYLAMINE	-	METHYLAMINE
N-METHYLAMINOBENZENE	-	N-METHYLANILINE
METHYL AMYL ACETATE	-	METHYL AMYL ACETATE
METHYL AMYL ALCOHOL	-	METHYL AMYL ALCOHOL
METHYLAMYL ALCOHOL	-	METHYL ISOBUTYL CARBINOL
METHYL AMYL KETONE	-	N-AMYL METHYL KETONE
O-METHYLANILINE	-	O-TOLUIDINE
2-METHYLANILINE	-	O-TOLUIDINE
N-METHYLANILINE	-	N-METHYLANILINE
METHYLANILINE (MONO)	-	N-METHYLANILINE
2-METHYLAZIRIDINE	-	PROPYLENEIMINE, INHIBITED
METHYLBENZENE	-	TOLUENE
METHYLBENZENESULFONIC ACID	-	P-TOLUENESULFONIC ACID
METHYLBENZOL	-	TOLUENE
BETA-METHYLBIVINYL	-	ISOPRENE
METHYL BROMIDE	-	METHYL BROMIDE
2-METHYL-1,3-BUTADIENE	-	ISOPRENE
3-METHYLBUTANAL	-	ISOBUTYRALDEHYDE
2-METHYLBUTANE	-	ISOPENTANE
3-METHYL-1-BUTANOL	-	ISOBUTYL ALCOHOL
2-METHYL-1-BUTENE-3-ONE	-	METHYL ISOPROPENYL KETONE, INHIBITED
METHYL N-BUTYL KETONE	-	METHYL N-BUTYL KETONE
3-METHYLBUTYL NITRITE	-	ISOBUTYL NITRITE
3-METHYLBUTYRALDEHYDE	-	ISOBUTYRALDEHYDE
METHYL CARBITOL	-	DIETHYLENE GLYCOL MONOMETHYL ETHER
METHYL CELLOSOLVE	-	ETHYLENE GLYCOL MONOMETHYL ETHER
METHYL CHLORIDE	-	METHYL CHLORIDE
METHYL CHLOROCARBONATE	-	METHYL CHLOROCARBONATE
METHYL CHLOROFORM	-	TRICHLOROETHANE
METHYL CHLOROFORMATE	-	METHYL CHLOROCARBONATE
METHYL CHLOROMETHYL ETHER, ANHYDROUS	-	CHLOROMETHYL METHYL ETHER
METHYL CYANIDE	-	ACETONITRILE
METHYLCYCLOPENTADIENYL ANGINESE	-	METHYLCYCLOPENTADIENYL ANGINESE
TRICARBONYL	-	TRICARBONYL
METHYLCYCLOPENTANE	-	METHYLCYCLOPENTANE
METHYLDICHLOROSILANE	-	METHYLDICHLOROSILANE
1-METHYL-2,4-DINITROBENZENE	-	2,4-DINITROTOLUENE
METHYLENE CHLORIDE	-	DICHLOROMETHANE
METHYLENE DICHLORIDE	-	DICHLOROMETHANE
METHYLENE DIMETHYL ETHER	-	METHYL FORMAL
METHYLENEBIS(4-PHENYL ISOCYANATE)	-	DIPHENYLMETHANEDIISOCYANATE (MDI)
METHYL ETHER	-	DIMETHYL ETHER
METHYL ETHER WOOD ETHER	-	DIMETHYL ETHER
METHYLETHYLCARBINOL	-	SEC-BUTYL ALCOHOL
METHYLETHYLENE	-	PROPYLENE
METHYLETHYLENE GLYCOL	-	PROPYLENE GLYCOL
2-METHYLETHYLENIMINE	-	PROPYLENEIMINE, INHIBITED
METHYL ETHYL KETONE	-	METHYL ETHYL KETONE
METHYLETHYLPYRIDINE	-	METHYLETHYLPYRIDINE
METHYL FORMAL	-	METHYL FORMAL
METHYL FORMATE	-	METHYL FORMATE
6-METHYL-1-HEPTANAL	-	ISOCTALDEHYDE
6-METHYL-1-HEPTANOL	-	ISOCTYL ALCOHOL
METHYLHYDRAZINE	-	METHYLHYDRAZINE
METHYL ISOBUTENYL KETONE	-	PESITYL OXIDE
METHYLISOBUTYL CARBINOL	-	METHYL AMYL ALCOHOL
METHYL ISOBUTYL CARBINOL	-	METHYL ISOBUTYL CARBINOL
METHYLISOBUTYLCARBINYL ACETATE	-	METHYL AMYL ACETATE
METHYL ISOBUTYL KETONE	-	METHYL ISOBUTYL KETONE
METHYL ISOPROPENYL KETONE, INHIBITED	-	METHYL ISOPROPENYL KETONE, INHIBITED
1-METHYL-4-ISOPROPYL-BENZENE	-	P-CYME

SYNONYM		COMPOUND NAME
2-METHYLLACTONITRILE	"	ACETONE CYANHYDRIN
METHYL MERCAPTAN	"	PETHYL MERCAPTAN
METHYL METHACRYLATE	"	PETHYL METHACRYLATE
METHYL ALPHA-METHACRYLATE	"	PETHYL METHACRYLATE
METHYLMETHANE	"	ETHANE
METHYL 2-METHYL-2-PROPENOATE	"	PETHYL METHACRYLATE
METHYL OXIRANE	"	PROPYLENE OXIDE
METHYL PARATHION	"	METHYL PARATHION
2-METHYLPENTANE	"	ISOMEXANE
2-METHYL-2,4-PENTANEDIOL	"	HEXYLENE GLYCOL
4-METHYL-2-PENTANOL	"	METHYL AMYL ALCOHOL
4-METHYL-2-PENTANOL	"	METHYL ISOBUTYL CARBINOL
4-METHYL-2-PENTANOL, ACETATE	"	METHYL AMYL ACETATE
4-METHYL-2-PENTANONE	"	METHYL ISOBUTYL KETONE
4-METHYL-3-PENTENE-2-ONE	"	MESITYL OXIDE
4-METHYL-2-PENTYL ACETATE	"	METHYL AMYL ACETATE
1-METHYL-1-PHENYLETHYLENE	"	ALPHA-METHYLSTYRENE
METHYL PENTYL KETONE	"	N-AMYL METHYL KETONE
METHYLPHENOLS	"	CRESOLS
METHYLPHENYLAMINE	"	N-METHYLANILINE
METHYL PHENYL KETONE	"	ACETOPHENONE
METHYL PHOSPHONOTHIOIC DICHLORIDE (ANHYD)	"	METHYL PHOSPHONOTHIOIC DICHLORIDE (ANHYD)
2-METHYLPROPANAL	"	ISO-BUTYRALDEHYDE
2-METHYLPROPANE	"	ISOBUTANE
2-METHYLPROPANENITRILE	"	ISOBUTYRONITRILE
2-METHYLPROPANOIC ACID	"	ISOBUTYRIC ACID
2-METHYL-1-PROPANOL	"	ISOBUTYL ALCOHOL
2-METHYL-2-PROPANOL	"	TERT-BUTYL ALCOHOL
2-METHYLPROPENE	"	ISOBUTYLENE
METHYL 2-PROPENOATE	"	METHYL ACRYLATE
ALPHA-METHYLPROPIONIC ACID	"	ISOBUTYRIC ACID
2-METHYLPROPIONITRILE	"	ISOBUTYRONITRILE
2-METHYL-1-PROPYL ACETATE	"	ISOBUTYL ACETATE
METHYL PROPYL BENZENE	"	P-CYMENE
BETA-METHYLPROPYL ETHANOATE	"	ISOBUTYL ACETATE
1-METHYL-2-(3-PYRIDYL)PYRROLIDINE	"	NICOTINE
1-METHYL-2-(3-PYRIDYL) PYRROLIDINE, 3-(1-METHYL-2-PYRROLIDYL) PYRIDINE	"	NICOTINE
N-METHYLPYRROLIDINONE	"	1-METHYLPYRROLIDONE
1-METHYLPYRROLIDONE	"	1-METHYLPYRROLIDONE
N-METHYL-PYRROLIDONE	"	1-METHYLPYRROLIDONE
1-METHYL-2-PYRROLIDINONE	"	1-METHYLPYRROLIDONE
N-METHYL-ALPHA-PYRROLIDONE	"	1-METHYLPYRROLIDONE
3-(2-METHYL-2-PYRROLIDYL)PYRIDINE	"	NICOTINE
METHYLSTYRENE	"	VINYLTOLUENE
ALPHA-METHYLSTYRENE	"	ALPHA-METHYLSTYRENE
METHYL SULFHYDRATE	"	PETHYL MERCAPTAN
METHYL SULFIDE	"	DIMETHYL SULFIDE
4-(METHYLSULFONYL)-2,6-DINITRO-N,N-DIPROPYLANILINE	"	NITRALIN
METHYL SULFOXIDE	"	DIMETHYL SULFOXIDE
METHYL THIRAM	"	THIRAM
METHYLTRICHLOROSILANE	"	PETHYLTRICHLOROSILANE
METHYL TUACS	"	THIRAM
METHYL VINYL ETHER	"	VINYL METHYL ETHER, INHIBITED
METHYL VINYL KETONE	"	METHYL VINYL KETONE
METHYL ZINC	"	DIMETHYLZINC
MH	"	PALEIC HYDRAZIDE
MIBC	"	METHYL AMYL ALCOHOL
MIBC	"	PETHYL ISOBUTYL CARBINOL
MIBK	"	METHYL ISOBUTYL KETONE
MIC	"	METHYL AMYL ALCOHOL
MIC	"	PETHYL ISOBUTYL CARBINOL

SYNONYM

MIDDLE OIL
 MILK
 MILD MERCURY CHLORIDE
 MILK ACID
 MINERAL CARBON
 MINERAL CHARCOAL
 MINERAL COLZA OIL
 MINERAL OIL
 MINERAL SEAL OIL
 MINERAL SPIRITS
 MITIS GREEN
 MIXED PRIMARY AMYL NITRATES
 MIXTURE OF BENZENE, TOLUENE, AND
 XYLENES
 MIXTURE OF O- AND S-(2-
 (ETHYLTHIO)ETHYL)PHOSPHOROTHIOIC
 ACID, O,O-DIETHYL ESTER
 MMH
 MOHRS SALT
 MOLYBDENUM TRIOXIDE
 MOLYBDIC ACID, 85 PER CENT
 MOLYBDIC ANHYDRIDE
 MOLYBDIC TRIOXIDE
 MCNDUR TDS
 MONOAMMONIUM ORTHOPHOSPHATE
 MONOBROMOBENZENE
 MCNCBROMOMETHANE
 MCND-N-BUTYLAMINE
 MONOCALCIUM PHOSPHATE, MONOHYDRATE
 MONOCHLORACETIC ACID, ETHYL ESTER
 MONOCHLORETHANE
 MONOCHLORETHANOIC ACID, ETHYL ESTER
 MONOCHLOROACETIC ACID
 MONOCHLOROBENZENE
 MONOCHLORODIFLUOROMETHANE
 MONOCHLOROMETHYL ETHER
 MONOETHANOLAMINE
 MCNCETHYLAMINE
 MONOETHYLENE GLYCOL
 MONOFLUORO ETHYLENE
 MONOGLYME
 MONOHYDRATE
 MCNOISOBUTYLAMINE
 MCNOISOPROPANOLAMINE
 MCNOISOPROPYLAMINE
 MONOMETHYLAMINE, ANHYDROUS
 MONOMETHYLHYDRAZINE
 MONONITROGEN MONOXIDE
 MCND PE
 MCNCSODIUM METHANEARSONATE
 MCNCSODIUM METHYL ARSONATE
 MONOXIDE
 MORPHOLINE
 MCRTOPAL
 MOSS GREEN
 MOTOR FUEL ANTI-KNOCK COMPOUNDS
 CONTAINING LEAD ALKYL
 MOTOR OIL
 MOTOR SPIRIT

 MPT
 MPTD

 MSMA

COMPOUND NAME

CARBOLIC OIL
 METHYL ISOBUTYL KETONE
 MERCURUS CHLORIDE
 LACTIC ACID
 CHARCOAL
 CHARCOAL
 GIL: MINERAL SEAL
 OIL: MINERAL
 GIL: MINERAL SEAL
 MINERAL SPIRITS
 COPPER ACETOARSENITE
 N-AMYL NITRATE
 NAPHTHA COAL TAR

 CEMENTON

 METHYLHYDRAZINE
 FERRUS AMMONIUM SULFATE
 MOLYBDIC TRIOXIDE
 AMMONIUM MOLYBDATE
 POLYBDIC TRIOXIDE
 MOLYBDIC TRIOXIDE
 TOLUENE 2,4-DIISOCYANATE (TDI)
 AMMONIUM PHOSPHATE
 BROMOBENZENE
 METHYL BROMIDE
 N-BUTYLAMINE
 CALCIUM PHOSPHATE
 ETHYL CHLOROACETATE
 ETHYL CHLORIDE
 ETHYL CHLOROACETATE
 MONOCHLOROACETIC ACID
 CHLOROBENZENE
 MONOCHLORODIFLUOROMETHANE
 CHLOROMETHYL METHYL ETHER
 MONOETHANOLAMINE
 ETHYLAMINE
 ETHYLENE GLYCOL
 VINYL FLUORIDE, INHIBITED
 ETHYLENE GLYCOL DIMETHYL ETHER
 CALCIUM PHOSPHATE
 ISOBUTYLAMINE
 MCNOISOPROPANOLAMINE
 ISOPROPYLAMINE
 METHYLAMINE
 METHYLHYDRAZINE
 NITRIC OXIDE
 PENTAERYTHRITOL
 METHANEARSONIC ACID, SODIUM SALTS
 METHANEARSONIC ACID, SODIUM SALTS
 CARBON MONOXIDE
 MORPHOLINE
 TETRAETHYL PYROPHOSPHATE
 COPPER ACETOARSENITE
 MOTOR FUEL ANTI-KNOCK COMPOUNDS
 CONTAINING LEAD ALKYL
 GIL: LUBRICATING
 GASOLINE, AUTOMOTIVE (LESS THAN 4.23
 G LEAD/GAL)
 METHYL PARATHION
 METHYL PHOSPHOROTHIOIC
 DICHLORIDE (AMHC)
 METHANEARSONIC ACID, SODIUM SALTS

SYNONYM		COMPOUND NAME
MULTRATHANE M	-	DIPHENYLMETHANEDIISOCYANATE (PDI)
MURIATIC ACID	-	HYDROCHLORIC ACID
MYRISTIC ALCOHOL	-	TETRADECANOL
MYRISTYL ALCOHOL	-	TETRADECANOL
NABAM	-	NABAM
NACCONATE 100	-	TOLUENE 2,4-DIISOCYANATE (TDI)
NACCONATE 300	-	DIPHENYLMETHANEDIISOCYANATE (MDI)
NADONE	-	CYCLOHEXANONE
NAPHTHA	-	MINERAL SPIRITS
NAPHTHA COAL TAR	-	NAPHTHA COAL TAR
NAPHTHA SOLVENT	-	NAPHTHA SOLVENT
NAPHTHA STODDARD SOLVENT	-	NAPHTHA STODDARD SOLVENT
NAPHTHA VM + P (75 PER CENT NAPHTHA)	-	NAPHTHA VM + P (75 PER CENT NAPHTHA)
NAPHTHALANE	-	DECAHYDRONAPHTHALENE
NAPHTHALENE, MOLTEN	-	NAPHTHALENE, MOLTEN
NAPHTHALIN	-	NAPHTHALENE, MOLTEN
NAPHTHANE	-	DECAHYDRONAPHTHALENE
NAPHTHENIC ACIDS	-	NAPHTHENIC ACIDS
ALPHA-NAPHTHYLAMINE	-	1-NAPHTHYLAMINE
1-NAPHTHYLAMINE	-	1-NAPHTHYLAMINE
1-NAPHTHYL N-METHYLCARBAMATE	-	CARBARYL
NATURAL GASOLINE	-	GASOLINE: CASINGHEAD
NEATSFOOT OIL	-	CIL: NEATSFOOT
NECATORINA	-	CARBON TETRACHLORIDE
NEOHXANE	-	NEOHXANE
NEUTRAL AMMONIUM FLUORIDE	-	AMMONIUM FLUORIDE
NEUTRAL ANHYDROUS CALCIUM HYPOCHLORITE	-	CALCIUM HYPOCHLORITE
NEUTRAL LEAD ACETATE	-	LEAD ACETATE
NEUTRAL NICOTINE SULFATE	-	NICOTINE SULFATE
NEUTRAL POTASSIUM CHROMATE	-	POTASSIUM CHROMATE
NEUTRAL SODIUM CHROMATE, ANHYDROUS	-	SODIUM CHROMATE
NEUTRAL VERDIGRIS	-	COPPER ACETATE
NICKEL ACETATE	-	NICKEL ACETATE
NICKEL ACETATE TETRAHYDRATE	-	NICKEL ACETATE
NICKEL AMMONIUM SULFATE	-	NICKEL AMMONIUM SULFATE
NICKEL AMMONIUM SULFATE HEXAHYDRATE	-	NICKEL AMMONIUM SULFATE
NICKEL BROMIDE	-	NICKEL BROMIDE
NICKEL BROMIDE TRIHYDRATE	-	NICKEL BROMIDE
NICKEL CARBONYL	-	NICKEL CARBONYL
NICKEL CHLORIDE	-	NICKEL CHLORIDE
NICKEL CHLORIDE	-	NICKEL CHLORIDE
NICKEL CYANIDE	-	NICKEL CYANIDE
NICKEL (II) FLUOBORATE	-	NICKEL FLUOROBORATE
NICKEL FLUOROBORATE SOLUTION	-	NICKEL FLUOROBORATE
NICKEL FLUOROBORATE	-	NICKEL FLUOROBORATE
NICKEL FORMATE	-	NICKEL FORMATE
NICKEL FORMATE DIHYDRATE	-	NICKEL FORMATE
NICKEL NITRATE	-	NICKEL NITRATE
NICKEL NITRATE HEXAHYDRATE	-	NICKEL NITRATE
NICKEL SULFATE	-	NICKEL SULFATE
NICKEL TETRACARBONYL	-	NICKEL CARBONYL
NICKELOUS ACETATE	-	NICKEL ACETATE
NICKELOUS SULFATE	-	NICKEL SULFATE
NICOTINE	-	NICOTINE
NICOTINE SULFATE	-	NICOTINE SULFATE
NIFOS	-	TETRAETHYL PYROPHOSPHATE
NITRALIN	-	NITRALIN
NITRAM	-	AMMONIUM NITRATE
O-NITRANILINE	-	2-NITROANILINE
P-NITRANILINE	-	4-NITROANILINE
NITREX NITROGEN SOLUTIONS (NON-PRESSURE)	-	AMMONIUM NITRATE-UREA SOLUTION
NITRIC ACID	-	NITRIC ACID
NITRIC ACID, ALUMINUM SALT	-	ALUMINUM NITRATE

SYNONYM	COMPOUND NAME
NITRIC ACID, IRON (III) SALT	FERRIC NITRATE
NITRIC ACID, LEAD (II) SALT	LEAD NITRATE
NITRIC OXIDE	NITRIC OXIDE
NITRILOTRIACETIC ACID AND SALTS	NITRILOTRIACETIC ACID AND SALTS
2,2,2 -NITRILOTRIETHANOL	TRIETHANCLAMINE
O-NITROANILINE	2-NITROANILINE
4-NITROANILINE	4-NITROANILINE
P-NITROANILINE	4-NITROANILINE
2-NITROANILINE	2-NITROANILINE
NITROBENZENE	NITROBENZENE
NITROBENZOL	NITROBENZENE
NITROCARBOL	NITROMETHANE
NITROCELLULOSE GUM	COLLODION
NITROCELLULOSE SOLUTION	COLLODION
NITROCHLOROFORM	CHLOROPICRIN, LIQUID
NITROETHANE	NITROETHANE
NITROGEN DIOXIDE	NITROGEN TETROXIDE
NITROGEN, LIQUEFIED	NITROGEN, LIQUEFIED
NITROGEN MONOXIDE	NITRIC OXIDE
NITROGEN PEROXIDE	NITROGEN TETROXIDE
NITROGEN TETROXIDE	NITROGEN TETROXIDE
NITROMETHANE	NITROMETHANE
O-NITROPHENOL	2-NITROPHENOL
2-NITROPHENOL	2-NITROPHENOL
P-NITROPHENOL	4-NITROPHENOL
4-NITROPHENOL	4-NITROPHENOL
SEC-NITROPROPANE	2-NITROPROPANE
2-NITROPROPANE	2-NITROPROPANE
NITROSYL CHLORIDE	NITROSYL CHLORIDE
NITROTRICHLOROMETHANE	CHLOROPICRIN, LIQUID
NITROUS ETHER	ETHYL NITRITE
NITROUS OXIDE	NITROUS OXIDE
N-MCPANE	MCPANE
MCPANE	MCPANE
MCPANOL	MCPANOL
1-MCPANOL	MCPANOL
5-MCPANONE	CI-N-BUTYL KETONE
MCPENE	MCPENE
1-MCPENE	1-MCPENE
MCPENE (MCP-LINEAR)	MCPENE
MCPYL ALCOHOL	MCPANOL
MCPYLCARBINOL	N-DECYL ALCOHOL
1-MCPYLENE	1-MCPENE
N-MCPYLETHYLENE	1-MCPENE
MCPYLPHENOL	MCPYLPHENOL
MCPMAL AMYL ALCOHOL	N-AMYL ALCOHOL
NORMAL BUTYL ACETATE	N-BUTYL ACETATE
MCPMAL BUTYL ACRYLATE	N-BUTYL ACRYLATE
MCPMAL BUTYL ALCOHOL	N-BUTYL ALCOHOL
NORMAL BUTYRALDEHYDE	N-BUTYRALDEHYDE
NORMAL DECYL ALCOHOL	N-DECYL ALCOHOL
NORMAL LEAD ACETATE	LEAD ACETATE
NORMAL PROPYL ACETATE	N-PROPYL ACETATE
MCPMAL PROPYL ALCOHOL	N-PROPYL ALCOHOL
MCPVALAMINE	N-BUTYLAMINE
2-MP	2-NITROPROPANE
NTA	NITRILOTRIACETIC ACID AND SALTS
1,2,4,5,6,7,8-8-	CHLORDANE
OCTACHLORO-2,3,3A,4,7,7A-HEXAHYCRO-	
4,7-METHANOINDENE	
OCTACHLOROCAMPHENE	TOXAPHENE
OCTADECANOIC ACID	STEARIC ACID
CIS-9-OCTADECENOIC ACID	CLEIC ACID
OCTADECYLDIMETHYLBENZYLAMMONIUM	BENZYLDECETHYLCOCTADECYLAMMONIUM
CHLORIDE	CHLORIDE

SYNONYM		COMPOUND NAME
CIS-OCTADECYLENIC ACID	-	OLEIC ACID
CIS-(DELTA 9)-	-	OLEIC ACID
OCTADECYLENIC ACID	-	
N-OCTADECYLIC ACID	-	STEARIC ACID
OCTANE	-	OCTANE
OCTA-KLOR	-	CHLORDANE
N-OCTANE	-	OCTANE
OCTANOL	-	OCTANOL
1-OCTANOL	-	OCTANOL
1-OCTENE	-	1-OCTENE
OCTOCHLOROCAMPHENE	-	TOXAPHENE
OCTOIL	-	DICCTYL PHTHALATE
OCTYL ALCOHOL	-	OCTANOL
OCTYL ALDEHYDE	-	ETHYLHEXALDEHYDE
OCTYL CARBINOL	-	NONANOL
ALPHA-OCTYLENE	-	1-OCTENE
OCTYL EPOXY TALLATE	-	OCTYL EPOXY TALLATE
300 DEG OIL	-	OIL: MINERAL SEAL
OIL: ABSORPTION	-	OIL: ABSORPTION
OIL: CASTOR	-	OIL: CASTOR
OIL: CLARIFIED	-	OIL: CLARIFIED
OIL: COAL TAR	-	OIL: COAL TAR
OIL: COTTONSEED	-	OIL: COTTONSEED
OIL: CRUDE	-	OIL: CRUDE
OIL: DIESEL	-	OIL: DIESEL
OIL: FISH	-	OIL: FISH
OIL: LUBRICATING	-	OIL: LUBRICATING
OIL: MINERAL	-	OIL: MINERAL
OIL: MINERAL SEAL	-	OIL: MINERAL SEAL
OIL: MOTOR	-	OIL: MOTOR
OIL: NEATSFOOT	-	OIL: NEATSFOOT
OIL OF BITTER ALMOND	-	BENZALDEHYDE
OIL OF MERRANS	-	NITROBENZENE
OIL OF VITRIOL	-	SULFURIC ACID
OIL: OLIVE	-	OIL: OLIVE
OIL: PEANUT	-	OIL: PEANUT
OIL: PENETRATING	-	OIL: PENETRATING
OIL: RANGE	-	OIL: RANGE
OIL: RESIN	-	OIL: RESIN
OIL: ROAD	-	OIL: ROAD
OIL: ROSIN	-	OIL: ROSIN
OIL, TANNERS	-	OIL, TANNERS
OILS EDIBLE: COCONUT	-	OILS EDIBLE: COCONUT
OILS EDIBLE: LARD	-	OILS EDIBLE: LARD
OILS EDIBLE: PALM	-	OILS EDIBLE: PALM
OILS EDIBLE: SAFFLOWER	-	OILS EDIBLE: SAFFLOWER
OILS EDIBLE: TUCUM	-	OILS EDIBLE: TUCUM
OILS MISCELLANEOUS: CROTON	-	OILS MISCELLANEOUS: CROTON
OILS MISCELLANEOUS: LINSEED	-	OILS MISCELLANEOUS: LINSEED
OILS MISCELLANEOUS: TURBINE	-	OILS MISCELLANEOUS: TURBINE
OIL: SOYA BEAN	-	OIL: SOYA BEAN
OIL: SPERM	-	OIL: SPERM
OIL: SPINDLE	-	OIL: SPINDLE
OIL: SPRAY	-	OIL: SPRAY
OIL: TALL	-	OIL: TALL
OIL: TRANSFORMER	-	OIL: TRANSFORMER
OIL: VEGETABLE	-	OIL: VEGETABLE
OLEFIANT GAS	-	ETHYLENE
OLEIC ACID	-	OLEIC ACID
OLEIC ACID, AMMONIUM SALT	-	AMMONIUM OLEATE
OLEIC ACID, POTASSIUM SALT	-	OLEIC ACID, POTASSIUM SALT
OLEIC ACID, SODIUM SALT	-	OLEIC ACID, SODIUM SALT
OLEUM	-	OLEUM
OLIVE OIL	-	OIL: OLIVE

SYNONYM	COMPOUND NAME
OPAL	TRICHLOROPHENOL
ONA	2-NITROANILINE
ONP	2-NITROPHENOL
ORPIMENT	ARSENIC TRISULFIDE
ORTHOARSENIC ACID	ARSENIC ACID
ORTHOBORIC ACID	BORIC ACID
ORTHOCIDE	CAPTAN
ORTHODICHLOROBENZENE	O-DICHLOROBENZENE
ORTHO-DIHYDROXYBENZENE	CATECHOL
ORTHOPHOSPHORIC ACID	PHOSPHORIC ACID
ORTHOTITANIC ACID, TETRABUTYL ESTER	TETRABUTYL TITANATE
ORTHOXYLENE	O-XYLENE
OXAL	GLYOXAL, 40% SOLUTION
OXALDEHYDE	GLYOXAL, 40% SOLUTION
OXALIC ACID	OXALIC ACID
OXALIC ACID, DIAMMONIUM SALT	AMMONIUM OXALATE
OXALIC ACID DINITRILE	CYANOGEN
OXALIC ACID, FERROUS SALT	FERRIC OXALATE
OXALONITRILE	CYANOGEN
OXAMMONIUM SULFATE	HYDROXYLAMINE SULFATE
3-OXA-1,5-PENTANEDIGL	DIETHYLENE GLYCOL
2-OXETANONE	BETA-PROPIOLACTONE
OXIDES OF NITROGEN	NITROGEN TETROXIDE
OXIRANE	ETHYLENE OXIDE
ALPHA-OXCDIPHENYLMETHANE	BENZOPHENONE
ALPHA-OXODITANE	BENZOPHENONE
2,2 OXYBISETHANOL	DIETHYLENE GLYCOL
OXYGEN, LIQUEFIED	OXYGEN, LIQUEFIED
OXYLITE	DIBENZOYL PEROXIDE
OXYPHENIC ACID	CATECHOL
OXYTOLUENES	CRESOLS
PAINT DRIER	COPPER NAPHTHATE
PAINTERS NAPHTHA	NAPHTHA VP + P (75 PER CENT NAPHTHA)
PALM BUTTER	OILS EDIBLE: PALM
PALM FRUIT OIL	OILS EDIBLE: PALM
PALM SEED OIL	OILS EDIBLE: TIGER
PAN	PHthalic ANHYDRIDE
PAPI	POLYMETHYLENE POLYPHENYL ISOCYANATE
PARADI	P-DICHLOROBENZENE
PARADICHLOROBENZENE	P-DICHLOROBENZENE
PARADOM	P-DICHLOROBENZENE
PARAFORMALDEHYDE	PARAFORMALDEHYDE
PARA HYDROGEN	HYDROGEN, LIQUEFIED
PARA-MENTHA-1,8-DIENE	CIPENTENE
PARAMOTH	P-DICHLOROBENZENE
PARANAPHTHALENE	ANTHRACENE
PARATHION, LIQUID	PARATHION, LIQUID
PARATHION-METHYL	METHYL PARATHION
PARAXYLENE	P-XYLENE
PARIS GREEN	COPPER ACETOARSENITE
PARROT GREEN	COPPER ACETOARSENITE
PATENT ALUM	ALUMINUM SULFATE
PCB	POLYCHLORINATED BIPHENYL (PCB)
PE	PENTAERYTHRITOL
PEANUT OIL	GIL: PEANUT
PEARL WHITE	BISMUTH OXYCHLORIDE
PELARGONIC ALCOHOL	NONANOL
PENETRATING OIL	GIL: PENETRATING
PENTA	PENTACHLOROPHENOL
PENTABORANE	PENTABORANE
(9)-PENTABORON MONOHYDRIDE	PENTABORANE
PENTACHLOROPHENOL	PENTACHLOROPHENOL
PENTADECANOL	PENTADECANOL
1-PENTADECANOL	PENTADECANOL
PENTADECANOL	LINEAR ALCOHOLS (12-15 CARBONS)

SYNONYM		COMPOUND NAME
PENTADECYL ALCOHOL	-	PENTADECANOL
PENTADECYLBENZENESULFONIC ACID	-	ALKYLBENZENESULFONIC ACIDS
PENTAERYTHRIT	-	PENTAERYTHRITOL
PENTAERYTHRITOL	-	PENTAERYTHRITOL
PENTAMETHYLENE	-	CYCLOPENTANE
PENTANAL	-	VALERALDEHYDE
PENTANE	-	PENTANE
1,5-PENTANEDIAL SOLUTION	-	GLUTARALDEHYDE SOLUTION
2,4-PENTANEDIONE	-	ACETYLACETONE
1-PENTANETHIOL	-	N-AMYL MERCAPTAN
1-PENTANOL	-	N-AMYL ALCOHOL
PENTEK	-	PENTAERYTHRITOL
1-PENTENE	-	1-PENTENE
PENTYL ACETATES	-	AMYL ACETATE
PENTYL ALCOHOL	-	N-AMYL ALCOHOL
SEC-PENTYL CARBINOL	-	ETHYL BUTANOL
1-PENTYL CHLORIDE	-	N-AMYL CHLORIDE
PENTYL METHYL KETONE	-	N-AMYL METHYL KETONE
PENTYLSILICON TRICHLORIDE	-	N-AMYLTRICHLOROSILANE
PERACETIC ACID	-	PERACETIC ACID
PERCARBAMIDE	-	UREA PEROXIDE
PERCHLORIC ACID	-	PERCHLORIC ACID
PERCHLORIC ACID SOLUTION	-	PERCHLORIC ACID
PERCHLOROCYCLOPENTADIENE	-	HEXACHLOROCYCLOPENTADIENE
PERCHLOROETHYLENE	-	TETRACHLOROETHYLENE
PERCHLOROMETHANE	-	CARBON TETRACHLORIDE
PERCHLOROMETHYL MERCAPTAN	-	PERCHLOROMETHYL MERCAPTAN
PERCLEN	-	TETRACHLOROETHYLENE
PERHYDROL-UREA	-	UREA PEROXIDE
PERHYDRONAPHTHALENE	-	DECAHYDRONAPHTHALENE
PERK	-	TETRACHLOROETHYLENE
PEROXIDE	-	HYDROGEN PEROXIDE
PEROXYACETIC ACID	-	PERACETIC ACID
PEROXYDICARBONIC ACID, DIISOPROPYL ESTER	-	ISOPROPYL PERCARBONATE
PEROXY-DICARBONIC ACID, BIS(1-METHYLETHYL)ESTER	-	ISOPROPYL PERCARBONATE
PEROXY-DICARBONIC ACID, BIS (1-METHYLETHYL) ESTER	-	ISOPROPYL PERCARBONATE
PEROXYDISULFURIC ACID, DIAMMONIUM SALT	-	AMMONIUM PERSULFATE
PETROHOL	-	ISOPROPYL ALCOHOL
PETROL	-	GASOLINE, AUTOMOTIVE (LESS THAN 4.23 G LEAD/GAL)
PETROLATUM	-	PETROLATUM
PETROLATUM JELLY	-	PETROLATUM
PETROLEUM	-	OIL: CRUDE
PETROLEUM ASPHALT	-	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
PETROLEUM ASPHALT	-	OIL: ROAD
PETROLEUM ASPHALT	-	ASPHALT
PETROLEUM DISTILLATE	-	DISTILLATE:FLASHED FEED STOCKS
PETROLEUM DISTILLATE	-	DISTILLATE:STRAIGHT RUN
PETROLEUM INSULATING OIL	-	OIL: TRANSFORMER
PETROLEUM JELLY	-	PETROLATUM
PETROLEUM NAPHTHA	-	PETROLEUM NAPHTHA
PETROLEUM PITCH	-	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
PETROLEUM RESIDUE	-	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
PETROLEUM SOLVENT	-	NAPHTHA SOLVENT
PETROLEUM SOLVENT	-	NAPHTHA STODDARD SOLVENT
PETROLEUM SOLVENT	-	NAPHTHA VP + P (75 PER CENT NAPHTHA)
PETROLEUM SOLVENT	-	PETROLEUM NAPHTHA
PETROLEUM SPIRITS	-	MINERAL SPIRITS

SYNONYM

PETROLEUM TAILINGS
 PETROLEUM WAX
 PHELLANDRENE
 PHENACHLOR
 PHENACYL CHLORIDE
 PHENETHYLENE
 PHENIC ACID
 PHENOL
 PHENOXYBENZENE
 PHENYLAMINE
 N-PHENYLANILINE
 PHENYLARSENIC DICHLORIDE
 PHENYL BROMIDE
 PHENYL CARBINOL
 PHENYL CHLORIDE
 PHENYL CHLOROMETHYL KETONE
 PHENYL CYANIDE
 1-PHENYLODECANE
 PHENYL DICHLOROARSINE, LIQUID
 1-PHENYLODODECANE
 PHENYLETHANE
 PHENYLETHYLENE
 PHENYL ETHER
 PHENYLHYDRAZINE HYDROCHLORIDE
 PHENYLHYDRAZINIL CHLORIDE
 PHENYL HYDROXIDE
 PHENYLMETHANOL
 PHENYLMETHYL ALCOHOL
 PHENYLMETHYL AMINE
 PHENYLPHOSPHINE DICHLORIDE
 PHENYLPHOSPHINE THIODICHLORIDE
 PHENYLPHOSPHONOTHIOIC DICHLORIDE
 PHENYL PHOSPHONOUS DICHLORIDE
 PHENYLPROPYLENE
 1-PHENYL TETRADECANE
 1-PHENYLUNDECANE
 PHOSGENE
 PHOSPHORIC ACID
 PHOSPHORIC ACID TRIETHYLENEIMIDE
 PHOSPHORIC SULFIDE
 PHOSPHORODICHLORIDIC ACID, ETHYL ESTER
 PHOSPHOROTHIOIC ACID, O,O-DIETHYL
 ESTER
 PHOSPHOROTHIOIC ACID, O,O-DIETHYL C-P-
 NITROPHENYL ESTER
 PHOSPHORUS BROMIDE
 PHOSPHORUS OXYCHLORIDE
 PHOSPHORUS PENTASULFIDE
 PHOSPHORUS PERSULFIDE
 PHOSPHORUS TRIBROMIDE
 PHOSPHORUS TRICHLORIDE
 PHOSPHORUS, RED
 PHOSPHORUS, WHITE
 PHOSPHORYL CHLORIDE
 PHOSPHORYL CHLORIDE
 PHOTOPHOS
 PHTHALANDIONE
 M-PHTHALIC ACID
 PHTHALIC ACID ANHYDRIDE
 PHTHALIC ACID, BENZYL BUTYL ESTER
 PHTHALIC ACID, DIAMYL ESTER
 PHTHALIC ACID, DIBUTYL ESTER
 PHTHALIC ACID, DIETHYL ESTER
 PHTHALIC ACID, DIHEPTYL ESTER
 PHTHALIC ACID, DIISODECYL ESTER

COMPOUND NAME

ASPHALT BLENDING STOCK: ROOFERS FLUX
 WAXES: PARAFFIN
 CIPENTENE
 TRICHLOROPHENOL
 CHLOROACETOPHENONE
 STYRENE
 PHENOL
 PHENOL
 DIPHENYL ETHER
 ANILINE
 DIPHENYLAMINE
 PHENYL DICHLOROARSINE, LIQUID
 BROMOBENZENE
 BENZYL ALCOHOL
 CHLOROBENZENE
 CHLOROACETOPHENONE
 BENZONITRILE
 N-CECYLBENZENE
 PHENYL DICHLOROARSINE, LIQUID
 DODECYLBENZENE
 ETHYLBENZENE
 STYRENE
 DIPHENYL ETHER
 PHENYLHYDRAZINE HYDROCHLORIDE
 PHENYLHYDRAZINE HYDROCHLORIDE
 PHENOL
 BENZYL ALCOHOL
 BENZYL ALCOHOL
 BENZYLAMINE
 BENZENE PHOSPHORUS DICHLORIDE
 BENZENE PHOSPHORUS THIODICHLORIDE
 BENZENE PHOSPHORUS THIODICHLORIDE
 BENZENE PHOSPHORUS DICHLORIDE
 ALPHA-METHYLSTYRENE
 TETRADECYLBENZENE
 N-UNDECYLBENZENE
 PHOSGENE
 PHOSPHORIC ACID
 TRIS(AZIRIDINYL)PHOSPHINE OXIDE
 PHOSPHORUS PENTASULFIDE
 ETHYL PHOSPHORODICHLORIDATE
 CEMENTON
 PARATHION, LIQUID
 PHOSPHORUS TRIBROMIDE
 PHOSPHORUS OXYCHLORIDE
 PHOSPHORUS PENTASULFIDE
 PHOSPHORUS PENTASULFIDE
 PHOSPHORUS TRIBROMIDE
 PHOSPHORUS TRICHLORIDE
 PHOSPHORUS, RED
 PHOSPHORUS, WHITE
 PHOSPHORUS OXYCHLORIDE
 PHOSPHORUS OXYCHLORIDE
 CALCIUM PHOSPHIDE
 PHTHALIC ANHYDRIDE
 ISOPHTHALIC ACID
 PHTHALIC ANHYDRIDE
 BENZYL N-BUTYL PHTHALATE
 DI-N-AMYL PHTHALATE
 DIBUTYL PHTHALATE
 DIETHYL PHTHALATE
 DIHEPTYL PHTHALATE
 DIISODECYL PHTHALATE

SYNONYM

PHTHALIC ACID, DIPENTYL ESTER
 PHTHALIC ACID, BIS(2-ETHYLHEXYL)ESTER
 PHTHALIC ACID, BIS(8-METHYLNONYL)ESTER
 PHTHALIC ANHYDRIDE
 PHYTAR 160
 PHYTAR 560
 PICFUME
 PIMELIC KETONE
 PIPERAZIDINE
 PIPERAZINE
 PITTSBURG PX-138
 PLANAVIN
 PLANT SPRAY OIL
 PLASKON MONOMER
 PLASTICIZER ODP
 PLASTIC LATEX
 PLUMBOUS ARSENATE
 PLUMBOUS FLUORIDE
 PLUMBOUS OXIDE
 PLURACOL POLYOL
 PNA
 PNP
 POLY (DIMETHYLSILOXANE)
 POLYBUTENE
 POLYCHLORINATED BIPHENYL (PCB)
 POLYCHLOROPOLYPHENYLS
 POLYFORMALDEHYDE
 POLYISOBUTYLENE PLASTICS
 POLYISOBUTYLENE RESINS
 POLYISOBUTYLENE WAXES
 POLYMETHYLENE POLYPHENYL ISOCYANATE
 POLYOXYPROPYLENE ETHER, PPG
 POLY(OXYETHYL)DODECYL ETHER
 POLY(OXYETHYL)LAURYL ETHER
 POLY(OXYETHYL)MYRISTYL ETHER
 POLY(OXYETHYL)PENTADECYL ETHER
 POLY(OXYETHYL)TETRADECYL ETHER
 POLY(OXYETHYL)TRIDECYL ETHER
 POLYOXYMETHYLENE
 POLYOXYMETHYLENE GLYCOL
 POLYOXYPROPYLENE GLYCOL
 POLYOXYPROPYLENE GLYCOL METHYL ETHER
 POLYPHOSPHORIC ACID
 POLYPROPYLENE
 POLYPROPYLENE GLYCOL
 POLYPROPYLENE GLYCOL METHYL ETHER
 POLY(PROPYLENE GLYCOL)METHYL ETHER
 POLYPROPYLENE GLYCOLS P400 TO P4000
 POLY-SOLV
 POLY-SOLV DB
 POLY-SOLV DE
 POLY-SOLV DM
 POLY-SOLV EB
 POLY-SOLV EE
 POLY-SOLV EE ACETATE
 POLY-SOLV EM
 POTASSIUM ACID ARSENATE
 POTASSIUM ACID OXALATE
 POTASSIUM ANTIMONY TARTRATE
 POTASSIUM ARSENATE
 POTASSIUM BICHRIMATE
 POTASSIUM BINOXALATE
 POTASSIUM CHLORATE

COMPOUND NAME

DI-N-AMYL PHTHALATE
 DICCTYL PHTHALATE
 DIISODECYL PHTHALATE
 PHTHALIC ANHYDRIDE
 SODIUM CACODYLATE
 SODIUM CACODYLATE
 CHLOROPICRIN, LIQUID
 CYCLOHEXANONE
 PIPERAZINE
 PIPERAZINE
 DIOCTYL PHTHALATE
 NITRALIN
 CIL: SPRAY
 TRIFLUOROCHLOROETHYLENE
 DIISODECYL PHTHALATE
 LATEX, LIQUID SYNTHETIC
 LEAD ARSENATE
 LEAD FLUORIDE
 LITHARGE
 POLYPROPYLENE GLYCOL
 4-NITROANILINE
 4-NITROPHENOL
 CINETHYL POLYSILOXANE
 POLYBUTENE
 POLYCHLORINATED BIPHENYL (PCB)
 POLYCHLORINATED BIPHENYL (PCB)
 PARAFORMALDEHYDE
 POLYBUTENE
 POLYBUTENE
 POLYBUTENE
 POLYMETHYLENE POLYPHENYL ISOCYANATE
 POLYPROPYLENE GLYCOL
 ETHOXYLATED DOCECANOL
 ETHOXYLATED DOCECANOL
 ETHOXYLATED TETRADECANOL
 ETHOXYLATED PENTADECANOL
 ETHOXYLATED TETRADECANOL
 ETHOXYLATED TRIDECANOL
 PARAFORMALDEHYDE
 PARAFORMALDEHYDE
 POLYPROPYLENE GLYCOL
 POLYPROPYLENE GLYCOL METHYL ETHER
 POLYPHOSPHORIC ACID
 POLYPROPYLENE
 POLYPROPYLENE GLYCOL
 POLYPROPYLENE GLYCOL METHYL ETHER
 POLYPROPYLENE GLYCOL METHYL ETHER
 POLYPROPYLENE GLYCOL
 DIETHYLENE GLYCOL DIPETHYL ETHER
 DIETHYLENE GLYCOL MONOBUTYL ETHER
 DIETHYLENE GLYCOL MONOETHYL ETHER
 DIETHYLENE GLYCOL MONOMETHYL ETHER
 ETHYLENE GLYCOL MONOBUTYL ETHER
 ETHYLENE GLYCOL MONOETHYL ETHER
 ETHYLENE GLYCOL MONOETHYL ETHER
 ACETATE
 ETHYLENE GLYCOL MONOMETHYL ETHER
 POTASSIUM ARSEATE
 POTASSIUM BINOXALATE
 ANTIMONY POTASSIUM TARTRATE
 POTASSIUM ARSENATE
 POTASSIUM DICHRIMATE
 POTASSIUM BINOXALATE
 POTASSIUM CHLORATE

SYNONYM		COMPOUND NAME
POTASSIUM CHROMATE	-	POTASSIUM CHROMATE
POTASSIUM CHROMATE(VI)	-	POTASSIUM CHROMATE
POTASSIUM CYANIDE	-	POTASSIUM CYANIDE
POTASSIUM DICHLOROISOCYANURATE	-	POTASSIUM DICHLORO-S-TRIAZINETRIONE
POTASSIUM DICHLORO-S-TRIAZINETRIONE	-	POTASSIUM DICHLORO-S-TRIAZINETRIONE
POTASSIUM DICHROMATE	-	POTASSIUM DICHROMATE
POTASSIUM HYDROXIDE SOLUTION	-	CAUSTIC POTASH SOLUTION
POTASSIUM IODIDE	-	POTASSIUM IODIDE
POTASSIUM DIHYDROGEN ARSENATE	-	POTASSIUM ARSENATE
POTASSIUM HYDROXIDE	-	POTASSIUM HYDROXIDE
POTASSIUM, METALLIC	-	POTASSIUM, METALLIC
POTASSIUM OLEATE	-	OLEIC ACID, POTASSIUM SALT
POTASSIUM OXALATE	-	POTASSIUM OXALATE
POTASSIUM OXALATE MONOHYDRATE	-	POTASSIUM OXALATE
POTASSIUM PERMANGANATE	-	POTASSIUM PERMANGANATE
POTASSIUM PEROXIDE	-	POTASSIUM PEROXIDE
POTASSIUM SUPEROXIDE	-	POTASSIUM PEROXIDE
POTATOSPIRIT OIL	-	ISOPHYL ALCOHOL
POTERATE	-	POTASSIUM CHLORATE
PRESERVATIVE OIL	-	OIL: PENETRATING
PRIMARY CALCIUM PHOSPHATE	-	CALCIUM PHOSPHATE
PRIME STEAM LARD	-	OILS EDIBLE, LARD
PROPADIENE-METHYLACETYLENE MIXTURE	-	METHYLACETYLENE - PROPADIENE MIXTURE
PROPALDEHYDE	-	PROPIONALDEHYDE
PROPANAL	-	PROPIONALDEHYDE
PROPANE	-	PROPANE
PROPANE-BUTANE-(PROPYLENE)	-	LIQUEFIED PETROLEUM GAS (LPG)
PROPANE-2-CARBOXYLIC ACID	-	ISOBUTYRIC ACID
PROPANECARBOXYLIC ACID	-	N-BUTYRIC ACID
1,2-PROPANEDIOL	-	PROPYLENE GLYCOL
1,2-PROPANEDIOL 1-ACRYLATE	-	HYDROXYPROPYL ACRYLATE
1,2-PROPANEDIOL 1-METHACRYLATE	-	HYDROXYPROPYL METHACRYLATE
1-PROPANETHIOL	-	N-PROPYL MERCAPTAN
2-PROPANETHIOL	-	ISOPROPYL MERCAPTAN
PROPANE-1-THIOL	-	N-PROPYL MERCAPTAN
PROPANE-2-THIOL	-	ISOPROPYL MERCAPTAN
1,2,3-PROPANETRIOL	-	GLYCERINE
PROPANOIC ACID	-	PROPIONIC ACID
PROPANOIC ANHYDRIDE	-	PROPIONIC ANHYDRIDE
1-PROPANOL	-	N-PROPYL ALCOHOL
2-PROPANOL	-	ISOPROPYL ALCOHOL
PROPANOLIDE	-	BETA-PROPIOLACTONE
2-PROPANONE	-	ACETONE
2-PROPENAL	-	ACROLEIN
2-PROPEN-1-OL	-	ALLYL ALCOHOL
PROPENAMIDE 50 PER CENT	-	ACRYLAMIDE
PROPENE	-	PROPYLENE
PROPENE OXIDE	-	PROPYLENE OXIDE
PROPENE POLYMER	-	POLYPROPYLENE
PROPENOIC ACID	-	ACRYLIC ACID
BETA-PROPIOLACTONE	-	BETA-PROPIOLACTONE
PROPIONALDEHYDE	-	PROPIONALDEHYDE
PROPIONIC ACID	-	PROPIONIC ACID
PROPIONIC ALDEHYDE	-	PROPIONALDEHYDE
PROPIONIC ANHYDRIDE	-	PROPIONIC ANHYDRIDE
BETA-PROPIOLACTONE	-	BETA-PROPIOLACTONE
PROPIONYL OXIDE	-	PROPIONIC ANHYDRIDE
N-PROPYL ACETATE	-	N-PROPYL ACETATE
2-PROPYL ACETATE	-	ISOPROPYL ACETATE
PROPYL ALCOHOL	-	N-PROPYL ALCOHOL
SEC-PROPYL ALCOHOL	-	ISOPROPYL ALCOHOL
N-PROPYL ALCOHOL	-	N-PROPYL ALCOHOL
PROPYL ALDEHYDE	-	PROPIONALDEHYDE
N-PROPYLCARBINOL	-	N-BUTYL ALCOHOL
PROPYLENE	-	PROPYLENE

SYNONYM

PROPYLENE BUTYLENE POLYMER
 PROPYLENE DICHLORIDE
 PROPYLENE GLYCOL METHYL ETHER
 PROPYLENE GLYCOL MONO-ACRYLATE
 PROPYLENE GLYCOL MONOMETHACRYLATE
 PROPYLENE GLYCOL
 PROPYLENIMINE
 PROPYLENE OXIDE
 PROPYLENE TETRAMER
 PROPYLENE TETRAMER
 PROPYLENE TRIMER
 PROPYLENEIMINE, INHIBITED
 PROPYLETHYLENE
 N-PROPYL MERCAPTAN
 N-N-PROPYL-L-PROPANAMINE
 PRUSSIC ACID
 PSEUDOHXYL ALCOHOL
 PYRAZINE HEXAHYDRIDE
 PYRIDINE
 PYROCATECHIN
 PYROCATECHINIC ACID
 PYROCATECHOL
 PYROCATECHUIC ACID
 PYROFAX
 PYROGALLIC ACID
 PYROGALLOL
 PYROGENTISIC ACID
 PYROMUCIC ALDEHYDE
 PYROXYLIC SPIRIT
 PYROXYLIN SOLUTION
 QUAKERAL
 QUICKLINE
 QUICKSILVER
 QUINOL
 QUINOLINE
 RACEMIC LACTIC ACID
 RANGE OIL
 RANGE OIL
 RANGE OIL
 RAW LINSEED OIL
 RC PLASTICIZER DBP
 RC PLASTICIZER COP
 REALGAR
 RED ARSENIC GLASS
 RED ARSENIC SULFIDE
 RED OIL
 RED ORPIMENT
 RED OXIDE OF NITROGEN
 RED TR BASE
 REFRIGERANT 152A
 REGULOX
 RESIDUAL ASPHALT
 RESIDUAL FUEL OIL, NO.6
 RESIDUAL FUEL OIL, NO.4
 RESIDUAL FUEL OIL, NO.5
 RESIDUAL OIL
 RESIN OIL
 RESORCIN
 RESORCINOL
 RETARDER W
 RETINOL
 RETINOL
 RHODANATE

COMPOUND NAME

PROPYLENE BUTYLENE POLYMER
 DICHLOROPROPANE
 PROPYLENE GLYCOL METHYL ETHER
 HYDROXYPROPYL ACRYLATE
 HYDROXYPROPYL METHACRYLATE
 PROPYLENE GLYCOL
 PROPYLENEIMINE, INHIBITED
 PROPYLENE OXIDE
 PROPYLENE TETRAMER
 CODECENE
 MONENE
 PROPYLENEIMINE, INHIBITED
 1-PENTENE
 N-PROPYL MERCAPTAN
 DI-N-PROPYLAMINE
 HYDROGEN CYANIDE
 ETHYL BUTANOL
 PIPERAZINE
 PYRIDINE
 CATECHOL
 CATECHOL
 CATECHOL
 CATECHOL
 LIQUEFIED PETROLEUM GAS (LPG)
 PYROGALLIC ACID
 PYROGALLIC ACID
 HYDROQUINONE
 FURFURAL
 METHYL ALCOHOL
 COLLOIDION
 FURFURAL
 CALCIUM OXIDE
 MERCURY
 HYDROQUINONE
 QUINOLINE
 LACTIC ACID
 FUEL OIL: NO 1 (KEROSENE)
 KEROSENE
 JET FUEL: JP-1 (KEROSENE)
 CILS MISCELLANEOUS: LINSEED
 DIBUTYL PHTHALATE
 DIOCTYL PHTHALATE
 ARSENIC DISULFIDE
 ARSENIC DISULFIDE
 ARSENIC DISULFIDE
 CLEIC ACID
 ARSENIC DISULFIDE
 NITROGEN TETROXIDE
 4-CHLORO-O-TOLUICINE
 1,1-DIFLUOROETHANE
 PALEIC HYDRAZINE
 ASPHALT BLEND STOCK:STRAIGHT RUN
 RESIDUE
 FUEL OIL: 6
 FUEL OIL: 4
 FUEL OIL: 5
 ASPHALT BLENDING STOCK:ROOFERS FLUX
 OIL: ROSIN
 RESORCINOL
 RESORCINOL
 SALICYLIC ACID
 CIL: RESIN
 CIL: ROSIN
 SODIUM THIOCYANATE

SYNONYM		COMPOUND NAME
ROAD BINDER	-	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
ROAD OIL	-	ASPHALT BLENDING STOCK:ROCKERS FLUX
ROSIN OIL	-	CIL: RESIN
ROSINOL	-	CIL: ROSIN
ROSINOL	-	CIL: RESIN
RUBBING ALCOHOL	-	ISOPROPYL ALCOHOL
RUBY ARSENIC	-	ARSENIC DISULFIDE
SACCHAROSE	-	SUCROSE
SACCHARUM	-	SUCROSE
SAFFLOWER SEED OIL	-	OILS EOTBLE: SAFFLOWER
SAL ACETOSELLA	-	POTASSIUM BINOXALATE
SAL AMMONIAC	-	AMMONIUM CHLORIDE
SALICYLIC ACID	-	SALICYLIC ACID
SALMIAC	-	AMMONIUM CHLORIDE
SALT OF SATURN	-	LEAD ACETATE
SALT OF SORREL	-	POTASSIUM BINOXALATE
SALUFER	-	SODIUM SILICOFLUORIDE
SAL VOLATILE	-	AMMONIUM CARBONATE
SAND ACID	-	FLUOSILICIC ACID
SANTACHLOR	-	P-DICHLOROBENZENE
SANTOPHEN 20	-	PENTACHLOROPHENOL
SARALEX	-	CLAZINON
SCHEELES GREEN	-	COPPER ARSENITE
SEAL-COATING MATERIAL	-	ASPHALT BLEND STOCK:STRAIGHT RUN RESIDUE
SECONDARY AMMONIUM PHOSPHATE	-	AMMONIUM PHOSPHATE
SECONDARY BUTYL ACETATE	-	SEC-BUTYL ACETATE
SECONDARY BUTYL ALCOHOL	-	SEC-BUTYL ALCOHOL
SECONDARY CALCIUM PHOSPHATE	-	CALCIUM PHOSPHATE
SELENIC ANHYDRIDE	-	SELENIUM TRIOXIDE
SELENIOUS ANHYDRIDE	-	SELENIUM DIOXIDE
SELENIUM DIOXIDE	-	SELENIUM DIOXIDE
SELENIUM OXIDE	-	SELENIUM DIOXIDE
SELENIUM TRIOXIDE	-	SELENIUM TRIOXIDE
SENARMONTITE	-	ANTIMONY TRIOXIDE
SENTRY	-	CALCIUM HYPOCHLORITE
SEVIN	-	CARBARYL
SEXTONE	-	CYCLOHEXANONE
SHELL CHARCOAL	-	CHARCOAL
SIGNAL OIL	-	CIL: MINERAL SEAL
SILBOND	-	ETHYL SILICATE
SILICOCHLOROFORM	-	TRICHLOROSILANE
SILICOFLUORIC ACID	-	FLUOSILICIC ACID
SILICON CHLORIDE	-	SILICON TETRACHLORIDE
SILICONE FLUIDS	-	DIMETHYL POLYSILOXANE
SILICON TETRACHLORIDE	-	SILICON TETRACHLORIDE
SILVER ACETATE	-	SILVER ACETATE
SILVER CARBONATE	-	SILVER CARBONATE
SILVER FLUORIDE	-	SILVER FLUORIDE
SILVER IODATE	-	SILVER IODATE
SILVER MONOFLUORIDE	-	SILVER FLUORIDE
SILVER NITRATE	-	SILVER NITRATE
SILVER OXIDE	-	SILVER OXIDE
SILVER SULFATE	-	SILVER SULFATE
SILVISAR 510	-	CACODYLIC ACID
SLAKED LIME	-	CALCIUM HYDROXIDE
SLOW-CURING ASPHALT	-	CIL: ROAD
SCDAMIDE	-	SODIUM AMIDE
SODIUM	-	SODIUM
SODIUM ACID SULFITE	-	SODIUM BISULFITE
SODIUM ALKYL BENZENESULFONATES	-	SODIUM ALKYL BENZENESULFONATES
SODIUM ALKYL SULFATES	-	SODIUM ALKYL SULFATES
SODIUM AMIDE	-	SODIUM AMIDE
SODIUM ARSENATE	-	SODIUM ARSENATE

SYNONYM

SODIUM ARSENATE, DIBASIC
 SODIUM ARSENITE
 SODIUM AZIDE
 SODIUM BIBORATE
 SODIUM BISULFIDE
 SODIUM BISULFITE
 SODIUM BORATE
 SODI. M BOROHYDRIDE
 SODIUM CACODYLATE
 SODIUM CETYL SULFATE SOLUTION
 SODIUM CHLORATE
 SODIUM CHROMATE
 SODIUM CHROMATE(VI)
 SODIUM CYANIDE
 SODIUM DICHLOROISOCYANURATE
 SODIUM DICHLORO-S-TRIAZINETRIONE
 SODIUM DICHROMATE
 SODIUM DIMETHYLARSONATE
 SODIUM DIOCTYL SULFOSUCCINATE
 SODIUM DODECYL SULFATE
 SODIUM FERROCYANIDE
 SODIUM FLUORIDE
 SODIUM FLUOSILICATE
 SODIUM HEXAFLUOROSILICATE
 SODIUM HYDRIDE
 SODIUM HYDROGEN ALKYL SULFATE
 SODIUM HYDROGEN SULFIDE
 SODIUM HYDROSULFIDE SOLUTION
 SODIUM HYDROXIDE
 SODIUM HYDROXIDE SOLUTION
 SODIUM HYPOCHLORITE
 SODIUM LAURYL SULFATE
 SODIUM METAARSENITE
 SODIUM METABISULFITE
 SODIUM METHOXIDE
 SODIUM METHYLATE
 SODIUM NITRITE
 SODIUM OLEATE
 SODIUM ORTHOARSENITE
 SODIUM OXALATE
 SODIUM PHOSPHATE
 SODIUM PYROBORATE
 SODIUM PYROSULFITE
 SODIUM RHODANIDE
 SODIUM SILICATE
 SODIUM SILICOFLUORIDE
 SODIUM SULFHYDRATE
 SODIUM SULFIDE
 SODIUM SULFITE
 SODIUM SULFOCYANATE
 SODIUM TETRABORATE, ANHYDROUS
 SODIUM THIOCYANATE
 SOLAR NITROGEN SOLUTIONS
 SOLUBLE GLASS
 SORBIT
 SORBITOL
 SORBO
 SORBOL
 SOYBEAN OIL
 SPECTRACIDE
 SPERM OIL
 SPINDLE OIL
 SPIRIT
 SPIRIT OF ETHER NITRITE
 SPIRITS OF TURPENTINE

COMPOUND NAME

SODIUM ARSENATE
 SODIUM ARSENITE
 SODIUM AZIDE
 SODIUM BORATE
 SODIUM HYDROSULFIDE SOLUTION
 SODIUM BISULFITE
 SODIUM BORATE
 SODIUM BOROHYDRIDE
 SODIUM CACODYLATE
 HEXADECYL SULFATE, SODIUM SALT
 SODIUM CHLORATE
 SODIUM CHROMATE
 SODIUM CHROMATE
 SODIUM CYANIDE
 SODIUM DICHLORO-S-TRIAZINETRIONE
 SODIUM DICHLORO-S-TRIAZINETRIONE
 SODIUM DICHROMATE
 SODIUM CACODYLATE
 DIOCTYL SODIUM SULFOSUCCINATE
 DODECYL SULFATE, SODIUM SALT
 SODIUM FERROCYANIDE
 SODIUM FLUORIDE
 SODIUM SILICOFLUORIDE
 SODIUM SILICOFLUORIDE
 SODIUM HYDRIDE
 SODIUM ALKYL SULFATES
 SODIUM HYDROSULFIDE SOLUTION
 SODIUM HYDROSULFIDE SOLUTION
 SODIUM HYDROXIDE
 CAUSTIC SODA SOLUTION
 SODIUM HYPOCHLORITE
 DODECYL SULFATE, SODIUM SALT
 SODIUM ARSENITE
 SODIUM BISULFITE
 SODIUM METHYLATE
 SODIUM METHYLATE
 SODIUM NITRITE
 OLEIC ACID, SODIUM SALT
 SODIUM ARSENITE
 SODIUM OXALATE
 SODIUM PHOSPHATE
 SODIUM BORATE
 SODIUM BISULFITE
 SODIUM THIOCYANATE
 SODIUM SILICATE
 SODIUM SILICOFLUORIDE
 SODIUM HYDROSULFIDE SOLUTION
 SODIUM SULFIDE
 SODIUM SULFITE
 SODIUM THIOCYANATE
 SODIUM BORATE
 SODIUM THIOCYANATE
 AMMONIUM NITRATE-UREA SOLUTION
 SODIUM SILICATE
 SORBITOL
 SORBITOL
 SORBITOL
 SORBITOL
 OIL: SOYA BEAN
 DIAZINON
 OIL: SPERM
 OIL: SPINDLE
 ETHYL ALCOHOL
 ETHYL NITRITE
 TURPENTINE

SYNONYM

SPIRITS OF WINE
 SPOTTING NAPHTHA
 SPRAY OIL
 STEAM TURBINE LUBE OIL
 STEAM TURBINE OIL
 STEARIC ACID
 STEARIC ACID, AMMONIUM SALT
 STEAROPHANIC ACID
 STEARYL ALCOHOL, CRUDE
 STEINBUHL YELLOW
 STREUNEX
 STYRENE
 STYROL
 STYROLENE
 SUCROSE
 SUGAR
 SUGAR OF LEAD
 SULFAMIC ACID, MONOAMMONIUM SALT
 SULFATED HEATSFOOT OIL, SODIUM SALT
 SULFATE OF COPPER
 SULFATE TURPENTINE
 SULFOLANE
 SULFOLANE-M
 SULFONATED ALKYL BENZENE, SODIUM SALT
 SULFUR DIOXIDE
 SULFURETTED HYDROGEN
 SULFURIC ACID
 SULFURIC ACID, SPENT
 SULFURIC ETHER
 SULFUR (LIQUID)
 SULFUR MONOCHLORIDE
 SULFURYL CHLORIDE
 SULPHUR (LIQUID)
 SULPHURETTED HYDROGEN
 SUPEROXOL
 SWEDISH GREEN
 SWEET SPIRIT OF NITRE
 SYNTHETIC RUBBER LATEX
 SYSTOX AND ISOSYSTOX MIXTURE
 2,4,5-T
 TALL OIL
 TALLOW
 TALLOW FATTY ALCOHOL
 TALLOW OIL
 TANNERS OIL
 TANNIC ACID
 TANNIN
 TAR ACIDS
 TAR CAMPHOR
 TARTAR EMETIC
 L-TARTARIC ACID, AMMONIUM SALT
 TARTARIZED ANTIMONY
 TARTRATED ANTIMONY
 TBA
 TCP
 TCP
 TCE
 TDI
 TEA
 TEAR GAS
 TEFLON MONOMER
 TEG
 TEL
 TELONE
 TEN

COMPOUND NAME

ETHYL ALCOHOL
 NAPHTHA STODDARD SOLVENT
 CIL: SPRAY
 GILS MISCELLANEOUS: TURBINE
 GILS MISCELLANEOUS: TURBINE
 STEARIC ACID
 AMMONIUM STEARATE
 STEARIC ACID
 TALLOW FATTY ALCOHOL
 CALCIUM CHROMATE
 BENZENE
 STYRENE
 STYRENE
 STYRENE
 SUCROSE
 SUCROSE
 LEAD . CETATE
 AMMONIUM SULFAPATE
 CIL, TANNERS
 COPPER SULFATE
 TURPENTINE
 SULFOLANE
 SULFOLANE
 SODIUM ALKYL BENZENESULFONATES
 SULFUR DIOXIDE
 HYDROGEN SULFIDE
 SULFURIC ACID
 SULFURIC ACID, SPENT
 ETHYL ETHER
 SULFUR (LIQUID)
 SULFUR MONOCHLORIDE
 SULFURYL CHLORIDE
 SULFUR (LIQUID)
 HYDROGEN SULFIDE
 HYDROGEN PEROXIDE
 COPPER ARSENITE
 ETHYL NITRITE
 LATEX, LIQUID SYNTHETIC
 DEMETON
 2,4,5-TRICHLOROPHENOXYACETIC ACID
 CIL: TALL
 TALLOW
 TALLOW FATTY ALCOHOL
 TALLOW
 CIL, TANNERS
 TANNIC ACID
 TANNIC ACID
 CRESOLS
 NAPHTHALENE, MCLTEN
 ANTIMONY POTASSIUM TARTRATE
 AMMONIUM TARTRATE
 ANTIMONY POTASSIUM TARTRATE
 ANTIMONY POTASSIUM TARTRATE
 TERT-BUTYLAMINE
 TRICRESYL PHOSPHATE
 CALCIUM PHOSPHATE
 GCO
 TGLUENE 2,4-DIISOCYANATE (TDI)
 TRIETHYLALUMINUM
 CHLOROACETOPHENONE
 TETRAFLUOROETHYLENE, INHIBITED
 TRIETHYLENE GLYCOL
 TETRAETHYL LEAD
 DICHLOROPROPENE
 TRIETHYLAMINE

SYNONYM	COMPOUND NAME
TEP	TETRAETHYL PYROPHOSPHATE
TEPP	TETRAETHYL PYROPHOSPHATE
TEREPHTHALIC ACID, DIMETHYL ESTER	DIMETHYL TEREPHTHALATE
TERGITOL 3-A-6 NONIONIC	ETHOXYLATED TRIDECANOL
TERGITOL NONIONIC 45-S-10	ETHOXYLATED PENTADECANOL
TERGITOL NONIONIC 45-S-10	ETHOXYLATED TETRADECANOL
TERGITOL NONIONIC TMH	ETHOXYLATED DOCECANOL
TERPINENE	CIPENTENE
DELTA-1,8-TERPIDIENE	CIPENTENE
TERTIARY BUTYL ALCOHOL	TERT-BUTYL ALCOHOL
TERTIARY BUTYL HYDROPEROXIDE	TERT-BUTYL HYDROPEROXIDE
2,4,5-T(ESTERS)	2,4,5-T(ESTERS)
TETA	TRIETHYLENETETRAPINE
TETRABUTYL TITANATE	TETRABUTYL TITANATE
1,1,2,2-TETRACHLOROETHANE	TETRACHLOROETHANE
TETRACHLOROETHANE	TETRACHLOROETHANE
TETRACHLOROETHYLENE	TETRACHLOROETHYLENE
TETRACHLOROMETHANE	CARBON TETRACHLORIDE
1-TETRADECANOL	TETRADECANOL
TETRADECANOL	TETRADECANOL
TETRADECANOL	TETRADECANOL
1-TETRADECENE	1-TETRADECENE
N-TETRADECYL ALCOHOL	TETRADECANOL
TETRADECYLBENZENE	TETRADECYLBENZENE
TETRADECYLBENZENE SULFONIC ACID	ALKYLBENZENESULFONIC ACIDS
TETRAETHYL DITHIONOPYROPHOSPHATE	TETRAETHYL DITHIONOPYROPHOSPHATE
TETRAETHYL DITHIOPYROPHOSPHATE	TETRAETHYL DITHIOPYROPHOSPHATE
TETRAETHYL LEAD	TETRAETHYL LEAD
TETRAETHYL ORTHOSILICATE	ETHYL SILICATE
TETRAETHYL PYROPHOSPHATE	TETRAETHYL PYROPHOSPHATE
0,0,0,0-TETRAETHYL PYROPHOSPHORODITHIONATE	TETRAETHYL DITHIOPYROPHOSPHATE
TETRAETHYLENE GLYCOL	TETRAETHYLENE GLYCOL
TETRAETHYLENEPENTAMINE	TETRAETHYLENEPENTAMINE
TETRAETHYL SILICATE	ETHYL SILICATE
TETRAFLUOROETHYLENE, INHIBITED	TETRAFLUOROETHYLENE, INHIBITED
TETRAHYDROFURAN	TETRAHYDROFURAN
3A,4,7,7A-TETRAHYDRO-4,7-METHANOINDENE	DICYCLOPENTADIENE
1,2,3,4-TETRAHYDRONAPHTHALENE	TETRAHYDRONAPHTHALENE
TETRAHYDRONAPHTHALENE	TETRAHYDRONAPHTHALENE
TETRAHYDRO-P-OXAZINE	MORPHOLINE
TETRAHYDRO-2H-1,4-OXAZINE	MORPHOLINE
TETRAHYDROTHIOPHENE-1,1-DIOXIDE	SULFOLANE
TETRAHYDROXYMETHYLMETHANE	PENTAERYTHRITOL
TETRALIN	TETRAHYDRONAPHTHALENE
TETRAMETHYLENEGLYCOL	1,4-BUTANEDIOL
TETRAMETHYLENE OXIDE	TETRAHYDROFURAN
TETRAMETHYLENE SULFONE	SULFOLANE
TETRAMETHYL LEAD	TETRAMETHYL LEAD
TETRAMETHYLOLMETHANE	PENTAERYTHRITOL
TETRAMETHYLTHIURAM DISULFIDE	THIRAM
TETRANAP	TETRAHYDRONAPHTHALENE
TETRAPROPYLENE	PROPYLENE TETRAMER
TETRAPROPYLENE	ECCECENE
TETRINE ACID	ETHYLENEDIAMINE TETRACETIC ACID
TETRON	TETRAETHYL PYROPHOSPHATE
THANOL PPG	POLYPROPYLENE GLYCOL
THF	TETRAHYDROFURAN
2-THIAPROPANE	DIMETHYL SULFIDE
THIOBUTYL ALCOHOL	N-BUTYL MERCAPTAN
THIOCARBONYL CHLORIDE	THIOPHOSGENE
THIOCYANIC ACID, AMMONIUM SALT	AMMONIUM THIOCYANATE
THIOETHYL ALCOHOL	ETHYL MERCAPTAN
THIOMETHYL ALCOHOL	METHYL MERCAPTAN
THIOPHOSGENE	THIOPHOSGENE
THIOPHOSPHORIC ANHYDRIDE	PHOSPHORUS PENTASULFIDE

SYNONYM

THIRAM
 THIURAM
 THORIUM NITRATE
 THORIUM NITRATE TETRAHYDRATE
 THRETHYLENE
 TIBA
 TIBAL
 TITANIUM BUTOXIDE
 TITANIUM TETRABUTOXIDE
 TITANIUM TETRACHLORIDE
 TOLUENE
 2,4-TOLUENE DIISOCYANATE
 TOLUENE 2,4-DIISOCYANATE (TDI)
 TOLUENE, MIXTURE WITH BENZENE AND
 XYLENES
 P-TOLUENESULFONIC ACID
 O-TOLUIDINE
 TOLUOL
 M-TOLYLENE DIISOCYANATE
 2,4-TOLYLENE DIISOCYANATE
 TOLYL EPOXYPROPYL ETHER
 TOLYL GLYCIDYL ETHER
 TOSIC ACID
 TOXAPHENE
 TOXICHLOR
 TOXILIC ACID
 TOXILIC ANHYDRIDE
 TRANSFORMER OIL
 TRANSMISSION OIL
 TRANSMISSION OIL
 TREFLAN
 TRETHYLENE
 TRI
 TRI-6
 TRICALCIUM ARSENATE
 TRICALCIUM ORTHOARSENATE
 TRICHLORAN
 TRICHLOROAMYL SILANE
 1,1,1-TRICHLORO-2,2-BIS(P-
 CHLOROPHENYL)ETHANE
 1,1,1-TRICHLOROETHANE
 TRICHLOROETHANE
 TRICHLOROETHENE
 TRICHLOROETHYLENE
 TRICHLOROETHYLSILANE
 TRICHLOROETHYLSILICANE
 TRICHLOROFLUOROMETHANE
 TRICHLOROIMINOISOCYANURIC ACID
 TRICHLOROISOCYANURIC ACID
 TRICHLOROMETHANE
 TRICHLOROMETHANE
 TRICHLOROMETHANE SULPHURYL CHLORIDE
 TRICHLOROMETHANESULFENYL CHLORIDE
 TRICHLOROMETHYL SULPHOCHLORIDE
 TRICHLOROMETHYLSILANE
 TRICHLOROMETHYLSULFUR CHLORIDE
 N-TRICHLOROMETHYLTHIO-CIS-CYCLOHEXENE-
 1,2-DICARBOXIMIDE
 N-((TRICHLOROMETHYL)THIO)-4-CYCLOHEXENE-
 1,2-DICARBOXIMIDE
 N-TRICHLOROMETHYLTHIO-CIS-(DELTA
 4)CYCLOHEXENE-1,2-DICARBOXIMIDE
 TRICHLOROMONOSILANE
 TRICHLORONITROMETHANE
 TRICHLOROXYD VANADIUM

COMPOUND NAME

THIRAM
 THIURAM
 THORIUM NITRATE
 THORIUM NITRATE
 TRICHLOROETHYLENE
 TRIISOBUTYLALUMINUM
 TRIISOBUTYLALUMINUM
 TETRABUTYL TITANATE
 TETRABUTYL TITANATE
 TITANIUM TETRACHLORIDE
 TOLUENE
 TOLUENE 2,4-DIISOCYANATE (TDI)
 TOLUENE 2,4-DIISOCYANATE (TDI)
 NAPHTHA COAL TAR
 P-TOLUENESULFONIC ACID
 O-TOLUIDINE
 TOLUENE
 TOLUENE 2,4-DIISOCYANATE (TDI)
 TOLUENE 2,4-DIISOCYANATE (TDI)
 CRESYL GLYCIDYL ETHER
 CRESYL GLYCIDYL ETHER
 P-TOLUENESULFONIC ACID
 TOXAPHENE
 CHLORDANE
 P-ALIC ACID
 P-ALIC ANHYDRIDE
 OIL: TRANSFORMER
 OIL: MOTOR
 OIL: LUBRICATING
 TRIFLURALIN
 TRICHLOROETHYLENE
 TRICHLOROETHYLENE
 BENZENE HEXACHLORIDE
 CALCIUM ARSENATE
 CALCIUM ARSENATE
 TRICHLOROETHYLENE
 N-AMYLTRICHLOROSILANE
 OCT
 TRICHLOROETHANE
 TRICHLOROETHANE
 TRICHLOROETHYLENE
 TRICHLOROETHYLENE
 ETHYLTRICHLOROSILANE
 ETHYLTRICHLOROSILANE
 TRICHLOROFLUOROMETHANE
 TRICHLORO-S-TRIAZINETRIGONE
 TRICHLORO-S-TRIAZINETRIGONE
 CHLOROFORM
 CALCIUM FLUORIDE
 PERCHLOROMETHYL PERCAPTAN
 PERCHLOROMETHYL PERCAPTAN
 PERCHLOROMETHYL PERCAPTAN
 PETHYLTRICHLOROSILANE
 PERCHLOROMETHYL PERCAPTAN
 CAPTAN
 CAPTAN
 TRICHLOROSILANE
 CHLOROPICRIN, LICLID
 VANADIUM OXYTRICHLORIDE

SYNONYM	COMPOUND NAME
TRICHLOROPENTYLSILANE	N-ARYLTRICHLOROSILANE
TRICHLOROPHENOL	TRICHLOROPHENOL
2,4,5-TRICHLOROPHENOL	TRICHLOROPHENOL
2,4,5-TRICHLOROPHENOXYACETIC ACID	2,4,5-TRICHLOROPHENOXYACETIC ACID
TRICHLOROSILANE	TRICHLOROSILANE
TRICHLORO-S-TRIAZINETRIONE	TRICHLORO-S-TRIAZINETRIONE
TRICHLOROTRIAZINETRIONE	TRICHLORO-S-TRIAZINETRIONE
TRICHLORO-S-TRIAZINE-2,4,6-(1H,3H,5H)-TRIONE	TRICHLORO-S-TRIAZINETRIONE
1,3,5-TRICHLORO-2,4,6-TRIOXO-1,3,5-TRIAZINE	TRICHLORO-S-TRIAZINETRIONE
TRICHLOROVINYLSILICANE	VINYLTRICHLOROSILANE
TRICHLOROVINYLSILANE	VINYLTRICHLOROSILANE
TRICLENE	TRICHLOROCETHYLENE
TRI-CLENE	TRICHLOROCETHYLENE
TRICRESYL PHOSPHATE	TRICRESYL PHOSPHATE
TRI-P-CRESYL PHOSPHATE	TRICRESYL PHOSPHATE
1-TRIDECANOL	TRIDECANOL
TRIDECANOL	TRIDECANOL
TRIDECANOL	TRIDECANOL
1-TRIDECENE	LINEAR ALCOHOLS (12-15 CARBONS)
TRIDECYLBENZENESULFONIC ACID	1-TRIDECENE
TRIELENE	ALKYLBENZENESULFONIC ACIDS
TRIEIN	TRICHLOROCETHYLENE
TRIETHANOLAMINE	TRIETHYLENETETRAPINE
TRIETHANOLAMINE	TRIETHANOLAMINE
CODECYLBENZENESULFONATE	CODECYLBENZENESULFONIC ACID,
TRIETHANOLAMINE LAURYL SULFATE	TRIETHANOLAMINE SALT
TRIETHYLALUMINUM	CODECYL SULFATE, TRIETHANOLAMINE SALT
TRIETHYLAMINE	TRIETHYLALUMINUM
TRIETHYLBENZENE	TRIETHYLAMINE
SYM-TRIETHYLBENZENE	TRIETHYLBENZENE
1,3,5-TRIETHYLBENZENE	TRIETHYLBENZENE
TRIETHYLENE GLYCOL	TRIETHYLBENZENE
TRIETHYLENE GLYCOL MONOETHYL ETHER	TRIETHYLENE GLYCOL
TRIETHYLENEPHOSPHORAMIDE	ETHOXY TRIGLYCOL
TRIETHYLENETETRAMINE	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
TRIETHYLOLAMINE	TRIETHYLENETETRAPINE
ALPHA,ALPHA,ALPHA-	TRIETHANOLAMINE
TRIFLUORO-2,6-DINITRO-N,N-DIPROPYL-P-TOLUIDINE	TRIFLURALIN
TRIFLUOROCHLOROETHYLENE	TRIFLUOROCHLOROETHYLENE
TRIFLUOROMONOCHLOROETHYLENE	TRIFLUOROCHLOROETHYLENE
TRIFLUOROVINYL CHLORIDE	TRIFLUOROCHLOROETHYLENE
TRIFLURALIN	TRIFLURALIN
TRIGLYCINE	NITRILOTRIACETIC ACID AND SALTS
TRIGLYCOL	TRIETHYLENE GLYCOL
TRIGLYCOL MONOETHYL ETHER	ETHOXY TRIGLYCOL
1,2,3-TRIHYDROXYBENZENE	PYROGALLIC ACID
3,4,5-TRIHYDROXYBENZOIC ACID	GALLIC ACID
1,2,3-TRIHYDROXYPROPANE	GLYCERINE
TRIHYDROXYTRIEETHYLAMINE	TRIETHANOLAMINE
TRIIISOBUTYLALUMINUM	TRIIISOBUTYLALUMINUM
TRILENE	TRICHLOROETHYLENE
TRILINE	TRICHLOROETHYLENE
TRIMAR	TRICHLOROETHYLENE
TRIMETHYLAMINE	TRIMETHYLAMINE
TRIMETHYLAMINOMETHANE	TERT-BUTYLAMINE
TRIMETHYLBENZYLAMMONIUM CHLORIDE	BENZYLTRIMETHYLAMMONIUM CHLORIDE
3,7,7-TRIMETHYLBICYCLO(0.1.4)HEPT-3-ENE	CARENE
TRIMETHYLCARBINDOL	TERT-BUTYL ALCOHOL
TRIMETHYLCHLOROSILANE	TRIMETHYLCHLOROSILANE
3,5,5-TRIMETHYL-2-CYCLOHEXENE-1-ONE	ISOPHORONE
TRIMETHYLENE	CYCLOPROPANE
TRIMETHYLHEPTANALS	ISODECALDEHYDE
4,7,7-TRIMETHYL-3-NORCARENE	CARENE

SYNONYM	COMPOUND NAME
2,4,4-TRIMETHYL-1-PENTENE	DISOBUTYLENE
TRIMETHYLSILYL CHLORIDE	TRIMETHYLCHLORSILANE
3,6,9-TRIOXAUNDECAN-1,11-DIOL	TETRAETHYLENE GLYCOL
TRIPROPYLENE	NONENE
TRIPROPYLENE GLYCOL	TRIPROPYLENE GLYCOL
TRIS(AZIRIDINYL)PHOSPHINE OXIDE	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
TRIS (HYDROXYETHYL)AMINE	TRIETHANOLAMINE
TRISODIUM NITRILOTRIACETATE	NITRILOTRIACETIC ACID AND SALTS
TRI-P-TOLYL PHOSPHATE	TRICRESYL PHOSPHATE
P-TSA	P-TOLUENESULFONIC ACID
TURPENTINE	TURPENTINE
TURPS	TURPENTINE
TYRANTON	CI ETONE ALCOHOL
UCANE ALKYLATE 12	OC CYLBENZENE
UCAR BISPHENOL HP	BISPHENOL A
UCON 11	TRICHLOROFLUOROMETHANE
UCON 14	DICHLORODIFLUOROMETHANE
UCON 22	MONOCHLORODIFLUOROMETHANE
UDPH	1,1-DIMETHYLHYDRAZINE
UNDECANOL	UNDECANOL
1-UNDECANOL	UNDECANOL
1-UNDECENE	1-UNDECENE
UNDECYL ALCOHOL	UNDECANOL
N-UNDECYLBENZENE	N-UNDECYLBENZENE
UNDECYLBENZENESULFONIC ACID	ALKYLBENZENESULFONIC ACIDS
UNDECYLETHYLENE	1-TRIDECENE
UNDECYLIC ALCOHOL	UNDECANOL
UNSLAKED LIME	CALCIUM OXIDE
URANIUM ACETATE	URANYL ACETATE
URANIUM ACETATE DIHYDRATE	URANYL ACETATE
URANIUM NITRATE	URANYL NITRATE
URANIUM OXYACETATE DIHYDRATE	URANYL ACETATE
URANIUM SULFATE	URANYL SULFATE
URANIUM SULFATE TRIHYDRATE	URANYL SULFATE
URANYL ACETATE	URANYL ACETATE
URANYL ACETATE DIHYDRATE	URANYL ACETATE
URANYL NITRATE	URANYL NITRATE
URANYL SULFATE	URANYL SULFATE
URANYL SULFATE TRIHYDRATE	URANYL SULFATE
UREA	UREA
UREA HYDROGEN PEROXIDE	UREA PEROXIDE
UREA PEROXIDE	UREA PEROXIDE
URITONE	HEXAMETHYLENETETRAMINE
UROTRUPIN	HEXAMETHYLENETETRAMINE
VALENTINITE	ANTIMONY TRIOXIDE
VALERAL	VALERALDEHYDE
VALERALDEHYDE	VALERALDEHYDE
VALERIC ALDEHYDE	VALERALDEHYDE
VAM	VINYL ACETATE
VANADIC ANHYDRIDE	VANADIUM PENTOXIDE
VANADIUM OXYSULFATE	VANADYL SULFATE
VANADIUM OXYTRICHLORIDE	VANADIUM OXYTRICHLORIDE
VANADIUM PENTAOXIDE	VANADIUM PENTOXIDE
VANADIUM PENTOXIDE	VANADIUM PENTOXIDE
VANADYL CHLORIDE	VANADIUM OXYTRICHLORIDE
VANADYL SULFATE	VANADYL SULFATE
VANADYL SULFATE DIHYDRATE	VANADYL SULFATE
VANADYL TRICHLORIDE	VANADIUM OXYTRICHLORIDE
VANICIDE	CAPTAN
VAPOTONE	TETRAETHYL PYROPHOSPHATE
VASELINE	PETROLATUM
VC	VINYL CHLORIDE
VCL	VINYL CHLORIDE
VCM	VINYL CHLORIDE
VEGETABLE CARBON	CHARCOAL

SYNONYM		COMPOUND NAME
VEGETABLE CHARCOAL	-	CHARCOAL
VEGETABLE OIL	-	CIL: VEGETABLE
VELSICOL	-	HEPTACHLOR
VELSICOL 1068	-	CHLORDANE
VENTOX	-	ACRYLONITRILE
VERSENE ACID	-	ETHYLENEDIAMINE TETRACETIC ACID
VIC-M-XYLENOL	-	XYLENOL
VIENNA GREEN	-	COPPER ACETOARSENITE
VILRATHANE 4300	-	CIPHENYLMETHANEDIISOCYANATE (MDI)
VINEGAR ACID	-	ACETIC ACID
VINYL ACETATE	-	VINYL ACETATE
VINYL A MONOMER	-	VINYL ACETATE
VINYLBENZENE	-	STYRENE
VINYLCARBINOL	-	ALLYL ALCOHOL
VINYL CHLORIDE	-	VINYL CHLORIDE
VINYL C MONOMER	-	VINYL CHLORIDE
VINYL CYANIDE	-	ACRYLONITRILE
VINYLETHYLENE	-	BUTADIENE, INHIBITED
VINYL FLUORIDE, INHIBITED	-	VINYL FLUORIDE, INHIBITED
VINYLDIENECHLORIDE, INHIBITED	-	VINYLDIENECHLORIDE, INHIBITED
VINYL METHYL ETHER, INHIBITED	-	VINYL METHYL ETHER, INHIBITED
VINYLSILICON TRICHLORIDE	-	VINYLTRICHLOROSILANE
VINYLTOLUENE	-	VINYLTOLUENE
VINYLTRICHLOROSILANE	-	VINYLTRICHLOROSILANE
VYAC	-	VINYL ACETATE
WATER DISPLACING OIL	-	CIL: PENETRATING
WATER GLASS	-	SODIUM SILICATE
WAXES: CARNAUBA	-	WAXES: CARNAUBA
WAXES: PARAFFIN	-	WAXES: PARAFFIN
WEISSPIESSGLANZ	-	ANTIMONY TRIOXIDE
WHITE ARSENIC	-	ARSENIC TRIOXIDE
WHITE OIL	-	CIL: MINERAL
WHITE VITRIOL	-	ZINC SULFATE
WITCIZER 300	-	CIBUTYL PHTHALATE
WITCIZER 312	-	CICCTYL PHTHALATE
WOOD ALCOHOL	-	METHYL ALCOHOL
WOOD CHARCOAL	-	CHARCOAL
WOOD ETHER	-	DIMETHYL ETHER
WOOD NAPHTHA	-	METHYL ALCOHOL
WOOD SPIRIT	-	METHYL ALCOHOL
WOOD TURPENTINE	-	TURPENTINE
META-XYLENE	-	M-XYLENE
P-XYLENE	-	P-XYLENE
O-XYLENE	-	O-XYLENE
M-XYLENE	-	P-XYLENE
XYLENES, MIXTURE WITH BENZENE AND TOLUENE	-	NAPHTHA COAL TAR
XYLENOL	-	XYLENOL
2,6-XYLENOL	-	XYLENOL
XY'OL	-	P-XYLENE
YELLOW ARSENIC SULFIDE	-	ARSENIC TRISULFIDE
YELLOW PETROLATUM	-	PETROLATUM
YELLOW PHOSPHORUS	-	PHOSPHORUS, WHITE
ZINC ACETATE	-	ZINC ACETATE
ZINC ACETATE DIHYDRATE	-	ZINC ACETATE
ZINC AMMONIUM CHLORIDE	-	ZINC AMMONIUM CHLORIDE
ZINC ARSENATE	-	ZINC ARSENATE
ZINC BORATE	-	ZINC BORATE
ZINC BROMIDE	-	ZINC BROMIDE
ZINC O,O-DI-N-BUTYLPHOSPHORODITHIATE	-	ZINC DIALKYL DITHIOPHOSPHATE
ZINC CHLORIDE	-	ZINC CHLORIDE
ZINC CHROMATE	-	ZINC CHROMATE
ZINC CHROMATE(VI)HYDROXIDE	-	ZINC CHROMATE
ZINC DIACETATE	-	ZINC ACETATE
ZINC DIALKYL DITHIOPHOSPHATE	-	ZINC DIALKYL DITHIOPHOSPHATE

SYNONYM

ZINC DIETHYL
 ZINC DIHEXYLDITHIOPHOSPHATE
 ZINC DIHEXYLPHOSPHORODITHIOATE
 ZINC DIMETHYL
 ZINC ETHYL
 ZINC FLUOBORATE SOLUTION
 ZINC FLUOROBORATE
 ZINC FLUOSILICATE
 ZINC HEXAFLUOROSILICATE
 ZINC METHYL
 ZINC NITRATE
 ZINC NITRATE HEXAHYDRATE
 ZINC P-PHENOLSULFONATE
 ZINC PHENOLSULFONATE
 ZINC PHENOLSULFONATE OCTAHYDRATE
 ZINC PHOSPHIDE
 ZINC SILICOFLUORIDE
 ZINC SILICOFLUORIDE HEXAHYDRATE
 ZINC SULFATE
 ZINC SULFATE HEPTAHYDRATE
 ZINC SULFOCARBOLATE
 ZINC SULFOPHENATE
 ZINC VITRIOL
 ZINC YELLOW
 ZIRCONIUM ACETATE
 ZIRCONIUM ACETATE SOLUTION
 ZIRCONIUM NITRATE
 ZIRCONIUM NITRATE PENTAHYDRATE
 ZIRCONIUM OXIDE CHLORIDE
 ZIRCONIUM OXYCHLORIDE
 ZIRCONIUM OXYCHLORIDE HYDRATE
 ZIRCONIUM SULFATE
 ZIRCONIUM SULFATE TETRAHYDRATE
 ZIRCONYL CHLORIDE

COMPOUND NAME

DIETHYLZINC
 ZINC DIALKYLDITHIOPHOSPHATE
 ZINC DIALKYLDITHIOPHOSPHATE
 DIMETHYLZINC
 DIETHYLZINC
 ZINC FLUOROBORATE
 ZINC FLUOROBORATE
 ZINC SILICOFLUORIDE
 ZINC SILICOFLUORIDE
 DIMETHYLZINC
 ZINC NITRATE
 ZINC NITRATE
 ZINC PHENOLSULFONATE
 ZINC PHENOLSULFONATE
 ZINC PHENOLSULFONATE
 ZINC PHOSPHIDE
 ZINC SILICOFLUORIDE
 ZINC SILICOFLUORIDE
 ZINC SULFATE
 ZINC SULFATE
 ZINC PHENOLSULFONATE
 ZINC PHENOLSULFONATE
 ZINC SULFATE
 ZINC CHROMATE
 ZIRCONIUM ACETATE
 ZIRCONIUM ACETATE
 ZIRCONIUM NITRATE
 ZIRCONIUM NITRATE
 ZIRCONIUM OXYCHLORIDE
 ZIRCONIUM OXYCHLORIDE
 ZIRCONIUM OXYCHLORIDE
 ZIRCONIUM SULFATE
 ZIRCONIUM SULFATE
 ZIRCONIUM OXYCHLORIDE

INDEX OF CODES

AAC	ACETIC ACID	ALM	ALUMINUM SULFATE
AAD	ACETALDEHYDE	ALN	ALUMINUM NITRATE
AAM	ACRYLAMIDE	ALS	AMMONIUM LAURYL SULFATE
AAN	n-AMYL ALCOHOL	ALT	AMMONIUM LACTATE
AAT	AMMONIUM ACETATE	AMA	AMMONIA, ANHYDROUS
ABC	AMMONIUM BICARBONATE	AMB	AMMONIUM MOLYBDATE
ABF	AMMONIUM BIFLUORIDE	AMC	AMMONIUM CHLORIDE
ABM	ACETYL BROMIDE	AMD	AMMONIUM DICHROMATE
ABR	ALLYL BROMIDE	AMF	AMMONIUM SULFITE
ABS	ALKYLBENZENESULFONIC ACIDS	AMH	AMMONIUM HYDROXIDE (<28% AQUEOUS AMMONIA)
ABZ	AMMONIUM BENZOATE	AMK	n-AMYL METHYL KETONE
ACA	ACETIC ANHYDRIDE	AML	AMYL ACETATE
ACB	AMMONIUM CARBONATE	AMM	n-AMYL MERCAPTAN
ACC	ACETYL CHLORIDE	AMN	AMMONIUM NITRATE
ACD	ACRIDINE	AMP	AMMONIUM PERCHLORATE
ACE	ACETYLENE	AMR	AMMONIUM STEARATE
ACF	ALLYL CHLOROFORMATE	AMS	AMMONIUM SULFATE
ACI	AMMONIUM CITRATE	AMT	AMMONIUM THIOCYANATE
ACL	ALUMINUM CHLORIDE	AMY	n-AMYL CHLORIDE
ACN	ACRYLONITRILE	ANI	iso-AMYL NITRITE
ACP	ACETOPHENONE	ANL	ANILINE
ACR	ACRYLIC ACID	ANP	AMMONIUM NITRATE - PHOSPHATE MIXTURE
ACT	ACETONE	ANS	AMMONIUM NITRATE - SULFATE MIXTURE
ACY	ACETONE CYANOHYDRIN	ANT	n-AMYL NITRATE
ADA	ADIPIC ACID	ANU	AMMONIUM NITRATE—UREA SOLUTION
ADN	ADIPONITRILE	AOL	AMMONIUM OLEATE
AEA	AMINOETHANOLAMINE	AOX	AMMONIUM OXALATE
AFM	AMMONIUM FORMATE	APB	AMMONIUM PENTABORATE
AFR	AMMONIUM FLUORIDE	APC	ANTIMONY PENTACHLORIDE
AGC	AMMONIUM GLUCONATE	APE	AMMONIUM PERSULFATE
AID	AMMONIUM IODIDE	APF	ANTIMONY PENTAFLUORIDE
ALA	ALLYL ALCOHOL	APP	AMMONIUM PHOSPHATE
ALC	ALLYL CHLORIDE	APS	ACETYL PEROXIDE SOLUTION
ALD	ALDRIN	APT	ANTIMONY POTASSIUM TARTRATE
ALF	ALUMINUM FLUORIDE		

INDEX OF CODES (Continued)

ARD	ARSENIC DISULFIDE	BBP	BENZYL n-BUTYL PHTHALATE
ARF	ASPHALT BLENDING STOCKS: ROOFERS FLUX	BBR	BENZYL BROMIDE
ARL	ACROLEIN	BBZ	BROMOBENZENE
ART	ARSENIC TRISULFIDE	BCF	BENZYL CHLOROFORMATE
ASA	ARSENIC ACID	BCL	BENZYL CHLORIDE
ASC	ANISOYL CHLORIDE	BCN	n-BUTYL ACETATE
ASF	AMMONIUM SULFIDE	BCP	BOILER COMPOUND, LIQUID
ASL	AMMONIUM SILICOFLUORIDE	BCR	BARIUM CHLORATE
ASM	AMMONIUM SULFAMATE	BCS	BUTYLTRICHLOROSILANE
ASP	ASPHALT	.DE	BISPHENOL A DIGLYCIDYL ETHER
ASR	ASPHALT BLENDING STOCKS: STRAIGHT RUN RESIDUE	BDI	BUTADIENE, INHIBITED
AST	ARSENIC TRICHLORIDE	BDO	1,4-BUTANEDIOL
ATA	ACETYLACETONE	BEC	BERYLLIUM CHLORIDE
ATC	ALLYLTRICHLOROSILANE	BEF	BERYLLIUM FLUORIDE
ATF	AMMONIUM THIOSULFATE	BEM	BERYLLIUM, METALLIC
ATH	ANTHRACENE	BEN	BERYLLIUM NITRATE
ATM	ANTIMONY TRICHLORIDE	BEO	BERYLLIUM OXIDE
ATN	ACETONITRILE	BES	BERYLLIUM SULFATE
ATO	ARSENIC TRIOXIDE	BHC	BENZENE HEXACHLORIDE
ATR	AMMONIUM TARTRATE	BHP	tert-BUTYL HYDROPEROXIDE
ATS	n-AMYLTRICHLOROSILANE	BMA	BENZYLTRIMETHYLAMMONIUM CHLORIDE
ATT	ANTIMONY TRIFLUORIDE	BMN	n-BUTYL METHACRYLATE
ATX	ANTIMONY TRIOXIDE	BNT	BARIUM NITRATE
ATZ	ATRAZINE	BNZ	BENZENE
AZM	AZINPHOSMETHYL	BOC	BISMUTH OXYCHLORIDE
		BPA	BISPHENOL A
BAC	BORIC ACID	BPC	BARIUM PERCHLORATE
BAD	iso-BUTYRALDEHYDE	BPD	BENZENE PHOSPHORUS DICHLORIDE
BAI	iso-BUTYL ACRYLATE	BPF	BROMINE PENTAFLUORIDE
BAL	BENZYL ALCOHOL	BPM	BARIUM PERMANGANATE
BAM	n-BUTYLAMINE	BPO	BARIUM PEROXIDE
BAN	n-BUTYL ALCOHOL	BPT	BENZENE PHOSPHORUS THIODICHLORIDE
BAS	sec-BUTYL ALCOHOL	BRA	n-BUTYRIC ACID
BAT	tert-BUTYL ALCOHOL	BRC	BARIUM CARBONATE
		BRT	BORON TRICHLORIDE

INDEX OF CODES (Continued)

BRU	BRUCINE	CBB	CARBON BISULFIDE
BRX	BROMINE	CBC	COBALT CHLORIDE
BTA	sec-BUTYL ACETATE	CBN	4-CHLOROBUTYRONITRILE
BTB	BORON TRIBROMIDE	CBO	CARBOLIC OIL
BTC	n-BUTYL ACRYLATE	CBR	CYANOGEN BROMIDE
BTD	1,4-BUTYNEDIOL	CBS	COBALT SULFATE
BTF	BROMINE TRIFLUORIDE	CBT	CARBON TETRACHLORIDE
BTL	sec-BUTYLAMINE	CBY	CARBARYL
BTM	n-BUTYL MERCAPTAN	CCA	CALCIUM ARSENATE
BTN	BUTYLENE	CCB	CALCIUM CARBIDE
BTO	BUTYLENE OXIDE	CCC	CALCIUM CHLORATE
BTP	p-tert-BUTYLPHENOL	CCH	CYCLOHEXANONE
BTR	n-BUTYRALDEHYDE	CCL	CYANOGEN CHLORIDE
BUA	tert-BUTYLAMINE	CCN	CALCIUM CYANIDE
BUD	1,4-BUTENEDIOL	CCP	CALCIUM PEROXIDE
BUT	BUTANE	CCR	CALCIUM CHROMATE
BZA	BENZOIC ACID	CCT	CREOSOTE, COAL TAR
BZC	BENZOYL CHLORIDE	CCY	COPPER CYANIDE
BZD	BENZALDEHYDE	CDA	CACODYLIC ACID
BZM	BENZYLAMINE	CDC	CADMIUM CHLORIDE
BZN	BENZONITRILE	CDN	CHLORDANE
BZO	BENZYLDIMETHYLOCTADECYLAMMONIUM CHLORIDE	CDO	CARBON DIOXIDE
BZP	BENZOPHENONE	CES	CUPRIETHYLENEDIAMINE SOLUTION
CAA	COPPER ACETOARSENITE	CFB	CADMIUM FLUOROBORATE
CAC	CHLOROACETYL CHLORIDE	CGE	CRESYL GLYCIDYL ETHER
CAF	CALCIUM FLUORIDE	CHA	CYCLOHEXYLAMINE
CAH	CALCIUM HYDROXIDE	CHC	CHARCOAL
CAL	CALCIUM PHOSPHATE	CHD	CHLOROHYDRINS (CRUDE)
CAM	CALCIUM, METALLIC	CHN	CYCLOHEXANOL
CAO	CALCIUM OXIDE	CHP	CYCLOHEXANONE PEROXIDE
CAP	p-CHLOROANILINE	CHT	CYCLOHEXYLTRICHLOROSILANE
CAR	CARENE	CHX	CYCLOHEXANE
CAT	CADMIUM ACETATE	CHY	CALCIUM HYPOCHLORITE
CBA	COBALT ACETATE		

INDEX OF CODES (Continued)

CID	COPPER IODIDE	CRA	CHLOROACETOPHENONE
CIT	CITRIC ACID	CRB	CHLOROBENZENE
CLC	CALCIUM CHLORIDE	CRE	CALCIUM RESINATE
CLD	COLLODION	CRF	CHLOROFORM
CLS	CAPROLACTAM, SOLUTION	CRS	CRESOLS
CLX	CHLORINE	CSA	CHLOROSULFONIC ACID
CMA	CHROMIC ANHYDRIDE	CSF	COPPER SULFATE
CMB	CADMIUM BROMIDE	CSS	CAUSTIC SODA SOLUTION
CMC	CHROMYL CHLORIDE	CSY	CORN SYRUP
CME	CHLOROMETHYL METHYL ETHER	CTA	CROTONALDEHYDE
CMH	CUMENE HYDROPEROXIDE	CTC	CATECHOL
CMN	CADMIUM NITRATE	CTD	4-CHLORO-o-TOLUIDINE
CMO	CARBON MONOXIDE	CTF	CHLORINE TRIFLUORIDE
CMP	p-CYME	CUM	CUMENE
CMS	CADMIUM SULFATE	CYA	CYANOACETIC ACID
CNI	COPPER NITRATE	CYG	CYANOGEN
CNN	COPPER NAPHTHENATE	CYP	CYCLOPENTANE
CNT	CALCIUM NITRATE		
COL	COPPER OXALATE	DAA	DIACETONE ALCOHOL
CON	COBALT NITRATE	DAC	DIMETHYLACETAMIDE
COP	COPPER ACETATE	DAI	DODECYLBENZENESULFONIC ACID, ISOPROPYLAMINE SALT
COU	COUMAPHOS	DAL	DECALDEHYDE
COX	CADMIUM OXIDE	DAM	DIPHENYLAMINE
CPA	COPPER ARSENITE	DAN	n-DECYL ALCOHOL
CPB	COPPER BROMIDE	DAP	DI-n-AMYL PHTHALATE
CPC	COPPER CHLORIDE	DBA	DI-n-BUTYLAMINE
CPF	COPPER FLUOROBORATE	DBC	DIISOBUTYLCARBINOL
CPH	CAMPENE	DBE	DI-n-BUTYL ETHER
CPL	CHLOROPICRIN, LIQUID	DBK	DI-n-BUTYL KETONE
CPN	p-CHLOROPHENOL	DBL	DIISOBUTYLENE
CPO	CAMPOR OIL	DBO	o-DICHLOROBENZENE
CPP	CALCIUM PHOSPHIDE	DBP	p-DICHLOROBENZENE
CPR	CYCLOPROPANE	DBR	DECABORANE
CPS	CAUSTIC POTASH SOLUTION	DBS	DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT
CPT	CAPTAN		

INDEX OF CODES (Continued)

DBT	DIBUTYLPHENOL	DGM	DIETHYLENE GLYCOL MONOMETHYL ETHER
DBZ	n-DECYLBENZENE	DHN	DECAHYDRO ^N APHTHALENE
DCA	2,4-DICHLOROPHENOXYACETIC ACID	DHP	DIREPTYL PHTHALATE
DCB	DICHLOROBUTENE	DIA	DIISOPROPYLAMINE
DCE	1-DECENE	DID	DIISODECYL PHTHALATE
DCF	DICHLORODIFLUOROMETHANE	DIH	DIISOPROPYLBENZENE HYDROPEROXIDE
DCM	DICHLOROMETHANE	DIK	DIISOBUTYL KETONE
DCP	2,4-DICHLOROPHENOL	DIM	DIMETHYL ETHER
DCS	DODECYLBENZENESULFONIC ACID, CALCIUM SALT	DIP	DIISOPROPANOLAMINE
DDB	DODECYLBENZENE	DLP	DALAPON
DDC	1-DODECENE	DMA	DIMETHYLAMINE
DDD	D D D	DMD	DIMETHYLDICHLOROSILANE
DDN	DODECANOL	DME	DIETHYLENEGLYCOL MONOBUTYL ETHER
DDS	DODECYL SULFATE, SODIUM SALT	DMF	DIMETHYLFORMAMIDE
DDT	DDT	DMH	1,1-DIMETHYLHYDRAZINE
DJW	DIMETHYLHEXANE DIHYDROPEROXIDE, WET	DMP	DIMETHYLPOLYSILOXANE
DEA	DIETHANOLAMINE	DMS	DIMETHYL SULFOXIDE
DEB	DIETHYLBENZENE	DMT	DIMETHYL TEREPHTHALATE
DEC	DIETHYL CARBONATE	DMZ	DIMETHYLZINC
DED	DIELDRIN	DNA	DI-n-PROPYLAMINE
DEE	DICHLOROETHYL ETHER	DNB	m-DINITROBENZENE
DEG	DIETHYLENE GLYCOL	DNC	DINITROCRESOLS
DEL	1,2-DICHLOROETHYLENE	DNP	2,4-DINITROPHENOL
DEM	DIETHYLENEGLYCOL MONOBUTYL ETHER ACETATE	DNT	2,4-DINITROANILINE
DEN	DIETHYLAMINE	DOA	DIOCTYL ADIPATE
DEP	DI-(2-ETHYLHEXYL)PHOSPHORIC ACID	DOD	DODECENE
DES	2,4-D ESTERS	DOP	DIOCTYL PHTHALATE
DET	DIETHYLENETRIAMINE	DOX	1,4-DIOXANE
DEZ	DIETHYLZINC	DPA	DIBUTYL PHTHALATE
DFA	DIFLUOROPHOSPHORIC ACID, ANHYDROUS	DPD	DIPHENYLDICHLOROSILANE
DFE	1,1-DIFLUOROETHANE	DPE	DIPHENYL ETHER
DFF	DISTILLATES: FLASHED FEED STOCKS	DPG	DIPROPYLENE GLYCOL
DGD	DIETHYLENE GLYCOL DIMETHYL ETHER	DPH	DIETHYL PHTHALATE
DGE	DIETHYLENE GLYCOL MONOETHYL ETHER	DPM	DIPHENYLMETHANE DIISOCYANATE

INDEX OF CODES (Continued)

DPN	DIPENTENE	ECS	ETHYLDICHLOROSILANE
DPO	DIBENZOYL PEROXIDE	EDA	ETHYLENEDIAMINE
DPP	DICHLOROPROPANE	EDB	ETHYLENE BIBROMIDE
DPR	DICHLOROPROPENE	EDC	ETHYLENE DICHLORIDE
DPT	DICYCLOPENTADIENE	EDR	ENDRIN
DSD	DODECYL SULFATE, DIETHANOLAMINE SALT	EDT	ETHYLENEDIAMINE TETRACETIC ACID
DSF	DIMETHYL SULFATE	EEE	ETHYLENE GLYCOL DIETHYL ETHER
DSL	DIMETHYL SULFIDE	EET	ETHYL ETHER
DSM	DODECYL SULFATE, MAGNESIUM SALT	EFM	ETHYL FORMATE
DSR	DISTILLATES: STRAIGHT RUN	EGA	ETHYLENE GLYCOL MONOETHYL ETHER ACETATE
DSS	DIOCTYL SODIUM SULFOSUCCINATE	EGD	ETHYLENE GLYCOL DIMETHYL ETHER
DST	DODECYL SULFATE, TRIETHANOLAMINE SALT	EGE	ETHYLENE GLYCOL MONOETHYL ETHER
DTC	DODECYLTRICHLOROSILANE	EGL	ETHYLENE GLYCOL
DTH	DOWTHERM	EGM	ETHYLENE GLYCOL MONOBUTYL ETHER
DTM	4,4'-DICHLORO- α -TRICHLOROMETHYL-BENZHYDROL	EGY	ETHYLENE GLYCOL DIACETATE
DTN	DEMETON	EHA	ETHYLHEXALDEHYDE
DTS	DEXTROSE SOLUTION	EHP	ETHOXYDIHYDROPYRAN
DTT	2,4-DINITROTOLUENE	EHT	ETHYL HEXYL TALLATE
DZN	DIAZINON	EHX	2-ETHYL HEXANOL
DZP	DI-(p-CHLORO BENZOYL) PEROXIDE	ELT	ETHYL LACTATE
EAA	ETHYL ACETOACETATE	EMA	ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE
EAC	ETHYL ACRYLATE	EMC	ETHYL MERCAPTAN
EAD	ETHYLALUMINUM DICHLORIDE	EME	ETHYLENE GLYCOL MONOMETHYL ETHER
EAI	2-ETHYLHEXYL ACRYLATE, INHIBITED	ENB	ETHYLIDENENORBORNENE
EAL	ETHYL ALCOHOL	ENP	ETHOXYLATED NGNYLPHENOL
EAM	ETHYLAMINE	EOD	ETHOXYLATED DODECANOL
EAS	ETHYLALUMINUM SESQUICHLORIDE	EOP	ETHOXYLATED PENTADECANOL
EBR	ETHYL BUTYRATE	EOT	ETHOXYLATED TETRADECANOL
EBT	ETHYL BUTANOL	EOX	ETHYLENE OXIDE
ECA	ETHYL CHLOROACETATE	EPA	2-ETHYL-3-PROPYLACROLEIN
ECF	ETHYL CHLOROFORMATE	EPC	EPICHLOROHYDRIN
ECH	ETHYLENE CHLOROHYDRIN	EPD	ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS
ECL	ETHYL CHLORIDE	EPP	ETHYL PHOSPHORODICHLORIDATE
		EPS	ETHYLPHENYLDICHLOROSILANE

INDEX OF CODES (Continued)

ESC	ETHYL SILICATE	GAK	GASOLINE BLENDING STOCKS: ALKYLATES
ETA	ETHYL ACETATE	GAT	GASOLINES: AUTOMOTIVE (<4.23g LEAD/GAL.)
ETB	ETHYLBENZENE	GAV	GASOLINES: AVIATION (<4.86g LEAD/GAL.)
ETC	ETHYLENE CYANOHYDRIN	GCM	GLYCIDYL METHACRYLATE
ETD	ETHOXYLATED TRIDECANOL	GCR	GLYCERINE
ETG	ETHOXY TRIGLYCOL	GCS	GASOLINES: CASINGHEAD
ETH	ETHANE	GLA	GALLIC ACID
ETI	ETHYLENEIMINE	GOC	GAS OIL: CRACKED
ETL	ETHYLENE	GOS	GLYOXAL, 40% SOLUTION
ETM	ETHYL METHACRYLATE	GPL	GASOLINES: POLYMER
ETN	ETHYL NITRITE	GRF	GASOLINE BLENDING STOCKS: REFORMATES
ETS	ETHYLTRICHLOROSILANE	GSR	GASOLINES: STRAIGHT RUN
EVO	EPOXIDIZED VEGETABLE OILS	GTA	GLUTARALDEHYDE SOLUTION
FAC	FERRIC AMMONIUM CITRATE	HAC	HEXADECYLTRIMETHYLAMMONIUM CHLORIDE
FAL	FURFURYL ALCOHOL	HAI	2-HYDROXYETHYL ACRYLATE, INHIBITED
FAO	FERRIC AMMONIUM OXALATE	HAL	n-HEXALDEHYDE
FAS	FERROUS AMMONIUM SULFATE	HAS	HYDROXYLAMINE SULFATE
FCL	FERRIC CHLORIDE	HBR	HYDROGEN BROMIDE
FCP	FERRIC GLYCEROPHOSPHATE	HCC	HEXACHLOROCYCLOPENTADIENE
FEC	FERROUS CHLORIDE	HCL	HYDROCHLORIC ACID
FFA	FURFURAL	HCN	HYDROGEN CYANIDE
FFB	FERROUS FLUOROBORATE	HDC	HYDROGEN CHLORIDE
FMA	FORMIC ACID	HDQ	HYDROQUINONE
FMS	FORMALDEHYDE SOLUTION	HDS	HYDROGEN SULFIDE
FNT	FERRIC NITRATE	HDZ	HYDRAZINE
FOX	FERROUS OXALATE	HFA	HYDROFLUORIC ACID
FRS	FERROUS SULFATE	HFX	HYDROGEN FLUORIDE
FSA	FLUOSULFONIC ACID	HMD	HEXAMETHYLENEDIAMINE
FSF	FERRIC SULFATE	HMI	HEXAMETHYLENEIMINE
FSL	FLUOSILICIC ACID	HMT	HEXAMETHYLENETETRAMINE
FUM	FUMARIC ACID	HPA	HYDROXYPROPYL ACRYLATE
FXX	FLUORINE	HPM	HYDROXYPROPYL METHACRYLATE

INDEX OF CODES (Continued)

HPO	HYDROGEN PEROXIDE	ISA	ISODECYL ALCOHOL
HPT	HEPTANE	IVA	ISOVALERALDEHYDE
HSS	HEXADECYL SULFATE, SODIUM SALT		
HTC	HEPTACHLOR	JPF	JET FUELS: JP-4
HTE	1-HEPTENE	JPO	JET FUELS: JP-1 (KEROSENE)
HTN	HEPTANOL	JPT	JET FUELS: JP-3
HXA	HEXANE	JPV	JET FUELS: JP-5 (KEROSENE, HEAVY)
HXE	1-HEXENE		
HXC	HEXYLENE GLYCOL	KPS	KEROSENE
HXN	HEXANOL		
HXX	HYDROGEN, LIQUEFIED	LAC	LEAD ACETATE
		LAH	LITHIUM ALUMINUM HYDRIDE
IAA	ISOAMYL ALCOHOL	LAL	LINEAR ALCOHOLS (12-15 CARBON)
IAC	ISOPROPYL ACETATE	LAR	LEAD ARSENATE
IAI	ISODECYL ACRYLATE, INHIBITED	LFB	LEAD FLUOROBORATE
IAL	ISOBUTYL ALCOHOL	LFR	LEAD FLUORIDE
IAM	ISOBUTYLAMINE	LHD	LITHIUM HYDRIDE
IBA	ISOBUTYL ACETATE	LID	LEAD IODIDE
IBL	ISOBUTYLENE	LLS	LATEX, LIQUID SYNTHETIC
IBN	ISOBUTYRONITRILE	ING	LIQUEFIED NATURAL GAS
IBR	ISOBUTYRIC ACID	LNT	LEAD NITRATE
IBT	ISOBUTANE	LPG	LIQUEFIED PETROLEUM GAS
IDA	ISODECALDEHYDE	LPO	LAUROYL PEROXIDE
IHA	ISOHEXANE	LRM	LAURYL MERCAPTAN
IOA	ISOOCYL ALCOHOL	LTA	LACTIC ACID
IOC	ISOOCALDEHYDE	LTC	LEAD THIOCYANATE
IPA	ISOPROPYL ALCOHOL	LTH	LITHARGE
IPC	ISOPROPYL PERCARBONATE	LTM	LITHIUM, METALLIC
IPE	ISOPROPYL ETHER	LTT	LEAD TETRAACETATE
IPH	ISOPHORONE		
IPL	ISOPHTHALIC ACID	M/A	METHYL AMYL ALCOHOL
IPM	ISOPROPYL MERCAPTAN	M/C	METHYL AMYL ACETATE
IPP	ISOPROPYLAMINE	MAL	METHYL ALCOHOL
IPR	ISOPRENE	MAM	METHYL ACRYLATE
IPT	ISOPENTANE		

INDEX OF CODES (Continued)

MAN	N-METHYLANILINE	MOX	MERCURIC OXIDE
MAP	METHYL ACETYLENE - PROPADIENE MIXTURE	MPA	MONOISOPROPANOLAMINE
MAT	MERCURIC ACETATE	MPC	MAGNESIUM PERCHLORATE
MBK	METHYL n-BUTYL KETONE	MPD	METHYL PHOSPHONOTHIOIC DICHLORIDE (ANHYD)
MCA	MONOCHLOROACETIC ACID	MPK	METHYL ISOPROPENYL KETONE, INHIBITED
MCC	MERCURIC AMMONIUM CHLORIDE	MPL	MORPHOLINE
MCF	MONOCHLORODIFLUOROMETHANE	MPT	METHYL PARATHION
MCH	METHYL CHLOROFORMATE	MPY	1-METHYLPYRROLIDONE
MCL	METHALLYL CHLORIDE	MRC	MERCURIC CHLORIDE
MCN	MERCURIC CYANIDE	MRN	MERCUROUS NITRATE
MCP	METHYLCYCLOPENTANE	MRR	MERCUROUS CHLORIDE
MCR	MERCURY	MSA	METHANEARSONIC ACID, SODIUM SALTS
MCS	METHYLDICHLOROSILANE	MSF	MERCURIC SULFIDE
MCT	METHYLCYCLOPENTADIENYLMANGANESE TRICARBONYL	MSO	MESITYL OXIDE
MEA	MONOETHANOLAMINE	MSR	alpha-METHYLSTYRENE
MEK	METHYL ETHYL KETONE	MTA	METHYLAMINE
MEP	METHYLETHYLPYRIDINE	MTB	METHYL BROMIDE
MFA	MOTOR FUEL ANTI-KNOCK COMPOUNDS CONTAINING LEAD ALKYLs	MIC	METHYL CHLORIDE
MPM	METHYL FORMATE	MTF	METHYL FORMAL
MGX	MAGNESIUM	MTM	METHANE
MHZ	METHYLHYDRAZINE	MTO	MOLYBDIC TRIOXIDE
MIC	METHYL ISOBUTYL CARBINOL	MTS	METHYLTRICHLOROSILANE
MID	MERCURIC IODIDE	MTT	METHYL ACETATE
MIK	METHYL ISOBUTYL KETONE	MVK	METHYL VINYL KETONE
MLA	MALEIC ANHYDRIDE	NAA	NITRILOTRIACETIC ACID AND SALTS
MLH	MALEIC HYDRAZIDE	NAB	NABAM
MLI	MALEIC ACID	NAC	NITRIC ACID
MLT	MALATHION	NAL	4-NITROANILINE
MMC	METHYL MERCAPTAN	NAN	NONANE
MMM	METHYL METHACRYLATE	NAO	1-NAPHTHYLAMINE
MNS	MINERAL SPIRITS	NAS	NICKEL AMMONIUM SULFATE
MNT	MERCURIC NITRATE	NBR	NICKEL BROMIDE
MOC	METHOXYCHLOR	NCL	NICKEL CHLORIDE

INDEX OF CODES (Continued)

NCN	NICKEL CYANIDE	OAC	OLEIC ACID, SODIUM SALT
NCS	NICOTINE SULFATE	OAN	OCTANE
NC1	NAPHTHA: COAL TAR	OAP	OLEIC ACID, POTASSIUM SALT
NFB	NICKEL FLUOROBORATE	OAS	OILS, MISCELLANEOUS: ABSORPTION
NFM	NICKEL FORMATE	OCA	OILS, EDIBLE: CASTOR
NHX	NEOHXANE	OCC	OILS, EDIBLE: COCONUT
NIC	NICOTINE	OCF	OILS: CLARIFIED
NKA	NICKEL ACETATE	OCR	OILS, MISCELLANEOUS: CROTON
NKC	NICKEL CARBONYL	OCS	OILS, EDIBLE: COTTONSEED
NKS	NICKEL SULFATE	OCT	OILS, MISCELLANEOUS: COAL TAR
NMT	NITROMETHANE	ODS	OILS: DIESEL
NNE	1-NONENE	OET	OCTYL EPOXY TALLATE
NNN	NONANOL	OFR	OILS, FUEL: NO. 4
NNP	NONYLPHENOL	OFS	OILS, EDIBLE: FISH
NNT	NICKEL NITRATE	OFV	OILS, FUEL: NO. 5
NON	NONENE	OIL	OILS: CRUDE
NOX	NITROGEN TETROXIDE	OLA	OLEIC ACID
NPH	4-NITROPHENOL	OLB	OILS, MISCELLANEOUS: LUBRICATING
NPP	2-NITROPROPANE	OLD	OILS, EDIBLE: LARD
NSS	NAPHTHA: STODDARD SOLVENT	OLM	OLEUM
NSV	NAPHTHA: SOLVENT	OLS	OILS, MISCELLANEOUS: LINSEED
NTA	2-NITROANILINE	OMN	OILS, MISCELLANEOUS: MINERAL
NTB	NITROBENZENE	OMS	OILS, MISCELLANEOUS: MINERAL SEAL
NTC	NITROSYL CHLORIDE	OMT	OILS, MISCELLANEOUS: MOTOR
NTE	NITROETHANE	ONF	OILS, MISCELLANEOUS: NEATSFOOT
NTI	NAPHTHENIC ACIDS	OOD	OILS, FUEL: NO. 1-D
NTL	NITRALIN	OOL	OILS, EDIBLE: OLIVE
NTM	NAPHTHALENE, MOLTEN	OON	OILS, FUEL: NO. 1 (KEROSENE)
NTO	NITROUS OXIDE	OPM	OILS, EDIBLE: PALM
NTP	2-NITROPHENOL	OPN	OILS, EDIBLE: PEANUT
NTX	NITRIC OXIDE	OPT	OILS, MISCELLANEOUS: PENETRATING
NVM	NAPHTHA: VM & P (75% NAPHTHA)	ORD	OILS, MISCELLANEOUS: ROAD
NXX	NITROGEN, LIQUEFIED	ORG	OILS, MISCELLANEOUS: RANGE

INDEX OF CODES (Continued)

ORN	OILS, MISCELLANEOUS: ROSIN	PCM	PERCHLOROMETHYL MERCAPTAN
ORS	OILS, MISCELLANEOUS: RESIN	PCP	PENTACHLOROPHENOL
OSB	OILS, EDIBLE: SOYA BEAN	PCR	POTASSIUM CHLORATE
OSD	OILS, MISCELLANEOUS: SPINDLE	PDC	PENTADECANOL
OSF	OILS, EDIBLE: SAFFLOWER	PDL	PHENYLDICHLOROARSINE, LIQUID
OSP	OILS, MISCELLANEOUS: SPERM	PDT	POTASSIUM DICHLORO-s-TRIAZINETRIONE
OSX	OILS, FUEL: NO. 6	PET	PENTAERYTHRITOL
OSY	OILS, MISCELLANEOUS: SPRAY	PFA	PARAFORMALDEHYDE
OTA	OCTANOL	PGA	PYROGALLIC ACID
OTB	OILS, MISCELLANEOUS: TURBINE	PGC	POLYPROPYLENE GLYCOL
OTC	OILS, EDIBLE: TUCUM	PGM	POLYPROPYLENE GLYCOL METHYL ETHER
OTD	OILS, FUEL: NO. 2-D	PHG	PHOSGENE
OTE	1-OCTENE	PHH	PHENYLHYDRAZINE HYDROCHLORIDE
OTF	OILS, MISCELLANEOUS: TRANSFORMER	PHN	PHENOL
OTL	OILS, MISCELLANEOUS: TALL	PII	PROPYLENEIMINE, INHIBITED
OTN	OILS, MISCELLANEOUS: TANNER'S	PLB	POLYBUTENE
OTW	OILS, FUEL: NO. 2	PLP	POLYPROPYLENE
OVG	OILS, EDIBLE: VEGETABLE	PLT	BETA-PROPIOLACTONE
OXA	OXALIC ACID	PME	PROPYLENE GLYCOL METHYL ETHER
OXY	OXYGEN, LIQUEFIED	PMN	n-PROPYL MERCAPTAN
PAA	PERACETIC ACID	PNA	PROPIONIC ACID
PAC	PHOSPHORIC ACID	POP	POTASSIUM PEROXIDE
PAD	PROPIONALDEHYDE	POX	PROPYLENE OXIDE
PAH	PROPIONIC ANHYDRIDE	PPA	POLYPHOSPHORIC ACID
PAL	n-PROPYL ALCOHOL	PPG	PROPYLENE GLYCOL
PAN	PHTHALIC ANHYDRIDE	PPI	POLYMETHYLENE POLYPHENYL ISOCYANATE
PAS	POTASSIUM ARSENATE	PPL	PROPYLENE
PAT	n-PROPYL ACETATE	PPO	PHOSPHORUS OXYCHLORIDE
PBO	POTASSIUM BINOXALATE	PPP	PHOSPHORUS PENTASULFIDE
PBP	PROPYLENE BUTYLENE POLYMER	PPR	PHOSPHORUS, RED
PBR	PHOSPHORUS TRIBROMIDE	PPT	PHOSPHORUS TRICHLORIDE
PCB	POLYCHLORINATED BIPHENYL	PPW	PHOSPHORUS, WHITE
PCH	POTASSIUM CHROMATE	PPZ	PIPERAZINE
PCL	PERCHLORIC ACID	PRD	PYRIDINE
		PRP	PROPANE

INDEX OF CODES (Continued)

PTA	PENTANE	SDA	SODIUM ARSENATE
PTB	PENTABORANE	SDB	SODIUM BORATE
PTC	POTASSIUM CYANIDE	SDC	SODIUM CHLORATE
PTD	POTASSIUM DICHROMATE	SDF	SODIUM FLUORIDE
PTE	1-PENTENE	SDH	SODIUM HYDRIDE
PTH	POTASSIUM HYDROXIDE	SDS	SODIUM SULFIDE
PTI	POTASSIUM IODIDE	SDT	SODIUM DICHLORO- <i>s</i> -TRIAZINETRIONE
PTL	PETROLATUM	SDU	SODIUM
PTM	POTASSIUM, METALLIC	SFA	SULFURIC ACID
PTN	PETROLEUM NAPHTHA	SFC	SODIUM FERROCYANIDE
PTO	PARATHION, LIQUID	SFD	SULFUR DIOXIDE
PTP	POTASSIUM PERMANGANATE	SFL	SULFOLANE
PTS	POTASSIUM OXALATE	SFM	SULFUR MONOCHLORIDE
PTT	PROPYLENE TETRAMER	SFR	SODIUM SILICOFLUORIDE
		SHC	SODIUM HYPOCHLORITE
QNL	QUINOLINE	SHD	SODIUM HYDROXIDE
		SHS	SODIUM HYDROSULFIDE SOLUTION
RSC	RESORCINOL	SLA	SALICYLIC ACID
		SLD	SELENIUM DIOXIDE
SAB	SODIUM ALKYL BENZENESULFONATES	SML	SODIUM METHYLATE
SAC	SULFURIC ACID, SPENT	SNF	SODIUM NITRITE
SAM	SODIUM AMIDE	SOX	SODIUM OXALATE
SAR	SODIUM ARSENITE	SPP	SODIUM PHOSPHATE
SAC	SODIUM ALKYL SULFATES	SRA	STEARIC ACID
SAZ	SODIUM AZIDE	SRS	SUCROSE
SBH	SODIUM BOROHYDRIDE	SSC	SODIUM SILICATE
SBS	SODIUM BISULFITE	SSF	SODIUM SULFITE
SBT	SORBITOL	STC	SILICON TETRACHLORIDE
SCD	SODIUM CACODYLATE	STO	SELENIUM TRIOXIDE
SCH	SODIUM CHROMATE	STY	STYRENE
SCL	SULFURYL CHLORIDE	SVA	SILVER ACETATE
SCN	SODIUM CYANIDE	SVC	SILVER CARBONATE
SCR	SODIUM DICHROMATE	SVF	SILVER FLUORIDE
SCY	SODIUM THIOCYANATE	SVI	SILVER IODATE

INDEX OF CODES (Continued)

SVN	SILVER NITRATE	THN	TETRAHYDRONAPHTHALENE
SVO	SILVER OXIDE	THR	THIRAM
SVS	SILVER SULFATE	TIA	TRIISOBUTYLALUMINUM
SXX	SULFUR (LIQUID)	TLI	o-TOLUIDINE
		TLO	TALLOW
TAL	TRIETHYLALUMINUM	TMA	TRIMETHYLAMINE
TAP	p-TCLUENESULFONIC ACID	TMC	TRIMETHYLCHLOROSILANE
TBT	TETRABUTYL TITANATE	TML	TETRAMETHYL LEAD
TCA	2,4,5-TRICHLOROPHENOXYACETIC ACID	TNA	TANNIC ACID
TCE	TRICHLOROETHANE	TOL	TOLUENE
TCF	TRICHLOROFLUOROMETHANE	TPG	THIOPHOSGENE
TCL	TRICHLOROETHYLENE	TPH	TRICHLOROPHENOL
TCP	TRICKESYL PHOSPHATE	TPO	TRIS(AZIRIDINYL)PHOSPHINE OXIDE
TCS	TRICHLOROSILANE	TPT	TURPENTINE
TCT	TRICHLORO-s-TRIAZINETRIONZ	TRN	THORIUM NITRATE
TDB	TETRADECYLBENZENE	TTD	1-TETRADECENE
TDC	1-TRIDECENE	TTE	TETRACHLOROETHYLENE
TDI	TOLUENE 2,4-DIISOCYANATE	FTG	TETRAETHYLENE GLYCOL
TDN	TRIDECANOL	TIN	TETRADECANOL
TEA	TRIETHANOLAMINE	ITP	TETRAETHYLENEPENTAMINE
TEB	TRIETHYLBENZENE	TTT	TITANIUM TETRACHLORIDE
TEC	TETRACHLOROETHANE	TXP	TOXAPHENE
TED	TETRAETHYL DIITHIOPYROPHOSPHATE		
TEG	TRIETHYLENE GLYCOL	UAN	URANYL NITRATE
TEL	TETRAETHYL LEAD	UDB	n-UNDECYLBENZENE
TEN	TRIETHYLAMINE	UDC	1-UNDECENE
TEP	TETRAETHYL PYROPHOSPHATE	UND	UNDECANOL
TES	2,4,5-T (ESTERS)	UPO	UREA PEROXIDE
TET	TRIETHYLENETETRAMINE	URA	URANYL ACETATE
TFA	TALLOW FATTY ALCOHOL	URE	UREA
TFC	TRIFLUOROCHLOROETHYLENE	URS	URANYL SULFATE
TFE	TETRAFLUOROETHYLENE, INHIBITED		
TFR	TRIFLURALIN	VAL	VALERALDEHYDE
TGC	TRIPROPYLENE GLYCOL	VAM	VINYL ACETATE
THF	TETRAHYDROFURAN		

INDEX OF CODES (Continued)

VCI	VINYLDENECHLORIDE, INHIBITED	ZAC	ZINC AMMONIUM CHLORIDE
VCM	VINYL CHLORIDE	ZAR	ZINC ARSENATE
VFI	VINYL FLUORIDE, INHIBITED	ZBO	ZINC BORATE
VME	VINYL METHYL ETHER, INHIBITED	ZBR	ZINC BROMIDE
VNT	VINYLTOLUENE	ZCA	ZIRCONIUM ACETATE
VOT	VANADIUM OXYTRICHLORIDE	ZCL	ZINC CHLORIDE
VOX	VANADIUM PENTOXIDE	ZCO	ZIRCONIUM OXYCHLORIDE
VSF	VANADYL SULFATE	ZCR	ZINC CHROMATE
VTB	VINYLTRICHLOROSILANE	ZCS	ZIRCONIUM SULFATE
		ZDP	ZINC DIALKYLDITHIOPHOSPHATE
WCA	WAXES: CARNAUBA	ZFB	ZINC FLUOROBORATE
WPF	WAXES: PARAFFIN	ZIR	ZIRCONIUM NITRATE
		ZNA	ZINC ACETATE
XML	m-XYLENE	ZNT	ZINC NITRATE
XLO	o-XYLENE	ZPP	ZINC PHOSPHIDE
XLP	p-XYLENE	ZPS	ZINC PHENOLSULFONATE
XYL	XYLENOL	ZSF	ZINC SULFATE
		ZSL	ZINC SILICOFLUORIDE

10. DATA SOURCES

The source of every item of data contained in Section 11 is recorded in master data files and is available on request. The principal sources are listed below. Many other sources were consulted, but most of them provided only a few items and are not given here. In a few cases the information given is based on an analogy with that for a closely related chemical; the analogy was drawn by an expert in the field, whose identity appears in the master data file.

Where a source was used for a single category of data, the source is given in Section 3 ("Explanation of Terms") and is not repeated here.

10.1 GENERAL SOURCES

The following sources contained data for many of the 13 data categories used:

1. **Manufacturers' Technical Bulletins** – This is usually the best single source of general information about the chemical. All bulletins were solicited in late 1972 and contain the most recent data. Bulletins were not available for a few chemicals that are not items of commerce but are intermediates shipped from one manufacturing site to another.

2. **Material Safety Data Sheets** – These were provided by the manufacturer using the U.S. Department of Labor Form OSHA-20 or an approved modification.

3. **Code of Federal Regulations** – Office of the Federal Register, Archives and Record Service, Washington, D.C., 1972. Titles 46 (Shipping) and 49 (Transportation) were used in the most recent revision available, in all cases since January 1, 1971.

4. **Chemical Safety Data Sheets** – Manufacturing Chemists Association, Washington, D.C.

5. **Industrial Safety Data Sheets** – National Safety Council, Chicago, Illinois.

6. **International Maritime Dangerous Goods Code** – Inter-Governmental Maritime Consultative Organization (IMCO), London, 1972.

7. **Petroleum Products Handbook** – V.B. Guthrie (ed.), McGraw-Hill, New York, 1960.

8. Glossary of Terms Used in Petroleum Refining – 2nd edition, American Petroleum Institute, New York, 1962.
9. The Handling and Storage of Liquid Propellants – Office of Defense Research and Engineering, U.S. Government Printing Office, Washington, D.C., 1963.
10. Industrial Chemicals – W.L. Faith, D.B. Keyes, and R.L. Clark, 3rd edition, Wiley, New York, 1965.
11. Chemical Technology of Petroleum – W.A. Gruse and D.R. Stevens, 3rd edition, McGraw-Hill, New York, 1960.
12. Chemical Rocket/Propellant Hazards – CPIA Publication No. 194, Vol. III, 1970.
13. Organic Solvents – J.A. Riddick and W.B. Bunger, 3rd edition, Wiley-Interscience, New York, 1970.
14. Transport of Dangerous Goods – (4 vols) United Nations, New York, 1970.
15. Kirk-Othmer Encyclopedia of Chemical Technology – 1st edition (1947-1960) and 2nd edition (1963-1970), Interscience-Wiley, New York.
16. Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide – National Academy of Sciences, Washington, D.C., 1970; includes supplement with additions to March 1972.
17. Matheson Gas Data Book – 5th edition, Matheson Gas Products, East Rutherford, New Jersey, 1971.
18. Explosive and Toxic Hazardous Materials – J. H. Meidl, Glencoe Press, Beverly Hills, California, 1969.
20. Organic Phosphorus Compounds – G. M. Kosolapoff and L. Maier (6 vols.), Wiley-Interscience, New York.
21. The Chemistry of Organo-Phosphorus Pesticides – C. Fest and K. J. Schmidt, Springer-Verlag, New York, 1973.

10.2 CHEMICAL DESIGNATIONS

1. Commercial Organic Chemical Names – Compiled by the Synthetic Organic Chemical Manufacturers Association (SOCMA), Chemical Abstracts Service, Columbus, Ohio, 1965.
2. Chemical Synonyms and Trade Names – W. Gardner and E.I. Cooke, 7th edition, CRC press, Cleveland, Ohio, 1971.
3. The Merck Index of Chemicals and Drugs – 8th edition, Merck and Co., Rahway, New Jersey, 1968.

10.3 HEALTH HAZARDS

1. Industrial Hygiene and Toxicology – F.A. Patty, 2nd edition, Vol. II, Interscience, New York, 1963.
2. Toxicity and Metabolism of Industrial Solvents – E. Browning, Elsevier, New York, 1965.
3. Practical Toxicology of Plastics – R. Lefaux, CRC Press, Cleveland, Ohio, 1968.
4. Industrial Toxicology – L.T. Fairhall, Williams and Wilkins, 2nd edition, Baltimore, Maryland, 1957.
5. Toxicology of Drugs and Chemicals – W.B. Deichmann and H.W. Girarde, Academic Press, New York, 1969.
6. Clinical Toxicology of Commercial Products – M.N. Gleason, et al., 3rd edition, Williams and Wilkins, Baltimore, Maryland, 1969.
7. Handbook of Toxicology: Acute Toxicities of Solids, Liquids and Gases to Laboratory Animals – W.S. Spector, Saunders, Philadelphia, Pa., 1956.
8. Occupational Diseases: A Guide to their Recognition – U.S. Department of Health, Education, and Welfare. Public Health Service Publication No. 1097. Superintendent of Documents, Washington, D.C., 1964.
9. First Aid Textbook – American National Red Cross, Washington, D.C., 1972.
10. Electrical Safety Practice: Odor Warning for Safety – Monograph 113 Instrument Society of America (ISA), Pittsburgh, Pa., 1972.

11. Toxic Substances — Annual List 1971 — H.E. Christensen, U.S. Department of Health, Education, and Welfare, Superintendent of Documents, Washington, D.C., 1971.

12. Hygienic Guide Series — American Industrial Hygiene Association, Detroit, Michigan, 48227.

13. Toxicity of Industrial Metals — E. Browning, 2nd Edition, Appleton-Century-Crofts, New York, 1969.

10.4 FIRE HAZARDS

1. The Fire and Explosion Hazards of Commercial Oils — W. Vlachos and C.A. Vlachos, Vlachos and Co., Philadelphia, Pa., 1921.

2. 1972 Annual Book of ASTM Standards — American Society for Testing and Materials, Philadelphia, Pa., 1972.

3. Fire Protection Guide on Hazardous Materials — 4th edition, Nos. 325A, 325M, 49, 491M, and 704M, National Fire Protection Association (NFPA), Boston, Mass., 1972.

4. Fire Protection Handbook — G.H. Tryon (ed.), 13th edition, National Fire Protection Association (NFPA), Boston, Mass., 1969.

5. Handbook of Industrial Loss Prevention — 2nd edition, Factory Mutual Engineering Corp., McGraw-Hill, New York, 1967.

10.5 WATER POLLUTION

1. Water Quality Criteria Data Book — Vol. 1 — Organic Chemicals (1970) and Vol. 2 — Inorganic Chemicals (1971), United States Environmental Protection Administration, Superintendent of Documents, Washington, D.C.

2. Engineering Management of Water Quality — P.H. McGauhey, McGraw-Hill, New York, 1968.

3. The BOD of Textile Chemicals — Proceedings of the American Association of Textile Chemists and Colorists, *American Dyestuff Reporter*, August 29, 1966, p. 39.

4. Biodegradable Surfactants for the Textile Industry — *American Dyestuff Reporter*, January 30, 1967.

5. Water Quality Criteria – J.E. McKee and M.W. Wolf, 2nd edition, California State Water Quality Control Board, Sacramento, California, 1963.

6. Water Quality Criteria – National Technical Advisory Committee, Federal Water Pollution Control Administration, Washington, D.C., 1968.

7. Water Quality Characteristics of Hazardous Materials – R. W. Hann, Jr., and P. A. Jensen, Environmental Engineering Division, Texas A and M University, College Station, Texas, 1974.

10.6 PHYSICAL AND CHEMICAL PROPERTIES

1. Solubilities of Inorganic and Organic Compounds – H. Stephen and T. Stephen, Macmillan, New York, 1963, Vol. 1, Part 1.

2. The Critical Constants of Organic Compounds – A.P. Kudchadker, G.H. Alani and B.J. Zwolinski, *Chemical Reviews*, **68**,659 (1968).

3. Physical Properties of Hydrocarbons – Vol. 1 (1968) and Vol. 2 (1970), R.W. Gallant, Gulf Publishing Co., Houston, Texas.

4. International Critical Tables – McGraw-Hill, New York, 1926.

5. Handbook of Chemistry and Physics – R.C. Weast (ed.), 53rd edition, CRC Publishing Co., Cleveland, Ohio, 1972.

6. The Properties of Gases and Liquids – R.C. Reid and T.K. Sherwood, 2nd edition, McGraw-Hill, New York, 1966.

7. Thermal Conductivity of Gases and Liquids – N.V. Tsederberg, MIT Press, Cambridge, Mass., 1965.

8. Lange's Handbook of Chemistry – N.A. Lange, 10th edition, McGraw-Hill, New York, 1969.

9. The Chemical Thermodynamics of Organic Compounds – D.R. Stull, et al., Wiley, New York, 1969.

10. Matheson Gas Data Book – 4th edition, Matheson Co., Inc., 1966.

11. Physical Properties of Chemical Compounds – Vol. 1 (1955), Vol. 2 (1959), and Vol. 3 (1961), R.R. Dreisbach, American Chemical Society, Washington, D.C.

12. Beilsteins Handbuch der Organischen Chemie – Springer, Berlin, Germany.
13. Gmelins Handbuch der Anorganischen Chemie – Verlag Chemie, Weinheim, Germany.
14. Solubilities of Inorganic and Organic Compounds – 3rd edition and supplement, A. Seidell and W.F. Linke, Van Nostrand, New York, 1941-1952.
15. Selected Values of Physical and Thermodynamic Properties of Hydrocarbons and Related Compounds, – F.D. Rossini, et al., American Petroleum Institute Project 44, American Petroleum Institute, Pittsburgh, Pa., 1953.
16. Heat of Combustion and Formation of Organic Compounds – E.S. Domalski, *Journal of Physical and Chemical Reference Data*, **1**, 221 (1972).
17. Surface Tension of Pure Liquid Compounds – J.L. Jasper, *J. Phys. Chem. Ref. Data*, **1**, 841 (1972).
18. JANAF Thermochemical Tables – NSRDS-NBS-37 (1970); 1974 Supplement and complete index, *J. Phys. Chem. Ref. Data*, **3**, 311 (1974).
19. Physical and Thermodynamic Properties of Aliphatic Alcohols – R.C. Wilhoit and B. J. Zwolinski, *J. Phys. Chem. Ref. Data*, **2** (1973), Supplement 1.
20. Critical Constants of Hydrocarbons – C. A. Passut and R. P. Danner, *Ind. Eng. Chem., Proc. Des. Devel.*, **12**, 365 (1973).

11. CHEMICAL-SPECIFIC INFORMATION

AAD

ACETALDEHYDE

Common Synonyms Acetic aldehyde Ethanal	Watery liquid Colorless Sharp fruity odor Floats and mixes with water. Flammable, irritating vapor is produced. Boiling point is 69°F.
Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Vapor is heavier than air.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness. LIQUID Will burn skin and eyes. Harmful if swallowed. HAZARDOUS TO AQUIATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.
Water Pollution	HARMFUL TO AQUIATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Codes Handbook CG 446-4) Issue warning of high flammability. Downwind and flash.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetic aldehyde Ethanal Ethyl aldehyde 3.2 Coast Guard Compatibility Classification: Aldehyde 3.3 Chemical Formula: CH ₃ CHO 3.4 IMCO United Nations Numerical Designation: 1.1, 1000	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Penetrating, fruity, sharp pungent
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, eye goggles, and other equipment to prevent any contact with body. Organic vapor or air pack as required. 5.2 Symptoms Following Exposure: If breathing vapors will be irritating and may cause nausea, vomiting, headache, and unconsciousness. Contact with eyes may cause burns. Skin contact from cleaning w/ w/ chemical causes burns or severe irritation. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air. If breathing has stopped give artificial respiration. If breathing is difficult give oxygen call a physician at once. SKIN: Wash with soap and water. EYES: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: 50 ppm for 60 min. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ is 5 g/kg rat. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel working usual conditions at moderate or high concentrations. 5.9 Liquid or Solid Irritant Characteristics: Minor irritant. If splashed on clothing and allowed to remain may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.21 ppm	

6. FIRE HAZARDS 6.1 Flash Point: -36°F (C) -54°F (C) 6.2 Flammable Limits in Air: 4 - 60% 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Produces irritating vapor when heated. 6.6 Behavior in Fire: Vapors are heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 36°F 6.8 Electrical Hazard: Class I Group C. 6.9 Burning Rate: 13 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 10 ppm/96 hr. sunfish 11 m. fresh water 70 ppm/24 hr. perch 11 m. salt water 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 93 - 12% 5 days 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: May occur. Avoid heat, dust, strong oxidizing or reducing substances, strong acids and bases. 7.6 Inhibitor of Polymerization: None.	9. SELECTED MANUFACTURERS 1. Celanese Corp. Celanese Chemical Co. Division 245 Park Ave. New York, N.Y. 10017 2. Eastman Kodak Co. Texas Eastman Co. Division Longview, Texas 75601 3. Union Carbide Corp. Chemicals & Plastics Division 270 Park Ave. New York, N.Y. 10017																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook CG 446-3 ABC11-NZ	10. SHIPPING INFORMATION 10.1 Grade or Purity: >99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Inert 10.4 Venting: Safety relief.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 HAS Hazard Rating for Bulk Water Transportation: <table data-bbox="982 1390 1226 1660"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>4</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>4</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td> Poison</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>2</td></tr> <tr> <td> Aquatic Toxicity</td><td>3</td></tr> <tr> <td> Acute Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>2</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="982 1692 1226 1778"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>4</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	4	Liquid or Solid Irritant	1	Poison	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	Acute Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	4	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 44.05 13.3 Boiling Point at 1 atm: 64.7°F = 20.4°C = 293.6°K 13.4 Freezing Point: -38°F = -12.2°C = 256°K 13.5 Critical Temperature: 159°F = 65°C = 341°K 13.6 Critical Pressure: 520 psia = 34.4 atm = 4.5 MN/m ² 13.7 Specific Gravity: 0.784 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 1.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.152 13.12 Latent Heat of Vaporization: 245 Btu/lb = 11.6 cal/g = 5.69 x 10 ³ J/kg 13.13 Heat of Combustion: -13,460 Btu/lb = -5,590 cal/g = -24,410 J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
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NOTES (continued on page 1 and 2)																																					

REVISED 1978

AAC	ACETIC ACID
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Chemical Data Sheet Glacial acetic acid Ethanoic acid Vinegar acid	Watery liquid Colorless Strong vinegar odor
Sinks and mixes with water. Irritating vapor is produced. Freezing point is 62° F.	
Fire	Combustible Vapor may explode if ignited in an enclosed area. Will burn vigorously in air. Extinguish with water, carbon dioxide, or foam.
Exposure	CAUSE FOR MEDICAL ATTENTION VAPOR Irritating to nose and throat. If inhaled, will cause coughing, nausea, vomiting, or difficult breathing. LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed. First aid: If in eyes, wash with plenty of water. If inhaled, get to fresh air. If swallowed, do not induce vomiting. Seek medical attention.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning, corrosive. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethanoic acid Glacial acetic acid Vinegar acid 3.2 Coast Guard Compatibility Classification: Organic acid 3.3 Chemical Formula: CH₃COOH 3.4 IMCO United Nations Numerical Designation: 1.1 (142)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Characteristic vinegar, pungent vinegar-like sharp
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing should be worn when skin contact might occur. Respiratory protection necessary when exposed to vapors. Eye protection. 5.2 Symptoms Following Exposure: Breathing of vapors causes coughing, chest pain, and irritation of nose and throat may cause nausea and vomiting. Contact with skin may cause severe burn. 5.3 Treatment for Exposure: INHALATION: move victim to fresh air. Breathing become difficult give oxygen. Get medical care quickly. INGESTION: if victim is conscious, have him drink water or milk. do NOT induce vomiting. SKIN OR EYE CONTACT: flush immediately with plenty of clean running water. Wash eyes for at least 15 min. and get medical care as quickly as possible. Remove contaminated clothing and launder before reuse. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 5.5 Short-Term Inhalation Limits: 40 ppm for 5 min. 5.6 Toxicity by Ingestion: Grade 2 (EPA 505.9-6 Agreement) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate to severe irritation to mucous membranes and find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Liquid severe skin irritant. May cause pain and second degree burns after a few minutes of contact. 5.10 Odor Threshold: 1.0 ppm	

6 FIRE HAZARDS 61 Flash Point: 112°F (40°C) 62 Flammable Limits in Air: 4.2 - 16.0% 63 Fire Extinguishing Agents: Water, alcohol foam, dry chemical or carbon dioxide 64 Fire Extinguishing Agents Not to be Used: None 65 Special Hazards of Combustion Products: Irritating vapor generated when heated 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Stable 68 Electrical Hazard: Not pertinent 69 Burning Rate: 1.6 mm/min	8 WATER POLLUTION 81 Aquatic Toxicity: 10 ppm 96 hr. Daphnia 11 hr. Fresh water; 10 ppm 96 hr. Daphnia 11 hr. Fresh water; 100 330 ppm 48 hr. shrimp 15% acrated water 82 Waterfowl Toxicity: Not pertinent 83 Biological Oxygen Demand (BOD): 52, 62, 5 days 84 Food Chain Concentration Potential: None noted																																				
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: Corrosive, particularly when diluted. Attacks most common metals including most stainless steels. Excellent solvent for many synthetic resins or rubber. 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Dilute with water; rinse with sodium bicarbonate solution 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Celanese Corp. Celanese Chemical Co. Div. 230 Park Ave. New York, N.Y. 10017 2. Eastman Kodak Co. Tennessee Eastman Co. Div. Kingston, Tenn. 37602 3. Union Carbide Corp. Chemicals & Plastics Div. 270 Park Ave. New York, N.Y. 10017																																				
10 SHIPPING INFORMATION 101 Grades or Purity: Commercial 1 NCP 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open																																					
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, C1, 6-15, 1 A P Q	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 60.05 13.3 Boiling Point at 1 atm: 244.1°F = 117.8°C = 391.1°K 13.4 Freezing Point: 62.1°F = 16.7°C = 290°K 13.5 Critical Temperature: 612°F = 321.8°C = 594.8°K 13.6 Critical Pressure: 519 psia = 35.7 atm = 5.78 MN/m² 13.7 Specific Gr. (liq): 1.051 at 20°C (liquids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.24 13.12 Latent Heat of Vaporization: 17.1 Btu/lb = 58.7 cal/g = 2.05 x 10³ J/kg 13.13 Heat of Combustion: -5645 Btu/lb = -1136 cal/g = -4.75 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																																				
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ACA

ACETIC ANHYDRIDE

Common Synonyms Ethanoic anhydride	Watery liquid Colorless Strong vinegar odor Sinks and reacts slowly with water. Irritating vapor is produced.
Fire	Combustible: Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR: Will burn eyes. Irritating to nose and throat. If inhaled, will cause nausea, vomiting, or difficult breathing. LIQUID: Will burn skin and eyes. Harmful if swallowed.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Materials Handbook, CG 445-4) Issue warning, contain, and dispose and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethanoic anhydride 3.2 Coast Guard Competibility Classification: Organic anhydride 3.3 Chemical Formula: CH ₃ COOCH ₃ 3.4 FMCO United Nations Numerical Designation: 140215	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Very strong, pungent, vinegar-like character.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing when skin contact might occur; respiratory protection equipment for all exposures; complete eye protection. 5.2 Systems Following Exposure: Liquid is irritant and causes skin irritation. Ingestion causes severe burns when clothing is wet with the chemical or if it enters the mouth. Nausea and vomiting may develop after exposure. 5.3 Treatment for Exposure: INHALATION: Move victim to fresh air. If breathing becomes difficult, give oxygen per medical advice quickly. INGESTION: do NOT induce vomiting. SKIN OR EYE CONTACT WITH LIQUID OR VAPOR: Flush immediately with plenty of clean running water. Wash eyes for at least 15 min. and get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): ppm 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Toxic if it enters the stomach. 5.7 Late Toxicity: Not pertinent. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating to the respiratory tract at levels above moderate to high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Liquid is severely irritant to the skin and causes severe burns after a few minutes of contact. 5.10 Odor Threshold: 0.1 ppm	

6. FIRE HAZARDS

- 6.1 **Flash Point:** 146°F (6°C) 120°F (50°C)
 5.2 **Flammable Limits in Air:** 2% - 10.0%
 6.3 **Fire Extinguishing Agents:** Water spray, dry chemical, alcohol foam, or carbon dioxide.
 6.4 **Fire Extinguishing Agents Not to be Used:** Water and foam react, but heat liberated is not enough to create a hazard. Dry chemical forced below the surface can cause foaming, and bubbling.
 6.5 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
 6.6 **Behavior in Fire:** Not pertinent.
 6.7 **Ignition Temperature:** 640°F
 6.8 **Electrical Hazard:** Not pertinent.
 6.9 **Burning Rate:** 4.3 cm/min.

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Reacts slowly with water; considerable heat liberated when water spray is used.
 7.2 **Reactivity with Common Materials:** Corrosive to steel and other metals.
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Caustics:** Dilute with water; use sodium bicarbonate solution to treat.
 7.5 **Polymerization:** Not pertinent.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 50 ppm 96 hr; bluegill; 1 mg/l for 96 hr; 100 mg/l for 48 hr; shrimp; 10 mg/l for 96 hr.
 8.2 **Waterfowl Toxicity:** Not pertinent.
 8.3 **Biological Oxygen Demand (BOD):** 5% 15 days.
 8.4 **Food Chain Concentration Potential:** None noted.

9. SELECTED MANUFACTURERS

1. Celanese Corp.
 Celanese Chemical Co., Inc.
 245 Park Ave.
 New York, N.Y. 10017
 2. Eastman Kodak Co.
 Eastman Eastman Co., Inc.
 Kingsport, Tenn. 37662
 3. Eastman Kodak Corp.
 Chemicals and Plastics Div.
 270 Park Ave.
 New York, N.Y. 10017

10. SHIPPING INFORMATION

- 10.1 **Gross or Purity:** Pure 99.9% min.
 Technical 99.9% min.
 10.2 **Storage Temperature:** Ambient.
 10.3 **Inert Atmosphere:** No requirement.
 10.4 **Venting:** Pressure required.

11. HAZARD ASSESSMENT CODE

From the hazard assessment codebook: 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.

A P Q

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Corrosive Material.
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 2 |
| Health | 2 |
| Vapor Irritant | 1 |
| Liquid or Solid Irritant | 1 |
| Poisons | 1 |
| Water Pollution | 1 |
| Human Toxics | 2 |
| Aquatic Toxics | 2 |
| Acute Effect | 2 |
| Reactivity | 1 |
| Other Chemicals | 1 |
| Water | 2 |
| Self Reaction | 0 |
- 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 2 |
| Reactivity (Yellow) | 1 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid.
 13.2 **Molecular Weight:** 102.09.
 13.3 **Boiling Point at 1 atm:** 140.1°C = 284.2°F = 412.3 K.
 13.4 **Freezing Point:** -100.1°C = -148.2°F = 173.1 K.
 13.5 **Critical Temperature:** 304.1°C = 579.4°F = 577.3 K.
 13.6 **Critical Pressure:** 47.9 atm = 48.2 atm = 4.82 MN/m².
 13.7 **Specific Gravity:** 1.08 at 20°C (liquid).
 13.8 **Liquid Surface Tension:** Not pertinent.
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.09.
 13.12 **Latent Heat of Vaporization:** 114 Btu/lb = 26.2 cal/g = 277 J/g = 107 J/mol.
 13.13 **Heat of Combustion:** -1795 Btu/lb = -81.5 cal/g = -341 J/g = -132 J/mol.
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** Not pertinent.
 13.16 **Heat of Polymerization:** Not pertinent.

NOTES

REVISED 1978

ACT

ACETONE

Common Synonyms Dimethyl Ketone Propanone	Watery liquid Colorless Sweet odor Floats and mixes with water. Flammable, irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, may cause difficult breathing or loss of consciousness. LIQUID Irritating to eyes. Not irritating to skin.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-1. Avoid warhead. High flammability. Dispose as usual.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dimethyl ketone 2 Propanone 3.2 Coast Guard Compatibility Classification: None 3.3 Chemical Formula: <chem>CH3COCH3</chem> 3.4 IMCO United Nations Numerical Designation: 1101	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweetish, pleasant, sometimes sharp, pungent, sharp, penetrating, cooling, sometimes pleasant, sometimes pungent.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor canister or a self-supplied mask, synthetic rubber gloves, chemical safety goggles or face splash shield. 5.2 Symptoms Following Exposure: INHALATION: vapor irritating to eyes and mucous membranes; acts as an anesthetic in very high concentrations. INGESTION: a wide variety of toxicities but very irritating to mucous membranes. SKIN: prolonged excessive contact causes defatting of the skin, possibly leading to dermatitis. 5.3 Treatment for Exposure: INHALATION: if victim is overcome, remove to fresh air and call a physician. INGESTION: if victim has swallowed large amounts and is conscious and not having convulsions, induce vomiting and get medical help promptly. No specific antidote known. SKIN: wash well with water. EYES: flush with water immediately for at least 15 min. Consult a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: 1000 ppm for 30 min 5.6 Toxicity by Ingestion: Grade I (Dose 10 g/kg) 5.7 Oral Toxicity: Not pertinent. 5.8 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors cause moderate irritation of the eye or respiratory system. Effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly from the skin. 5.10 Odor Threshold: 100 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 47°F (11°C) 6.2 Flammable Limits in Air: 2.5% - 12.5% 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water in straight hose stream will wet and spread fire and should not be used. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 500°F 6.8 Electrical Hazard: Class I, Group D. 6.9 Burning Rate: Moderate.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 4250 ppm, 24 hr; 5000 ppm, 96 hr; 1000 ppm, 48 hr; 2000 ppm, 144 hr; turbid water. 8.2 Waterway Toxicity: Not pertinent. 8.3 Biological Oxygen Demand (BOD): Theoretical 125% in 5 days. 8.4 Food Chain Concentration Potential: None noted.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive. 7.2 Reactivity with Common Materials: Not reactive. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Allied Chemical Corp. Specialty Chemicals Div. Wilmington, Delaware Marcus Hook, Pa. 19381 2. Shell Chemical Co. Industrial Chemicals Div. Houston, Texas 77001 3. Union Carbide Corp. Chemicals and Plastics Div. 270 Park Ave. New York, N.Y. 10017																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-2. VP000	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical: 99.95% plus 0.05% water Reagent: 99.95% plus 0.05% water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arrested or pressure vacuum.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td>1</td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Acute Toxicity</td> <td>1</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>1</td> </tr> <tr> <td>Self-Reaction</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	1	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	1	Acute Toxicity	1	Reactivity	1	Other Chemicals	1	Water	1	Self-Reaction	1	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 58.1 13.3 Boiling Point at 1 atm: 56.1°C (133°F) 13.4 Freezing Point: -94.8°C (-138.6°F) 13.5 Critical Temperature: 205.1°C (397.2°F) 13.6 Critical Pressure: 48.2 atm (4820 kPa) 13.7 Specific Gravity: 0.791 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 2.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.27 13.12 Latent Heat of Vaporization: 220 Btu/lb = 12.5 cal/g = 51.1 kJ/kg 13.13 Heat of Combustion: -12,250 Btu/lb = -5600 kJ/kg = -25.9 MJ/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	1																																				
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NOTES 1. Continued on page 2 of 2																																					

REVISED 1978

ACY	ACETONE CYANOHYDRIN
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Common Synonyms: 2-Methyl lactonitrile Alpha-hydroxy nitrile	Waters: liquid Colorless Mild almond odor	Floats and mixes with water. Poisonous vapor is produced.
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear chemical protective suit with self-contained breathing apparatus. Stop discharge if possible. Stop operation and use water spray to knock down vapor. Call fire department. Isolate and secure discharge material. Notify authorities with appropriate agency.		
Fire	Combustible POISONOUS GASES ARE PRODUCED WHEN HEATED Vapor may explode if ignited in an enclosed area. WEAR CHEMICAL PROTECTIVE SUIT WITH SELF-CONTAINED BREATHING APPARATUS. Combustible in solid, liquid, and vapor phase and oxidation. Extinguish with water. If burning in shell, use water to break shell. Exposed containers with water.	
 Exposure	CAUTION: MEDIUM VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat. More: Irritant. If breathing has stopped, give artificial respiration. If breathing is difficult, use oxygen. LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes. Remove contaminated clothing. Wash with plenty of water. DO NOT ALLOW SWALLOWED LIQUID TO BE CONSIDERED SAFE (victim drinks water, milk, and has vomited). IF SWALLOWED AND VICTIM IS UNCONSCIOUS OR HAVING CONVULSIONS, DO NOT INDUCE VOMITING.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Signs of health of wildlife. Effects. Notify pertinent authority with release.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Two warning: poison. Restrict access. Should be removed: human toxicity.		
2. LABEL  POISON		
3. CHEMICAL DESIGNATIONS 31 Synonyms: alpha-Hydroxy nitrile; 2-Methyl lactonitrile 32 Coast Guard Compatibility Classification: Cyanohydrin 33 Chemical Formula: (CH₃)₂C(OH)CN 34 IMCO/United Nations Numerical Designation: 6.1 1541		
4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): liquid 42 Color: colorless 43 Odor: characteristic, distinct, strong cyanide.		
5. HEALTH HAZARDS 51 Personal Protective Equipment: Air supplied mask with canister, approved respirator with acrylonitrile, in less than 2% concentrations; rubber or plastic gloves; cover goggles or face mask; rubber boots; slicker suit; safety helmet. 52 Symptoms Following Exposure: At low dosages the earliest symptoms may be weakness, headaches, confusion and occasionally nausea and vomiting. Respiratory rate and depth will usually be increased at the beginning and at later stages become slow and easing. 53 Treatment for Exposure: Call a physician for all cases of exposure. INHALATION: remove victim to fresh air. (Rescuer should wear suitable risk.) INGESTION: if victim is conscious, induce vomiting by having him drink strong salt water. SKIN: remove contaminated clothing and wash affected skin thoroughly with soap and water. EYES: hold eyelids apart and wash with continuous gentle stream of water for at least 15 min. If breathing has stopped, give artificial respiration until physician arrives. If victim is unconscious, administer and ventilate by crushing an ampule of ethyl and holding it under his nose for 15 seconds, in every minute. Do not interrupt artificial respiration during this procedure. Replace ampule when its strength is spent. Continue treatment until victim's condition improves or physician arrives. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Grade 4 below 50 mg/kg (mice). 57 Late Toxicity: Causes liver damage in rats. 58 Vapor (Gaseous) Irritant Characteristics: Vapors irritate the eyes and respiratory system if present in high concentrations. The effect is temporary. (Continued on page 4)		

6. FIRE HAZARDS 1 Flash Point: 165°F (74°C) 2 Flammable Limits in Air: 2.5% - 12.5% 3 Fire Extinguishing Agents: Water spray, dry chemical, alcohol foam, carbon dioxide. 4 Fire Extinguishing Agents Not to be Used: Not pertinent. 5 Special Hazards of Combustion Products: Toxic hydrogen cyanide is generated when heated. 6 Behavior in Fire: Not pertinent. 7 Ignition Temperature: 1270°F 8 Electrical Hazard: Not pertinent. 9 Burning Rate: Data not available.	8. WATER POLLUTION 81 Aquatic Toxicity: Data not available. 82 Waterway Toxicity: Not pertinent. 83 Biological Oxygen Demand (BOD): Data not available. 84 Food Chain Concentration Potential: Data not available.																																				
7. CHEMICAL REACTIVITY 1 Reactivity with Water: No reaction. 2 Reactivity with Common Materials: No reaction. 3 Stability During Transport: Stable. 4 Neutralizing Agents for Acids and Caustics: Not pertinent. 5 Polymerization: Not pertinent. 6 Inhibitor of Polymerization: Not pertinent.																																					
9. SELECTED MANUFACTURERS 1 Aldrich Chemical Co. 940 West St. Paul Ave. Milwaukee, Wis. 53233 2 Eastman Kodak Co. Rochester, New York 14650 3 Rohm and Haas Co. Independence Mall West Philadelphia, Pa. 19138																																					
10. SHIPPING INFORMATION 101 Grades or Purity: 98.99% 102 Storage Temperature: Ambient. 103 Inert Atmosphere: No requirement. 104 Venting: Pressure/vacuum.																																					
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P Q																																					
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Poisonous liquid or solid, Class B. 122 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>1</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>1</td></tr> <tr><td>Liquid or Solid Irritant</td><td>2</td></tr> <tr><td>Poisons</td><td>4</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>4</td></tr> <tr><td>Aquatic Toxicity</td><td>3</td></tr> <tr><td>Aesthetic Effect</td><td>3</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>2</td></tr> <tr><td>Water</td><td>3</td></tr> <tr><td>Self Reaction</td><td>0</td></tr> </tbody> </table> 123 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>4</td></tr> <tr><td>Flammability (Red)</td><td>1</td></tr> <tr><td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>		Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	4	Water Pollution		Human Toxicity	4	Aquatic Toxicity	3	Aesthetic Effect	3	Reactivity		Other Chemicals	2	Water	3	Self Reaction	0	Category	Classification	Health Hazard (Blue)	4	Flammability (Red)	1	Reactivity (Yellow)	2
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Flammability (Red)	1																																				
Reactivity (Yellow)	2																																				
13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: liquid 132 Molecular Weight: 85.11 133 Boiling Point at 1 atm: Decomposes. 134 Freezing Point: -22.5°C = -21°F = -25.5°K. 135 Critical Temperature: Not pertinent. 136 Critical Pressure: Not pertinent. 137 Specific Gravity: 0.925 at 25°C (liquid). 138 Liquid Surface Tension: Not pertinent. 139 Liquid-Water Interfacial Tension: Not pertinent. 1310 Vapor (Gas) Specific Gravity: Not pertinent. 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 1312 Latent Heat of Vaporization: Data not available. 1313 Heat of Combustion: Data not available. 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: Not pertinent. 1316 Heat of Polymerization: Not pertinent.																																					
5. HEALTH HAZARDS (Cont'd) 59 Liquid or Solid Irritant Characteristics: Causes stinging of the skin and first degree burns on short exposure and may cause secondary burns on long exposure. 510 Odor Threshold: Data not available.																																					

ATN

ACETONITRILE

Common Synonyms: Methyl cyanide Cyanoacetaldehyde Ethane nitrile	Watery liquid Colorless Sweet odor Floats and mixes with water. Flammable, irritating vapor is produced.
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED WHEN HEATED Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled, will cause difficult breathing LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability. Dispense and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethane nitrile Ethyl nitrile Cyanoacetaldehyde Methyl cyanide 3.2 Coast Guard Compatibility Classification: Nitrile 3.3 Chemical Formula: CH_3CN 3.4 IMCO/United Nations Numerical Designation: 6.1, 1645	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweet, ethereal
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Wear self-contained breathing apparatus. 5.2 Symptoms Following Exposure: Exposure to 100 ppm for 4 hours causes flushing of the face and a feeling of constriction in the chest. 500 ppm for brief periods is irritating to the nose and throat. Severe exposures cause irritability, skin eruptions, confusion, delirium, convulsions, paralysis and death due to central nervous system depression. 5.3 Treatment for Exposure: Remove victim from contaminated atmosphere. Give artificial respiration and oxygen if respiration is impaired. 5.4 Toxicity by Inhalation (Threshold Limit Value): 40 ppm 5.5 Short-Term Inhalation Limits: 40 ppm for 60 min 5.6 Toxicity by Ingestion: (Grade 3-5) 500 mg/kg (guinea pig) 5.7 Late Toxicity: Not pertinent 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. Effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and red dening of the skin. 5.10 Odor Threshold: 4 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 42°F (0°C) 6.2 Flammable Limits in Air: 4.4% - 16% 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Toxic vapors are generated when heated 6.6 Behavior in Fire: Vapor heavier than air and may travel a considerable distance to a source of ignition and flash back 6.7 Ignition Temperature: 975°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 2" min/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 1150 ppm/24 hr. Fathead minnow, 11 m hard water 8.2 Waterfowl Toxicity: Not pertinent 8.3 Biological Oxygen Demand (BOD): 1/5 days 8.4 Food Chain Concentration Potential: None noted																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. American Cyanamid Co. Industrial Chemicals and Plastics Division New Orleans, La. 70121 2. Eastman Kodak Co. Texas Eastman Co. Division Longview, Texas 75601 3. Avtron Corp. Midland Building Cleveland, Ohio 44115																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-P-O-R-N	10. SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Pressure vacuum																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>3</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>3</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>2</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>1</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>2</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></tbody></table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	3	Water Pollution		Human Toxicity	2	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 41.05 13.3 Boiling Point at 1 atm: 179°F = 81.6°C = 354.8°K 13.4 Freezing Point: -20.5°F = -4.87°C = 27.5°K 13.5 Critical Temperature: 526.5°F = 274.7°C = 547.9°K 13.6 Critical Pressure: 701 psia = 47.7 atm = 4.93 MN/m ² 13.7 Specific Gravity: 0.787 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.4 13.11 Ratio of Specific Heats of Vapor (Gas): 1.192 13.12 Latent Heat of Vaporization: 113 Btu/lb = 174 cal/g = 7.29 x 10 ⁴ J/kg 13.13 Heat of Combustion: -13,360 Btu/lb = -7420 cal/g = -3.17 x 10 ⁴ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	3																												
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Continued on pages 5 and 6

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ATA

ACETYLACETONE

Common Synonyms 2,4-Pentanedione Diacetyl methane		Liquid Colorless Unpleasant Odor
		Floats and mixes slowly with water. Flammable, irritating vapor is produced.
Short ignition sources. Call fire department. Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Notify local health and pollution control agencies.		
Fire	Combustible Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or alcohol foam. Carbon dioxide water may be ineffective. Do not use water spray. Do not mix with water.	
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes. If inhaled will cause dizziness, coughing, headache, or loss of consciousness. If on eyes, flush with plenty of water. If on clothing, "trapped" at or near head respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, do not induce VOMITING. IF UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify water treatment plant.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 444-4.) Issue warning - water contaminant. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Diacetyl methane 2,4-Pentanedione 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: $\text{CH}_3\text{COCH}_2\text{COCH}_3$ 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Water white 4.3 Odor: Unpleasant
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety glasses, eye bath and safety shower, air supplied mask for concentrations above 2%. 5.2 Symptoms Following Exposure: Inhalation causes dizziness, headache, nausea, vomiting and loss of consciousness. Contact with liquid irritates eyes. 5.3 Treatment for Exposure: INHALATION: remove to fresh air; if victim is not breathing, give artificial respiration and then oxygen; call a physician. EYES or SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, oral $\text{LD}_{50} = 1,000 \text{ mg/kg (rat)}$. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS

- 6.1 **Flash Point:** 105°F (30°C) 93°F (34°C)
 6.2 **Flammable Limits in Air:** 2.4% - 11.6%
 6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide.
 6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective on fire.
 6.5 **Special Hazards of Combustion Products:**
 6.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back.
 6.7 **Ignition Temperature:** 643°F
 6.8 **Electrical Hazard:** Data not available.
 6.9 **Burning Rate:** 3.6 mm/min.

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction.
 7.2 **Reactivity with Common Materials:** May dissolve plastics.
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
 7.5 **Polymerization:** Not pertinent.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available.
 8.2 **Waterfowl Toxicity:** Data not available.
 8.3 **Biological Oxygen Demand (BOD):** Data not available.
 8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

1. Union Carbide Corp.
 Chemicals and Plastics Div.
 270 Park Avenue
 New York, N.Y. 10017
 2. Aldrich Chemical Co.
 940 W. Saint Paul Ave.
 Milwaukee, Wis. 53233
 3. Eastman Organic Chemicals
 343 State Street
 Rochester, N.Y. 14650

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** Commercial.
 10.2 **Storage Temperature:** Ambient.
 10.3 **Inert Atmosphere:** No requirement.
 10.4 **Venting:** Open (flame arrester).

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 444-3.)
 A P G

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed.
 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.
 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 2 |
| Reactivity (Yellow) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid.
 13.2 **Molecular Weight:** 100.12.
 13.3 **Boiling Point at 1 atm:**
 $244.7^\circ\text{F} = 140.4^\circ\text{C} = 413.6^\circ\text{K}$
 13.4 **Freezing Point:**
 $-10.3^\circ\text{F} = -23.5^\circ\text{C} = 249.7^\circ\text{K}$
 13.5 **Critical Temperature:** Not pertinent.
 13.6 **Critical Pressure:** Not pertinent.
 13.7 **Specific Gravity:** 0.975 at 20°C.
 13.8 **Liquid Surface Tension:**
 $31.2 \text{ dyne/cm} = 0.0312 \text{ N/m at } 20^\circ\text{C}$
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
 13.10 **Vapor (Gas) Specific Gravity:** 3.45.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.072.
 13.12 **Latent Heat of Vaporization:**
 $194 \text{ Btu/lb} = 108 \text{ cal/g} = 4.52 \times 10^3 \text{ J/kg}$
 13.13 **Heat of Combustion:** -11,070 Btu/lb
 $= -6,150 \text{ cal/g} = -257 \times 10^3 \text{ J/kg}$
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** -11.5 Btu/lb
 $= -6.4 \text{ cal/g} = -0.27 \times 10^3 \text{ J/kg}$
 13.16 **Heat of Polymerization:** Not pertinent.

Continued on pages 9 and 6

NOTES

ABM

ACETYL BROMIDE

Common Synonyms		Liquid	Colorless	Sharp unpleasant odor
Flammable, irritating vapor is produced				
AVOID CONTACT WITH LIQUID AND VAPOR. KEEF PROFFE AWAY VAPOR: If inhaled, get fresh air immediately. If in contact with skin, wash with water. If in contact with eyes, flush with water for at least 15 minutes. If in contact with clothing, remove clothing immediately. If in contact with hair, wash with water. If in contact with face, wash with water. If in contact with hands, wash with water. If in contact with feet, wash with water. If in contact with mouth, do not swallow. If in contact with nose, do not sniff. If in contact with ears, do not insert. If in contact with neck, do not touch. If in contact with back, do not scratch. If in contact with arms, do not rub. If in contact with legs, do not rub. If in contact with feet, do not rub.				
Fire	FLAMMABLE: Irritating gases are produced when heated Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Weigh, seal, store, and dispose of in proper containers Do not use water on fire			
Exposure	VAPOR: Irritating to eyes, nose and throat If inhaled will cause difficult breathing If in eyes, hold eyes open and flush with plenty of water If in mouth, have victim spit out and drink water If in nose, have victim sniff water If in throat, have victim drink water If in lungs, have victim drink water LIQUID: Will burn skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water If in EYES, hold eyes open and flush with plenty of water If SWALLOWED, have victim drink water If SWALLOWED and victim is UNCONSCIOUS, have victim drink water Do not induce vomiting			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and welfare officials Notify appropriate water pollution agency			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning - corrosive Restrict access Evacuate area Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: CH3COBr 3.4 IMCO/United Nations Numerical Designation: 81716		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Acid and sharp		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety goggles, gloves, adequate ventilation provisions for flushing eyes or skin with water 5.2 Symptoms Following Exposure: Inhalation produces primary irritation of the respiratory tract. Symptoms of lung damage may be delayed. Contact with liquid produces primary irritation of eyes and severe skin damage. Delayed blistering is not uncommon. 5.3 Treatment for Exposure: INHALATION: remove victim from exposure; if breathing has stopped give artificial respiration, if breathing is difficult, give oxygen; watch for delayed lung damage. EYES: flush with water for at least 15 min.; get medical attention. SKIN: flush with water; treat burns as needed. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral rat LD50 = 3,310 mg/kg (acetic acid). Decomposes violently in water forming bismic acid and acetic acid. 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: 5.0 x 10^-4 ppm				

5. FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water 6.5 Special Hazards of Combustion Products: Toxic and irritating hydrogen bromide fumes may form in fires 6.6 Behavior in Fire: Do not apply water to adjacent fires. Reacts with water to produce toxic and irritating gases 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently forming corrosive and toxic fumes of hydrogen bromide 7.2 Reactivity with Common Materials: Attacks and corrodes wood and most metals in the presence of moisture. Flammable hydrogen gas may collect in enclosed spaces 7.3 Stability During Transport: Stable if protected from moisture 7.4 Neutralizing Agents for Acids and Caustics: Flood with water; rinse with dilute sodium bicarbonate or soda ash solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Eastman Organic Chemicals 343 State Street Rochester, N.Y. 14650 2 Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233 3 Gallard Schlesinger Chemical Mfg. Co. 584 Mincola Ave. Carle Place, N.Y. 11514
	10. SHIPPING INFORMATION 10.1 Grades or Purities: Analytical Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Padded 10.4 Venting: Pressure/vacuum
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-2) A-O	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 122.95 13.3 Boiling Point at 1 atm: 169°F = 76°C = 349°K 13.4 Freezing Point: -141.7°F = -96.5°C = 176.7°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.66 at 16°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 4.24 13.11 Ratio of Specific Heats of Vapor (Gas) (est): 1.144 13.12 Latent Heat of Vaporization: 106 Btu/lb = 49 cal/g = 2.5×10^5 J/kg 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	

Continued on page 5 and 6

NOTES

ACC

ACETYL CHLORIDE

Common Synonyms		Liquid	Colorless	Sharp odor
		Reacts violently with water. Irritating visible vapor cloud is produced.		
See Response Methods Handbook, CG 448-1 True warning: high flammability, corrosive Restrict access Disperse and flush				
Fire		FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.		
Exposure		VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. LIQUID Will burn skin and eyes. Harmful if swallowed.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-1)		2. LABEL		
True warning: high flammability, corrosive Restrict access Disperse and flush				
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: No common synonyms 3.2 Coast Guard Competibility Classification: Not applicable 3.3 Chemical Formula: <chem>CH3COCl</chem> 3.4 IMCO/United Nations Numerical Designation: N-1717		4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Safety goggles, rubber or plastic gloves, self-contained breathing apparatus 5.2 Symptoms Following Exposure: Vapor irritates mucous membranes. Ingestion of liquid in contact with eyes or skin causes severe irritation 5.3 Treatment for Exposure: INHALATION: remove from exposure, seek medical attention. EYES: flush with copious amounts of water. SKIN: flush with copious amounts of water. INGESTION: give plenty of water; do NOT induce vomiting 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Readily hydrolyzes to form hydrochloric and acetic acids. Oral human LD₅₀ = 1470 mg/kg (acetic acid). Grade 2 oral rat LD₅₀ = 3310 mg/kg (acetic acid) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes 5.10 Odor Threshold: Acetic acid: 1 ppm; hydrochloric acid: 1 ppm				

6. FIRE HAZARDS

- 6.1 Flash Point: 40°F (4°C)
 6.2 Flammable Limits in Air: Data not available.
 6.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical.
 6.4 Fire Extinguishing Agents Not to be Used: Water, foam.
 6.5 Special Hazards of Combustion Products: When heated to decomposition, hydrogen chloride and phosgene, extremely poisonous gases, are evolved.
 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
 6.7 Ignition Temperature: 774°F
 6.8 Electrical Hazard: Data not available.
 6.9 Burning Rate: 2.6 mm/min.

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Reacts vigorously with water, evolving hydrogen chloride fumes (hydrochloric acid).
 7.2 Reactivity with Common Materials: Is highly corrosive to most metals in the presence of moisture.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: Following dilution with water, limestone or sodium bicarbonate can be used.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): Data not available.
 8.4 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

- Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650
- Allied Chemical Corp.
Specialty Chemicals Division
P.O. Box 1087R
Morristown, N.J. 07960
- White Chemical Corp.
P.O. Box 278
Bayonne, N.J. 07002

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Commercial.
 10.2 Storage Temperature: Ambient.
 10.3 Inert Atmosphere: No requirement.
 10.4 Venting: Pressure/vacuum.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 448-3)
 A-O

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Corrosive material.
 12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Fire | 3 |
| Health | |
| Vapor Irritant | 4 |
| Liquid or Solid Irritant | 4 |
| Poisons | 3 |
| Water Pollution | |
| Human Toxicity | 2 |
| Aquatic Toxicity | 3 |
| Aesthetic Effect | 2 |
| Reactivity | |
| Other Chemicals | 3 |
| Water | 4 |
| Self Reaction | 0 |

12.3 IFFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid.
 13.2 Molecular Weight: 78.5.
 13.3 Boiling Point at 1 atm: 124°F = 51°C = 324°K .
 13.4 Freezing Point: -170°F = -112°C = 161°K .
 13.5 Critical Temperature: (est.) 474°F = 246°C = 519°K .
 13.6 Critical Pressure: (est.) 445 psia = 57.4 atm = 4.83 MN/m².
 13.7 Specific Gravity: 1.029 at 20°C (liquid).
 13.8 Liquid Surface Tension: 26 dynes/cm = 0.026 N/m at 20°C .
 13.9 Liquid-Water Interfacial Tension: Not pertinent.
 13.10 Vapor (Gas) Specific Gravity: 3.
 13.11 Ratio of Specific Heats of Vapor (Gas): 1.146.
 13.12 Latent Heat of Vaporization: 160 Btu/lb = 88 cal/g = 1.1×10^5 J/kg.
 13.13 Heat of Combustion: -6,000 Btu/lb = -3,400 cal/g = -140×10^3 J/kg.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: (est.) 54 Btu/lb = 30 cal/g = 1.1×10^5 J/kg.
 13.16 Heat of Polymerization: Not pertinent.

(Continued on pages 5 and 6)

NOTES

ACE

ACETYLENE

Common Synonyms Ethyne Ethere	Compressed gas Colorless Mild garlic odor This flammable gas is slightly lighter than air and will disperse slowly unless confined
Fire	FLAMMABLE. Containers may explode in fire. Flashback along gas trail may occur. May explode if ignited in an enclosed area.
Exposure	GAS Not irritating to eyes, nose or throat. If inhaled will cause headache, difficult breathing or loss of consciousness.
Water Pollution	Not harmful to aquatic life
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability	2. LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: Ethyne Ethere 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: C_2H_2 34 IMCO United Nations Numerical Designation: 201001	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Compressed gas 42 Color: Colorless 43 Odor: Distinctive garlic-like
5. HEALTH HAZARDS 51 Personal Protective Equipment: Air supplied respirator in areas of high concentration. Avoid all sources of ignition. 52 Symptoms Following Exposure: Headache, dizziness and loss of consciousness may occur. Death from asphyxiation may occur if oxygen content of the air is severely reduced by dilution with acetylene. 53 Treatment for Exposure: INHALATION: no specific antidote known; remove victim to fresh air; keep him warm and quiet and call doctor; recovery usually rapid. If patient is unconscious, administer oxygen if breathing has stopped; give artificial respiration. 54 Toxicity by Inhalation (Threshold Limit Value): 500 ppm (suggested) 55 Short-Term Inhalation Limits: 100,000 ppm for 30 - 60 min 56 Toxicity by Ingestion: Not pertinent 57 Late Toxicity: Not pertinent 58 Vapor (Gas) Irritant Characteristics: None 59 Liquid or Solid Irritant Characteristics: Not pertinent 510 Odor Threshold: Data not available	

6. FIRE HAZARDS 61 Flash Point: Gas 62 Flammable Limits in Air: 2.5% - 80% 63 Fire Extinguishing Agents: Stop flow of gas 64 Fire Extinguishing Agents Not to be Used: Carbon dioxide, dry chemical and water sprays are not generally recommended because the discharged gas or volatile liquid may create a more serious explosion hazard. 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: May explode in fire 67 Ignition Temperature: 581°F 68 Electrical Hazard: Class I, Group A 69 Burning Rate: Not pertinent	8. WATER POLLUTION 81 Aquatic Toxicity: 1000 cc/l. 1 hr. sunfish not killed; fresh water 82 Waterfowl Toxicity: Not pertinent 83 Biological Oxygen Demand (BOD): Not pertinent 84 Food Chain Concentration Potential: Not pertinent								
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: Under certain conditions forms spontaneously explosive compounds with copper 73 Stability During Transport: Stable as shipped 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Monoschem Inc. P.O. Box 488 Grismer, Louisiana 70734 2. Monsanto Co. Monsanto Polymers & Petrochemicals Co. 800 North Lindbergh Blvd. St. Louis, Mo. 63166 3. Union Carbide Corp. Chemicals & Plastics Div. 270 Park Ave. New York, N.Y. 10017								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A B C	10. SHIPPING INFORMATION 101 Grades or Purity: Commercial grade acetylene is supplied dissolved in acetone under pressure in cylinders. 102 Storage Temperature: Data not available 103 Inert Atmosphere: Data not available 104 Venting: Data not available								
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable compressed gas 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: <table> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	4	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Compressed gas 132 Molecular Weight: 26.04 133 Boiling Point at 1 atm: $-119.3^{\circ}F = -84.0^{\circ}C = 189.2^{\circ}K$ 134 Freezing Point: Not pertinent 135 Critical Temperature: $95.3^{\circ}F = 35.2^{\circ}C = 308.4^{\circ}K$ 136 Critical Pressure: $580^{\circ}F = 304.4^{\circ}C = 6.135 \text{ MPa}$ 137 Specific Gravity: 0.913 at $-80^{\circ}C$ (liquids) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: 0.9 1311 Ratio of Specific Heats of Vapor (Gas): 1.24 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: $-20,747 \text{ Btu/lb}$ $= -11,526 \text{ cal/g} = -482.5^{\circ}F \times 10^3 \text{ J/g}$ 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	4								
Reactivity (Yellow)	2								
NOTES									

REVISED 1978

ACETYL PEROXIDE SOLUTION

Common Synonyms Diacetyl peroxide solution		Liquid	Colorless	Sharp odor
Sinks in water				
Fire		Combustible May explode on contact with combustibles. Containers may explode in fire		
Exposure		VAPOR Irritating to eyes, nose and throat LIQUID Irritating to skin and eyes Harmful if swallowed		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: Spilling material a water contaminant Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Diacetyl peroxide solution 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CH3COOACCH3 (dimethyl peroxide) 3.4 IMCO/United Nations Numerical Designation: 1.2 (1.1)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective goggles, rubber apron and gloves 5.2 Symptoms Following Exposure: Contact with liquid causes irritation to eyes and skin. Irritation of mucous membranes and stomach 5.3 Treatment for Exposure: EYES: wash with plenty of water; flush; seek medical aid. SKIN: wash with plenty of soap and water. INGESTION: induce vomiting; seek medical aid. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: 114 F (40) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: May explode. Burns with accelerating intensity 6.7 Ignition Temperature: Explodes 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: May ignite combustible materials such as wood 7.3 Stability During Transport: Heat and shock, severe accidents may separate at very low temperatures during transport 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Pennwalt Corporation Luccid Division 1740 Military Road Buffalo, N.Y. 14240 2. Arco Chemical Division Dac Industries, Inc. 555 Gardner Street Elyria, Ohio 44035								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) XXX	10. SHIPPING INFORMATION 10.1 Grades or Purity: 20% acetyl peroxide, 80% dimethyl peroxide 10.2 Storage Temperature: 12 F to 60 F (10 to 15 C) minimum 10.3 Inert Atmosphere: No requirements 10.4 Venting: Pressure vacuum								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Organic Peroxide 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>4</td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	3	Reactivity (Yellow)	4	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Mixture 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: -71 F (-57 C) (20% K) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2 at 20°C (liquid) 13.8 Liquid Surface Tension: test at 30°C, $\gamma_{\text{cm}} = 0.030 \text{ N/m}$ at 20°C 13.9 Liquid-Water Interfacial Tension: test at 30°C, $\gamma_{\text{cm}} = 0.030 \text{ N/m}$ at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: test at 1500 Btu/lb $= 8750 \text{ cal/g} = 366 \times 10^3 \text{ J/kg}$ 13.14 Heat of Decomposition: test at 50 Btu/lb $= 2400 \text{ cal/g} = 100 \times 10^3 \text{ J/kg}$ 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	3								
Flammability (Red)	3								
Reactivity (Yellow)	4								
NOTES									

(continued on page 1 and 2)

ACD

ACRIDINE

Common Synonyms Dibenz[b,e]pyridine 10-Azaanthracene Benzo[b]pyrene		Solid	Yellow	Weak irritating odor
Sinks in water				
A N N N				
Fire		Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Burns severely Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing		
Exposure		DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed If swallowed, give artificial respiration if breathing is difficult, give oxygen. EYES: wash with copious amounts of water for 20 min., seek medical attention. SKIN: wash with large amounts of water for 20 min.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 10-Azaanthracene Benzo[b]pyridine Dibenz[b,e]pyridine 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₁₇ H ₉ N 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow 4.3 Odor: Weak, somewhat irritating		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator, chemical goggles, rubber gloves 5.2 Symptoms Following Exposure: Inhalation irritates respiratory system and causes sneezing, coughing, and vomiting. Contact with liquid irritates eyes, skin, and mucous membranes. At high temperature and during sun exposure, damage to the cornea, skin, and mucous membranes may occur following the liberation of acridine vapor. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; if breathing has stopped, give artificial respiration; if breathing is difficult, give oxygen. EYES: wash with copious amounts of water for 20 min.; seek medical attention. SKIN: wash with large amounts of water for 20 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral rat LD ₅₀ = 1000 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS

- 6.1 **Flash Point:** Not pertinent (combustible solid)
 6.2 **Flammable Limits in Air:** Not pertinent
 6.3 **Fire Extinguishing Agents:** Water, foam, monoammonium phosphate, dry chemical
 6.4 **Fire Extinguishing Agents Not to be Used:** Carbon dioxide and other dry chemicals may not be effective
 6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire
 6.6 **Behavior in Fire:** Sublimes before melting
 6.7 **Ignition Temperature:** Data not available
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Not pertinent

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 9.7 ppm/L perch kill/fresh water
 *Time period not specified
 8.2 **Wetland Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Aldrich Chemical Co.
 940 W. Saint Paul Avenue
 Milwaukee, Wis. 53233
 2. E. I. du Pont de Nemours and Co.
 1200 Northern Boulevard
 Florham Park, N. J. 07931
 3. J. T. Baker Chemical Co.
 Phillipsburg, N. J. 08865

10. SHIPPING INFORMATION

- 10.1 **Grades or Purities:** Commercial
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 II

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed
 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
 12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid
 13.2 **Molecular Weight:** 179.08
 13.3 **Boiling Point at 1 atm:** 655°F = 346°C = 619°K
 13.4 **Freezing Point:** 230°F = 110°C = 383°K
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** (approx) 1.2 at 20°C (solid)
 13.8 **Liquid Surface Tension:** Not pertinent
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 13.12 **Latent Heat of Vaporization:** Not pertinent
 13.13 **Heat of Combustion:** -14,800 Btu/lb
 = -8,700 cal/g = -36.8 x 10³ J/kg
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** Not pertinent
 13.16 **Heat of Polymerization:** Not pertinent

(continued on pages 5 and 6)

NOTES

ACROLEIN

Common Synonyms Acrolein de Acrylic aldehyde Allyl aldehyde Ethyl vinyl aldehyde 2-propenal Acrylaldehyde		Waters liquid Colorless to light yellow Sharp irritating odor	
Floats and mixes with water. Poisonous flammable vapor is produced.			
Fire		FLAMMABLE POISONOUS GASES ARE PRODUCED WHEN HEATED Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area	
 Exposure		VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat LIQUID POISONOUS IF SWALLOWED Will burn eyes Irritating to skin	
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook (CG 446-4) Issue warning - high flammability air contaminant Restrict access Evacuate area Disperse and flush		2. LABELS 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acrolein de Acrylic aldehyde 2 Propenal Acrylaldehyde 3.2 Coast Guard Compatibility Classification: Aldehyde 3.3 Chemical Formula: C_3H_4O 3.4 IMCO/United Nations Numerical Designation: 311092		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: colorless to slightly yellow 4.3 Odor: Extremely sharp. Irritating or piercing. Detectable extremely irritating and pungent	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety goggles and face shield, self contained breathing apparatus, positive pressure hose mask, or three mask or industrial canister type gas mask, rubber safety shoes, clothing made of rubber or other impervious material. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat, a feeling of pressure in the chest, and shortness of breath. Nausea and vomiting commonly occur. Loss of consciousness if exposure has been sufficiently great. Congestion in the chest may be present in serious amounts and fluid may collect in the lungs. In serious cases edema of severe exposure persons. Vapor also causes severe eye irritation (redness, weeping, and swelling of eyelids) liquid burns eyes, contact with skin causes reddening, blistering. Ingestion causes severe irritation of mouth and throat. 5.3 Treatment for Exposure: Keep patient warm. The victim may require artificial respiration if breathing apparatus is not available. INHALATION: remove patient to fresh air if breathing becomes difficult give oxygen. If breathing has stopped start artificial respiration. EYES: immediately flush with plenty of water for at least 5 min. If medical attention is not immediately available continue eye irrigation for another 24 min. period. If pain completion of the first 24 min. of irrigation is impossible wait 10 or 15 min. after an effective hypodermic eye anesthetic for relief of pain. No other treatments should be used unless ordered by the physician. SKIN: flush at once with large volumes of water. Wash thoroughly with soap and water. If eyes are irritated with water. INGESTION: have victim drink large amounts of water. Induce vomiting by sucking a finger down back of throat. Do not give water until able to tolerate it with glass of water. Keep patient warm and quiet. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 ppm			

6. FIRE HAZARDS		8. WATER POLLUTION	
6.1	Flash Point: $< 0^{\circ}F$ ($< -17^{\circ}C$)	8.1	Aquatic Toxicity: 0.08 ppm/24hr rainbow trout, fresh water 9.054 ppm/96 hr oyster, 100% salt water
6.2	Flammable Limits in Air: 2% - 11%	8.2	Waterfowl Toxicity: Data not available
6.3	Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide	8.3	Biological Oxygen Demand (BOD): 33% 10 days
6.4	Fire Extinguishing Agents Not to be Used: Water may be ineffective	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: Poisonous vapor of acrolein is formed from hot liquid	9. SELECTED MANUFACTURERS	
6.6	Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Polymerization may take place and containers may explode in fire	1.	Union Carbide Corporation Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017
6.7	Ignition Temperature: 453°F	2.	Shell Chemical Company Industrial Chemicals Division P.O. Box 2463 Houston, Texas 77001
6.8	Electrical Hazard: Data not available	10. SHIPPING INFORMATION	
6.9	Burning Rate: 3.8 mm/min	10.1	Grade or Purity: Industrial 92+%
7. CHEMICAL REACTIVITY		10.2	Storage Temperature: Ambient
7.1	Reactivity with Water: No reaction	10.3	Inert Atmosphere: No requirement
7.2	Reactivity with Common Materials: No reaction	10.4	Venting: Pressure/vacuum
7.3	Stability During Transport: Stable when inhibited	11. HAZARD ASSESSMENT CODE	
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent	(See Hazard Assessment Handbook CG 446-3)	
7.5	Polymerization: Undergoes uncatalyzed polymerization reaction around 200°C. Light promotes polymerization	APQRN/	
7.6	Inhibitor of Polymerization: Hydroquinone 0.10 to 0.25%	12. HAZARD CLASSIFICATIONS	
12. HAZARD CLASSIFICATIONS		13. PHYSICAL AND CHEMICAL PROPERTIES	
12.1	Code of Federal Regulations: Flammable liquid	13.1	Physical State at 15°C and 1 atm: Liquid
12.2	NAS Hazard Rating for Bulk Water Transportation:	13.2	Molecular Weight: 56.1
		13.3	Boiling Point at 1 atm: $20.9^{\circ}F = 5.9^{\circ}C = 273.15^{\circ}K$
		13.4	Freezing Point: $-12.5^{\circ}F = -22.5^{\circ}C = 256.15^{\circ}K$
		13.5	Critical Temperature: (est.) 349°F = 176°C = 449°K
		13.6	Critical Pressure: (est.) 717 psia = 50.0 atm = 5.08 MN/m ²
		13.7	Specific Gravity: 0.843 at 20°C (liquid)
		13.8	Liquid Surface Tension: 24 dynes/cm = 0.024 N/m at 20°C
		13.9	Liquid-Water Interfacial Tension: (est.) 33 dynes/cm = 0.033 N/m at 20°C
		13.10	Vapor (Gas) Specific Gravity: 1.94
		13.11	Ratio of Specific Heats of Vapor (Gas): $\gamma = 1.45$
		13.12	Latent Heat of Vaporization: 216 Btu/lb = 120 cal/g = 5.02 x 10 ³ J/kg
		13.13	Heat of Combustion: -12,400 Btu/lb = -6,950 cal/g = -280 x 10 ³ J/kg
		13.14	Heat of Decomposition: Not pertinent
		13.15	Heat of Solution: Not pertinent
		13.16	Heat of Polymerization: (est.) -90 Btu/lb = -25 cal/g = -1.1 x 10 ³ J/kg
		5. HEALTH HAZARDS (Cont'd)	
5.5	Short-Term Inhalation Limits: 0.1 ppm - 0.2 ppm - 0.5 ppm		
5.6	Toxicity by Ingestion: Grade 4 LD ₅₀ below 50 mg/kg		
5.7	Late Toxicity: Grade 4 oral rat LD ₅₀ = 46 mg/kg Grade 4 oral rabbit LD ₅₀ = 7 mg/kg		
5.8	Vapor (Gas) Irritant Characteristics: Vapor causes severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even in low concentrations.		
5.9	Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure may cause red and degree burns on long exposure.		
5.10	Odor Threshold: 0.2 ppm		

AAM

ACRYLAMIDE

Common Synonyms Propenamide (50%) Acrylamide (50%)		Liquid	colorless	Odorless
		Sinks and mixes with water		
HAZARD STATEMENT: IRRITANT HAZARD PICTURE: C HAZARD SIGNAL: DANGER HAZARD CLASSIFICATION: H314				
Fire	Not flammable			
Exposure	VAPOR Irritating to eyes, nose and throat Harmful if inhaled			
	LIQUID Irritates skin and eyes Harmful if swallowed			
Water Pollution	INGESTION Harmful if swallowed			
	EFFECT OF LOW CONCENTRATIONS ON AQUATIC LIFE IS UNKNOWN MAY BE DANGEROUS IF IT ENTERS WATER INTAKES			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning - water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acrylic amide 50% Propenamide 50% 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $(CH_2=CHCONH_2)_2$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety glasses with side shields, clean body covering, clothing, rubber gloves, boots, apron as dictated by circumstances, in absence of proper environmental control, use approved dust respirator 5.2 Symptoms Following Exposure: Has produced central nervous system damage, which is partly reversible. Effects can be produced by oral or skin contact as well as by ingestion. Chronic acrylamide poisoning can cause midbrain disturbance and peripheral neuropathy. Contact with liquid can cause moderate irritation of eyes and skin and may cause moderate transient corneal injury. 5.3 Treatment for Exposure: INHALATION: If ill effects occur, immediately get patient to fresh air. Keep him quiet and warm, and get medical help. INGESTION: If ingested, immediately give large amounts of water (or milk if immediately available), then induce vomiting and get medical help. EYES: Immediately flush with plenty of water for at least 15 min. and get medical help promptly. SKIN: Immediate continuous and thorough washing in flowing water is imperative. preferably decontaminate with abundant soap, if burns are present, get medical help, discard all contaminated clothing and wearing accessories. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3, oral rat LD ₅₀ = 1700 mg/kg 5.7 Late Toxicity: Repeated exposure to small amounts may cause eventually reversible neurological effects				

Continued on page 2

(Continued on page 6)

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire 6.6 Behavior in Fire: Sealed containers may burst as a result of polymerization 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 150 ppm/96 hr, single fish LC₅₀ 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: May occur at temperatures above 50°C (120°F) 7.6 Inhibitor of Polymerization: Oxygen (air) plus 50 ppm of copper as copper sulfate	9. SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48040 Acrylon Corp. Midland Building Cleveland, Ohio 44115																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) A P Z	10. SHIPPING INFORMATION 10.1 Grades or Purity: 15% - 50% solution in water 10.2 Storage Temperature: Below 50°C (122°F) 10.3 Inert Atmosphere: Ventilated (natural) 10.4 Venting: Open																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: <table border="1"><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>0</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>0</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Hazardous</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>0</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>2</td></tr><tr><td>Water</td><td>1</td></tr><tr><td>Self Reaction</td><td>1</td></tr></tbody></table> 12.3 NFPA Hazard Classifications: Data not available	Category	Rating	Fire	0	Health		Vapor Irritant	0	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Hazardous	1	Aquatic Toxicity	1	Aesthetic Effect	0	Reactivity		Other Chemicals	2	Water	1	Self Reaction	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 71 (molecular units) 13.3 Boiling Point at 1 atm: Data not available (Vapor Pressure = 0.033 atm at 125°C) 13.4 Freezing Point: 183°F = 84°C = 353°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.05 at 25°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Data not available
Category	Rating																												
Fire	0																												
Health																													
Vapor Irritant	0																												
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Hazardous	1																												
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Aesthetic Effect	0																												
Reactivity																													
Other Chemicals	2																												
Water	1																												
Self Reaction	1																												
5. HEALTH HAZARDS (Cont'd) 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent																													

(Continued on pages 7 and 8)

ACR

ACRYLIC ACID

Common Synonyms Propenoic Acid	Physical State Liquid Boiling Point 163°C Freezing Point 16°C Density 1.18 g/cm³ Solubility Soluble in water, alcohol, ether, and many organic solvents.
Fire Flammability Flammable Flash Point -10°C Autoignition Temperature 480°C Explosion Limits 2.5% - 11.5%	Health Hazards Acute Toxicity Harmful if swallowed. Chronic Toxicity May cause skin irritation and respiratory irritation.
Exposure Routes Inhalation, ingestion, skin contact. Effects Irritation to eyes, nose, and throat. First Aid For inhalation: Move to fresh air. For skin contact: Wash with water. For ingestion: Do not induce vomiting.	Water Pollution Biodegradability Biodegradable. Ecotoxicity Harmful to aquatic life.
1. RESPONSE TO DISCHARGE (See Response Materials Handbook, CG 446-4) Evaporating, corrosive. Restrict access. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Propenoic acid 3.2 Coast Guard Compatibility Classification: Organic acid 3.3 Chemical Formula: CH ₂ =CHCOOH 3.4 IMCO United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Use usual respirator at ambient temperatures to avoid inhalation of mists or fumes; rubber gloves if exposed to wet material; and goggles or face shield for splash exposure; safety shower and eye wash fountain may be required. 5.2 Symptoms Following Exposure: May burn skin or eyes upon short contact. INHALATION: eye and nasal irritation and lacrimation. INGESTION: may cause severe damage to the gastrointestinal tract. 5.3 Treatment for Exposure: Get medical attention promptly for all exposures. INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting. SKIN OR EYES: flush with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2.1 (D-0.5 to 0.5 g/kg). 5.7 Late Toxicity: Not pertinent. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating; such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Liquid, severe skin irritant; may cause pain and second degree burns after a few minutes of contact. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: (Glass) 107°C 6.2 Flammable Limits in Air: (Glass) 2.4% LEL 6.3 Fire Extinguishing Agents: Water, foam, alcohol foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic vapors are generated when heated. 6.6 Behavior in Fire: May polymerize and expand. 6.7 Ignition Temperature: 472°C 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 35% 10 days. 8.4 Food Chain Concentration Potential: Not listed.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Normally unstable but will not deteriorate. 7.4 Neutralizing Agents for Acids and Caustics: Wash with water; rinse with sodium bicarbonate solution. 7.5 Polymerization: May occur on contact with acids, iron salts, or at elevated temperatures and release high energy rapidly; may cause explosion under confinement. 7.6 Inhibitor of Polymerization: Monomethyl ether of hydroquinone (40-200 ppm), phenothiazine (the tech grade) (100 ppm), hydroquinone (10-20 ppm), methylene blue (0.1-0.5%), N,N-diphenyl-p-phenylenediamine (0.05%).	9. SELECTED MANUFACTURERS Celanese Corporation Celanese Chemical Division 245 Park Ave. New York, N.Y. 10017 Rohm and Haas Co. Independence Mall West Philadelphia, Pa. 19106 Eastman Organic Chemicals Division 270 Park Ave. New York, N.Y. 10017																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A P 0 2	10. SHIPPING INFORMATION 10.1 Grades or Purities: Technical 98.0% 10.2 Storage Temperature: 0°C to 15°C 10.3 Inert Atmosphere: Data not available. 10.4 Venting: Data not available.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive Material 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>2</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisonous</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Acute Toxicity</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>2</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self-Reactive</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classification: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (H)</td> <td>1</td> </tr> <tr> <td>Flammability (F)</td> <td>2</td> </tr> <tr> <td>Reactivity (R)</td> <td>2</td> </tr> </tbody> </table>	Category	Rating	Fire	2	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisonous	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Acute Toxicity	2	Reactivity		Other Chemicals	2	Water	0	Self-Reactive	1	Category	Classification	Health Hazard (H)	1	Flammability (F)	2	Reactivity (R)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 72.06 13.3 Boiling Point at 1 atm: 163°C 13.4 Freezing Point: 16°C 13.5 Critical Temperature: 344°C 13.6 Critical Pressure: 44.3 atm 13.7 Specific Gravity: 1.18 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.22 13.12 Latent Heat of Vaporization: 27.7 kJ/mol 13.13 Heat of Combustion: -1100 kJ/mol 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: -45.3 kJ/mol
Category	Rating																																				
Fire	2																																				
Health																																					
Vapor Irritant	1																																				
Liquid or Solid Irritant	1																																				
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NOTES																																					

REVISED 1978

6. FIRE HAZARDS 6.1 Flash Point: 100°C (212°F) 6.2 Flammable Limits in Air: 1.1% - 7.1% 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water in foam may cause frothing 6.5 Special Hazards of Combustion Products: When heated or burned, MCN may evolve toxic fumes consisting of oxides of carbon and nitrogen 6.6 Behavior in Fire: Vapor is heavier than air and may travel along under air and ignite at a distance. It is flammable in air and may cause fire and explosion 6.7 Ignition Temperature: 500°C 6.8 Electrical Hazard: Class I Group D 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: 100 ppm 24 hr LC50 (96 hr LC50) for fish 8.2 Waterfowl Toxicity: Not pertinent 8.3 Biological Oxygen Demand (BOD): Not pertinent 8.4 Food Chain Concentration Potential: Not pertinent																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not pertinent 7.2 Reactivity with Common Inorganic: Attacks organic and inorganic materials. These materials should not be used. Penetrates weathered or contaminated materials and pipes should be destroyed. Attacks aluminum, magnesium, zinc, and cadmium 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Corrosives: Not pertinent 7.5 Polymerization: May cause spontaneous polymerization of oxygen under pressure. In the presence of oxygen, the polymerization may be rapid and exothermic. The polymerization product is not flammable and not toxic 7.6 Inhibitor for Polymerization: Methylcyclopentadiene (1-4% ppm)	9. SELECTED MANUFACTURERS 1. E. I. du Pont de Nemours & Co., Inc., P.O. Box 118, Newark, DE 19101 2. Monsanto Chemicals, P.O. Box 71, St. Louis, MO 63103 3. Union Carbide Corp., P.O. Box 1170, Danbury, CT 06810 4. American Cyanamid Co., P.O. Box 1170, Danbury, CT 06810																																				
11. HAZARD ASSESSMENT CODE See Table of Hazard Assessment Code (HAC) in the Appendix 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td></td></tr> <tr> <td>Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Hazardous to Aquatic Life</td><td>4</td></tr> <tr> <td>Marine Toxicity</td><td>1</td></tr> <tr> <td>Volatility Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>4</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant		Poisons	1	Water Pollution		Hazardous to Aquatic Life	4	Marine Toxicity	1	Volatility Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	4	Flammability (Red)	1	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 43.06 13.3 Boiling Point at 1 atm: 100°C (212°F) 13.4 Freezing Point: -120°C (-180°F) 13.5 Critical Temperature: 300°C (572°F) 13.6 Critical Pressure: 33.5 atm (3.35 MPa) 13.7 Specific Gravity: 0.87 at 20°C liquid 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.4 13.11 Ratio of Specific Heats of Vapor (Gas): 1.4 13.12 Latent Heat of Vaporization: 25.8 kJ/mol (6.2 kcal/mol) 13.13 Heat of Combustion: -14,300 Btu/lb (-7930 cal/g) = -332 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	1																																				
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Self Reaction	1																																				
Category	Classification																																				
Health Hazard (Blue)	4																																				
Flammability (Red)	1																																				
Reactivity (Yellow)	2																																				
5. HEALTH HAZARDS (Cont'd.) 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not readily tolerate moderate or high vapor concentrations 5.9 Liquid or Solid Irritant Characteristics: Irritated on clothing and allowed to remain in place, causing staining and reddening of the skin. Large amounts may be absorbed through the skin and cause poisoning 5.10 Odor Threshold: 2.4 ppm (threshold of smell for pure liquid)																																					

ADA

ADIPIC ACID

Common Synonyms: Adipic acid 1,4-Benzenedicarboxylic acid Hexanedioic acid	Solid crystals White Odorless
	Sinks and mixes slowly with water

Fire

Combustible
Dust cloud may explode if ignited in an enclosed area

Exposure

DUST
Irritating to eyes, nose and throat.
If inhaled will cause coughing or difficult breathing.

SOLID
Irritating to skin and eyes.
Harmful if swallowed.

Water Pollution

Dangerous to aquatic life in high concentrations.
May be dangerous if it enters water intakes.

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-4)

Should be removed
Chemical and physical treatment

2. LABELS

No hazard label required by
Code of Federal Regulations

3. CHEMICAL DESIGNATIONS

- 3.1 Synonyms: 1,4-Adipic acid
1,4-Benzenedicarboxylic acid
Hexanedioic acid
- 3.2 Coast Guard Compatibility Classification:
Data not available
- 3.3 Chemical Formula: $\text{HOOC}(\text{CH}_2)_4\text{COOH}$
- 3.4 MSD/MSD Hazard Numerical
Designation: Data not available

4. OBSERVABLE CHARACTERISTICS

- 4.1 Physical State (as shipped): Crystalline
- 4.2 Color: White
- 4.3 Odor: None

5. HEALTH HAZARDS

- 5.1 Personal Protective Equipment: Normal protection against exposure to fluids of solid organs, solvents, rubber gloves, plastic goggles
- 5.2 Symptoms Following Exposure: Inhalation of vapor irritates mucous membranes of the nose and lungs, causes coughing and sneezing. Contact with liquid irritates eyes and has a pronounced drying effect on the skin, may produce dermatitis.
- 5.3 Treatment for Exposure: **IRRITATION:** remove victim to fresh air, get medical attention if irritation persists. **EYES:** flush with water for at least 15 min. **SKIN:** flush with water.
- 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available
- 5.5 Short-Term Inhalation Limit: Data not available
- 5.6 Toxicity by Ingestion: Grate 1 oral mouse LD₅₀ = 1,900 mg/kg
- 5.7 Late Toxicity: Data not available
- 5.8 Vapor (Gas) Irritant Characteristics: Data not available
- 5.9 Liquid or Solid Irritant Characteristics: Data not available
- 5.10 Odor Threshold: Data not available

6. FIRE HAZARDS

- 6.1 Flash Point: Combustible solid
300°F (149°C) - 376°F (191°C)
- 6.2 Flammable Limits in Air: (dust)
10-15 mg/l
- 6.3 Fire Extinguishing Agents: Foam, water
for carbon dioxide or dry chemical
- 6.4 Fire Extinguishing Agents Not to be Used:
None
- 6.5 Special Hazards of Combustion Products:
None
- 6.6 Behavior in Fire: Melts and may decompose
to give volatile acids, vapors of valeric
acid and other substances. These may form
explosive mixture with air.
- 6.7 Ignition Temperature: 550°C
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials:
None
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and
Alkalies: Reacts with dilute sodium
bicarbonate or soda ash solution
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity:
≤ 130 ppm: 24 hr. "No effect" 14 day fresh
water
- 8.2 Waterway Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD):
(theoretical) 133.0 mg/l
- 8.4 Food Chain Concentration Factor:
None

9. SELECTED MANUFACTURERS

- 1 Celanese Chemical Corp.
A Division of Celanese Corp.
245 Park Avenue
New York, N.Y. 10017
- 2 E. I. du Pont de Nemours & Co., Inc.
1001 Market St.
Wilmington, Del. 19801
- 3 Monsanto Company
400 North Lindbergh Blvd.
St. Louis, Mo. 63106

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Commercial, 99.9%
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

NS II

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations:
Not listed
- 12.2 HAS Hazard Rating for Bulk Water
Transportation: Not listed
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 1 |
| Reactivity (Yellow) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm:
Solid
- 13.2 Molecular Weight: 146.1
- 13.3 Boiling Point at 1 atm: Not pertinent
(decomposes)
- 13.4 Freezing Point:
104°F = 40°C = 424°K
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.36 at 20°C (solid)
- 13.8 Liquid Surface Tension: Not pertinent
- 13.9 Liquid-Water Interfacial Tension:
Not pertinent
- 13.10 Vapor (Gas) Specific Gravity:
Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas):
Not pertinent
- 13.12 Latent Heat of Vaporization:
Not pertinent
- 13.13 Heat of Combustion: -8,242 Btu/lb
= -4,574 cal/g = -191 kJ/mol
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

(continued on pages 2 and 3)

NOTES

ADN

ADIPONITRILE

Common Synonyms 1,4-Dicyanobutane		Liquid	Colorless to light yellow	Odorless
Floats on water. Freezing point is 36°F.				
SAFETY DATA SHEET 1. IDENTIFICATION 2. HAZARD IDENTIFICATION 3. COMPOSITION 4. FIRST AID MEASURES 5. FIRE FIGHTING MEASURES 6. ACCIDENT PREVENTION 7. STORAGE 8. TRANSPORT 9. DISPOSAL 10. ADDITIONAL INFORMATION				
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Vapor may explode if ignited in an enclosed area Water spray may cause violent reaction Extinguish with dry chemical, foam, or carbon dioxide.			
Exposure	LIQUID OR SOLID Irritating to skin and eyes If swallowed, will cause nausea or vomiting Inhalation may cause irritation of the respiratory system May cause dizziness or headache May cause nausea or vomiting May cause unconsciousness May cause death			
Water Pollution	Dangerous to aquatic life in high concentrations Floating to shoreline May be dangerous if it enters water intakes May cause death			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: poison, water contaminant Mechanical containment Should be removed		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,4-Dicyanobutane 3.2 Coast Guard Compatibility Classification: Neutral 3.3 Chemical Formula: C ₄ H ₆ N ₂ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Water white to light yellow 4.3 Odor: Practically odorless		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves and clothing giving full body and face protection to avoid contact with skin. Air or oxygen mask 5.2 Symptoms Following Exposure: Ingestion of a few ml. may cause weakness, mental confusion, vomiting, rapid respiration, and tachycardia and convulsions. Headache and convulsions can result from exposure to vapor 5.3 Treatment for Exposure: Symptomatic treatment. Call physician. Thiosulfate should be considered. Administer vapor or amyl nitrite if patient is unconscious 5.4 Toxicity by Inhalation (Threshold Limit Value): 50 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors cause a slight stinging of the eyes or respiratory system and may also cause more severe symptoms such as headache and convulsions 5.9 Liquid or Solid Irritant Characteristics: If spilled on clothing and allowed to remain, may cause smothering and reddening of the skin. If absorbed by skin may cause more severe symptoms such as headache and convulsions 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS

- 6.1 Flash Point: 199°F (93°C)
 6.2 Flammable Limits in Air: LFL = 1.0% at 200°C
 6.3 Fire Extinguishing Agents: Water spray, dry chemical, foam, or carbon dioxide.
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent.
 6.5 Special Hazards of Combustion Products: Toxic gases are generated in fires.
 6.6 Behavior in Fire: Not pertinent.
 6.7 Ignition Temperature: Data not available.
 6.8 Electrical Hazard: Not pertinent.
 6.9 Burning Rate: 2.7 mm/min.

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
 7.2 Reactivity with Common Materials: No reaction.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor or Polymerization: Not pertinent.

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: 1250 ppm, 24 hr, sunfish, 11 m, fresh water.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): 40% 5 days.
 8.4 Food Chain Concentration Potential: Data not available.

9 SELECTED MANUFACTURERS

1. Celanese Corporation
 Celanese Chemical Co. Division
 245 Park Ave.
 New York, N.Y. 10017
 2. E. I. duPont de Nemours & Co.
 Plastics Department
 DuPont Building
 Wilmington, Del. 19898
 3. Monsanto Company
 Monsanto Textiles Co.
 800 N. Lindbergh Blvd.
 St. Louis, Mo. 63166

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Data not available.
 10.2 Storage Temperature: Ambient.
 10.3 Inert Atmosphere: No requirement.
 10.4 Venting: Pressure vacuum.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446.3)
 A-E-L

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Combustible Liquid.
 12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Health | 1 |
| Vapor Irritant | 1 |
| Liquid or Solid Irritant | 1 |
| Poisons | 3 |
| Water Pollution | |
| Human Toxicity | 3 |
| Aquatic Toxicity | 2 |
| Aesthetic Effect | 3 |
| Reactivity | |
| Other Chemicals | 2 |
| Water | 0 |
| Self-Reaction | 0 |
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 4 |
| Flammability (Red) | 2 |
| Reactivity (Yellow) | 0 |

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid.
 13.2 Molecular Weight: 108.
 13.3 Boiling Point at 1 atm: 554°F = 290°C = 563°K.
 13.4 Freezing Point: 36°F = 2°C = 275°K.
 13.5 Critical Temperature: Not pertinent.
 13.6 Critical Pressure: Not pertinent.
 13.7 Specific Gravity: 0.9611 at 25°C (liquid).
 13.8 Liquid Surface Tension: Not pertinent.
 13.9 Liquid-Water Interfacial Tension: Not pertinent.
 13.10 Vapor (Gas) Specific Gravity: Not pertinent.
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.
 13.12 Latent Heat of Vaporization (est.): 240 Btu/lb = 134 cal/g = 5.59×10^3 J/kg.
 13.13 Heat of Combustion: -14,230 Btu/lb = -7910 cal/g = -331×10^3 J/kg.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: Not pertinent.

(Continued on pages 4 and 5)

NOTES

ALD

ALDRIN

Common Synonyms 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4-endo-exo-5,8-dimethanonaphthalene		Solid crystals or solution	Light to dark brown	Mild chemical odor
		Solid sinks in water; solution flows on water		
AVOID CONTACT WITH LIQUID OR SOLID. KEEP PEOPLE AWAY. Wear goggles with vented breathing apparatus and rubber overclothing including gloves if splash hazard is possible. Call fire department if fire is discharged. Isolate area if there is discharged material. Notify local health and pollution control agencies.				
Fire		Solid is not flammable but usually is dissolved in a combustible liquid. POISONOUS GASES ARE PRODUCED WHEN HEATED. Wear goggles with vented breathing apparatus and rubber overclothing including gloves. Extinguish with water, dry chemical foam or carbon dioxide. Contact exposed containers with water.		
 Exposure		CALL FOR MEDICAL AID. SOLID OR SOLUTION POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin, eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED, do not vomit. If CONSCIOUS, have victim drink water or milk and try to get him to vomit. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison, water contaminant. Liquid forms are flammable. Mechanical containment (of liquid form) should be removed.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: endo-exo-1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro-1,4-endo-exo-5,8-dimethanonaphthalene HHDN 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₁₂ H ₆ Cl ₆ 3.4 IMCO/United Nations Numerical Designation: 6.1 1542		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Tan to dark brown 4.3 Odor: Mild chemical		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: During prolonged exposure to mixing and loading operations, wear clean synthetic rubber gloves and mask or respirator of the type posed by the U.S. Bureau of Mines for aldrin protection. 5.2 Symptoms Following Exposure: Ingestion, inhalation, or skin absorption of a toxic dose will induce nausea, vomiting, hyperexcitability, tremors, epileptiform convulsions, and ventricular fibrillation. Aldrin may cause temporary reversible kidney and liver injury. Symptoms may be seen after ingestion of less than 1 gram in an adult; ingestion of 25 mg has caused death in children. 5.3 Treatment for Exposure: SKIN CONTACT: Wash with soap and running water. If material gets into eyes, wash immediately with running water for at least 15 minutes; get medical attention. INGESTION: Call physician immediately on face vomiting immediately. Repeat until vomit fluid is clear. Never give anything by mouth to an unconscious person. Keep patient prone and quiet. PHYSICIANS: administer barbiturates as anti-convulsant therapy. Observe patient carefully because repeated treatment may be necessary. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.25 mg/m ³ 5.5 Short-Term Inhalation Limits: 1 mg/m ³ for 30 min 5.6 Toxicity by Ingestion: Grade 1 LD 50 is 500 mg/kg (rat) 5.7 Late Toxicity: Chronic exposure produces benign tumors in mice 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause slight irritation of the eyes or respiratory system if present in high concentrations. Effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause irritation and reddening of the skin. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable.
6.2 **Flammable Limits in Air:** Not pertinent.
6.3 **Fire Extinguishing Agents:** Water sprays, dry chemical foam or carbon dioxide for fires involving solutions of aldrin in hydrocarbon solvents.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
6.5 **Special Hazards of Combustion Products:** Irritating fumes of hydrochloric acid and chlorinated decomposition products are given off.
6.6 **Behavior in Fire:** Not pertinent.
6.7 **Ignition Temperature:** Not pertinent.
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** Not pertinent.

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 0.10 ppm/24 hr. bluegill, LC₅₀ fresh water; 0.05 ppm/24 hr. goldfish, LC₅₀ fresh water; 0.01 ppm/24 hr. oyster, sublethal effect, salt water.
8.2 **Waterfowl Toxicity:** 520 mg/kg.
8.3 **Biological Oxygen Demand (BOD):** Not pertinent.
8.4 **Food Chain Concentration Potential:** High.

9. SELECTED MANUFACTURERS

Shell Chemical Co.
Agricultural Div.
2401 Crow Canyon Rd.
San Ramon, Calif. 94583

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction.
7.2 **Reactivity with Common Materials:** No reaction.
7.3 **Stability During Transport:** Stable.
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent.

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** 20-95% aldrin.
50% inert ingredients. Several solvents in hydrocarbon solvents.
10.2 **Storage Temperature:** Data not available.
10.3 **Inert Atmosphere:** Data not available.
10.4 **Venting:** Data not available.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
11

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B.
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	3
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	4
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid.
13.2 **Molecular Weight:** 364.93.
13.3 **Boiling Point at 1 atm:** Not pertinent.
13.4 **Freezing Point:** 219°F = 104°C = 377°K.
13.5 **Critical Temperature:** Not pertinent.
13.6 **Critical Pressure:** Not pertinent.
13.7 **Specific Gravity:** 1.6 at 20°C (solid).
13.8 **Liquid Surface Tension:** Not pertinent.
13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
13.12 **Latent Heat of Vaporization:** Not pertinent.
13.13 **Heat of Combustion:** Not pertinent.
13.14 **Heat of Decomposition:** Not pertinent.
13.15 **Heat of Solution:** Not pertinent.
13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 5 and 6)

NOTES

REVISED 1978

ALKYLBENZENESULFONIC ACIDS

Common Synonyms Decylbenzenesulfonic acid Dis Du In Irr Tetra Penta Hexa		Liquid White to yellow Odorless	
Mixes with water		Not for sale as a pesticide. Keep in original container. Do not use for any other purpose. Avoid contact with liquid. Do not use on or around food or feed. Notify local health and fire departments of this product.	
Fire		Combustible Flammable gas may be produced on contact with metals. Extinguish with water or foam. Do not use dry chemical. Water may be ineffective.	
Exposure		ALL INFORMATION LIQUID Irritating to skin and eyes. If swallowed will cause nausea. Keep out of reach of children. Do not use for any other purpose. Do not use on or around food or feed. Do not use in or near water. Do not use in or near drinking water. Do not use in or near swimming pools. Do not use in or near hot tubs. Do not use in or near saunas. Do not use in or near showers. Do not use in or near bathtubs. Do not use in or near bedrooms. Do not use in or near living rooms. Do not use in or near dining rooms. Do not use in or near kitchens. Do not use in or near bathrooms. Do not use in or near closets. Do not use in or near attics. Do not use in or near basements. Do not use in or near garages. Do not use in or near sheds. Do not use in or near barns. Do not use in or near fields. Do not use in or near woods. Do not use in or near parks. Do not use in or near playgrounds. Do not use in or near schools. Do not use in or near hospitals. Do not use in or near nursing homes. Do not use in or near prisons. Do not use in or near military bases. Do not use in or near government buildings. Do not use in or near public places. Do not use in or near private places. Do not use in or near any place where people are gathered.	
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and fire departments of this product. Do not use in or near water bodies.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Isolate, contain, collect, dispose, and flush.		2 LABELS No hazard label required by Code of Federal Regulations.	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms In Du Dis Irr Tetra Penta Hexa decylbenzenesulfonic acid 3.2 Coast Guard Competibility Classification Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to yellow 4.3 Odor: None	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, face shield, rubber gloves. 5.2 Symptoms Following Exposure: Free throat, irritation of mouth and stomach. Contact with liquid irritates eyes and skin. 5.3 Treatment for Exposure: INGESTION: Give large amount of water. EYES: Flush with water for at least 15 min. SKIN: Flush with water. Wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 2 LD₅₀ 5.5 g/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.			
6 FIRE HAZARDS 6.1 Flash Point: 195 F (90 C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Irritating sulfuric acid mist may form in fire. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Data not available.			
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: May attack metals causing accumulation of flammable hydrogen gas in enclosed spaces. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute sodium bicarbonate or soda ash solution. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.			
8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.			
9. SELECTED MANUFACTURERS 1. Continental Oil Co. Petrochemical Dept. Park 80 Plaza East Saddle Brook, N.J. 07662 2. Witco Chemical Co. Organics Div. 277 Park Avenue New York, N.Y. 10017			
10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial, 97% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open.			
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 310-394 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: Data not available. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.0 to 1.4 at 20°C (liquid). 13.8 Liquid Surface Tension: Data not available. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Data not available. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		(Continued on page 5 and 6)	
5 HEALTH HAZARDS (Cont'd) 5.3 Chemical Formula: C₁₁H₂₅(C₁₀H₇)SO₃H (mw 310-394) 5.4 IMCO/United Nations Numerical Designation: Not listed.			

ALA

ALLYL ALCOHOL

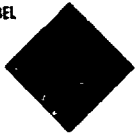
Common Synonyms Vinyl carbolol 2-Propen-1-ol	Waterly liquid Colorless Sharp mustard odor Flies and mixes with water. Poisonous, flammable vapor is produced.
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PLO... Shut off sources of fires and call fire department. Wear goggles, self-contained breathing apparatus and rubber overclothing including gloves. Stop discharge if possible. Stay upwind and use water spray to knock down vapor. Isolate and vent or discharge material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus and rubber overclothing including gloves. Extinguish with dry chemical, alcohol foam, carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
 Exposure	CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED Irritating to eyes, nose and throat. Move to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water. IF ASKED, have victim spit out.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 444-4) Issue warning: high flammability, poison. Restrict access. Disperse and flush.	2. LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Propen-1-ol Vinylcarbinol 3.2 Coast Guard Competibility Classification: Substituted allyl 3.3 Chemical Formula: CH ₂ =CHCH ₂ OH 3.4 IMCO-United Nations Munerial Designation: 1.2 109X	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Characteristic pungent sharp, causes tears
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic canister or air pack, rubber gloves, goggles, other protective equipment as required to prevent all body contact. 5.2 Symptoms Following Exposure: Vapors are quite irritating to eyes, nose and throat. Eye irritation may be accompanied by complaints of photophobia and pain in the eyeballs; pain may not begin until 10 hours after exposure. Liquid may cause first- and second-degree burns of the skin, with blister formation; underlying part will become swollen and painful, and local muscle spasms may occur. 5.3 Treatment for Exposure: INHALATION: remove victim from contaminated area and administer oxygen; get medical attention immediately. SKIN: remove liquid with soap and water. EYES: flush with continuous stream of water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 2 ppm 5.5 Short-Term Inhalation Limits: 5 ppm for 30 min 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 40 to 500 mg/kg mouse (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: 0.2% ppm	

6. FIRE HAZARDS 6.1 Flash Point: 22°F (4°C) (90°F (32°C)) 6.2 Flammable Limits in Air: 2.5% - 18% 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Toxic vapors are generated when heated. 6.6 Behavior in Fire: Vapor heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 829°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 2.7 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 10 ppm/*threshold/fresh water 2.5 ppm/*bivalve larvae/lethal/salt water *Time period not specified. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 57% 10 days 20°C 5 days 8.4 Food Chain Concentration Potential: None noted.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable at ordinary temperatures and pressures. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. FMC Corp. Organic Chemicals Div. 633 Third Ave. New York, N.Y. 10012 2. Olin Corp. Chemicals Div. Brandenburg, Ky. 40018 3. Shell Chemical Co. Industrial Chemicals Div. Houston, Texas 77001																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A P Q	10. SHIPPING INFORMATION 10.1 Grades or Purity: 98% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure vacuum.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="865 1433 1110 1692"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>1</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>3</td></tr> <tr><td>Liquid or Solid Irritant</td><td>2</td></tr> <tr><td>Poison</td><td>1</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>2</td></tr> <tr><td>Aquatic Toxicity</td><td>3</td></tr> <tr><td>Aesthetic Effect</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>2</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="865 1714 1110 1800"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>1</td></tr> <tr><td>Flammability (Red)</td><td>1</td></tr> <tr><td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	3	Liquid or Solid Irritant	2	Poison	1	Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 58.08 13.3 Boiling Point at 1 atm: 206°F = 96.9°C = 370.1°K 13.4 Freezing Point: -206°F = -129°C = 144°K 13.5 Critical Temperature: 521.4°F = 271.9°C = 545.1°K 13.6 Critical Pressure: 840 psia = 57 atm = 5.5 MN/m ² 13.7 Specific Gravity: 0.852 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 2.0 13.11 Ratio of Specific Heats of Vapor (Gas): 1.12 13.12 Latent Heat of Vaporization: 295 Btu/lb = 164 cal/g = 6.87 X 10 ³ J/kg 13.13 Heat of Combustion: -13,220 Btu/lb = -7620 cal/g = -319.0 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: (est.) Negligible 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	3																																				
Liquid or Solid Irritant	2																																				
Poison	1																																				
Water Pollution																																					
Human Toxicity	2																																				
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Flammability (Red)	1																																				
Reactivity (Yellow)	0																																				
NOTES (Continued on pages 4 and 6.)																																					

REVISED 1978

ABR

ALLYL BROMIDE

Common Synonyms 3-Bromopropene Bromallylene 3-Bromopropylene	Liquid Colorless to light yellow Irritating odor Sinks in water. Flammable, irritating vapor is produced.
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause headache, dizziness, coughing or difficult breathing LIQUID Irritating to skin and eyes If swallowed will cause irritation of mouth and stomach
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability Restrict access Should be removed Chemical and physical treatment	2. LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: Bromallylene 3-Bromopropene 3-Bromopropylene 32 Coast Guard Competibility Classification: Not applicable 33 Chemical Formula: CH ₂ =CH·CH ₂ Br 34 IMCO/United Nations Numerical Designation: 3.2/1099	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless to light yellow 43 Odor: Irritating, unpleasant, pungent
5. HEALTH HAZARDS 51 Personal Protective Equipment: Goggles and face shield; protective clothing; self-contained breathing apparatus for high vapor concentrations 52 Symptoms Following Exposure: Inhalation of vapor irritates mucous membranes and causes dizziness, headache, and lung irritation. Contact with liquid irritates eyes and skin. Ingestion causes irritation of mouth and stomach. 53 Treatment for Exposure: INHALATION: remove from exposure; if breathing is difficult, give oxygen; call physician. EYES: flush with water for at least 15 min. and call physician. SKIN: flush with water; get medical attention for skin irritation. INGESTION: do NOT induce vomiting; get medical attention. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade 4 oral LD ₅₀ = 10 mg/kg (guinea pig) 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 59 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant. May cause pain and second degree burns after a few minutes' contact. 510 Odor Threshold: Data not available	

6. FIRE HAZARDS

- 61 **Flash Point:** 30°F C.C.
- 62 **Flammable Limits in Air:** 1.4% - 7.3%
- 63 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, or carbon dioxide
- 64 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
- 65 **Special Hazards of Combustion Products:** Toxic hydrogen bromide gas formed in fire
- 66 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back
- 67 **Ignition Temperature:** 563°F
- 68 **Electrical Hazard:** Data not available
- 69 **Burning Rate:** 3.5 mm/min

7. CHEMICAL REACTIVITY

- 71 **Reactivity with Water:** No reaction
- 72 **Reactivity with Common Materials:** No reaction
- 73 **Stability During Transport:** Stable
- 74 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 75 **Polymerization:** Not pertinent
- 76 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

- 81 **Aquatic Toxicity:** Data not available
- 82 **Waterway Toxicity:** Data not available
- 83 **Biological Oxygen Demand (BOD):** Data not available
- 84 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

- White Chemical Corporation
East 22nd Street
Box 278
Bayonne, N.J. 07002
- American Hoechst Corporation
Chemicals and Plastics Division
Somerville, N.J. 08876
- Columbia Organic Chemical Co.
912 Drake St.
Columbia, S.C. 29205

10. SHIPPING FORMATION

- 101 **Grade or Purity:** Commercial
- 102 **Storage Temperature:** Ambient
- 103 **Inert Atmosphere:** No requirement
- 104 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
A X-1

12. HAZARD CLASSIFICATIONS

- 121 **Code of Federal Regulations:** Flammable liquid
- 122 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 3 |
| Health | |
| Vapor Irritant | 3 |
| Liquid or Solid Irritant | 1 |
| Poisons | 2 |
| Water Pollution | |
| Human Toxicity | |
| Aquatic Toxicity | 2 |
| Aesthetic Effect | 2 |
| Reactivity | |
| Other Chemicals | 2 |
| Water | 0 |
| Self-Reaction | 1 |
- 123 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 3 |
| Flammability (Red) | 3 |
| Reactivity (Yellow) | 1 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 131 **Physical State at 15°C and 1 atm:** Liquid
- 132 **Molecular Weight:** 121
- 133 **Boiling Point at 1 atm:** 158°F = 70°C = 343°K
- 134 **Freezing Point:** -182°F = -119°C = 154°K
- 135 **Critical Temperature:** Not pertinent
- 136 **Critical Pressure:** Not pertinent
- 137 **Specific Gravity:** 1.4161 at 20°C (liq/liq)
- 138 **Liquid Surface Tension:** 26.9 dynes/cm = 0.0269 N/m at 20°C
- 139 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 20°C
- 1310 **Vapor (Gas) Specific Gravity:** 4.2
- 1311 **Ratio of Specific Heats of Vapor (Gas):** 1210
- 1312 **Latent Heat of Vaporization:** (es.) 1110 Btu/lb = 49 cal/g = 2.5 × 10⁵ J/kg
- 1313 **Heat of Combustion:** (es.) 16,700 Btu/lb = 3,700 cal/g = 150 × 10³ J/g
- 1314 **Heat of Decomposition:** Not pertinent
- 1315 **Heat of Solution:** Not pertinent
- 1316 **Heat of Polymerization:** Not pertinent

NOTES

ALC

ALLYL CHLORIDE

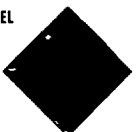
Common Synonyms 3-Chloropropene 3-Chloropropylene	Liquid Colorless to yellowish brown or red Sharp, irritating odor Floats on water. Flammable; irritating vapor is produced.
Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Heat causes release of irritating, corrosive fumes. Extinguish with dry chemical or carbon dioxide. Do not use water.
 Exposure	CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes, nose and throat. If breathed, stop breathing and get fresh air. If swallowed, stop eating and drinking. LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. If on skin, wash with plenty of water. If in eyes, flush with plenty of water. If swallowed, do not vomit. Get medical attention. Do not drink water. If swallowed, do not induce vomiting. If swallowed, do not induce vomiting or having on. If swallowed, do not induce vomiting or having on.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Not recommended for use in water.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-2) Issue warning: high flammability. Result: assess.	2 LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms 3-Chloropropene 3-Chloropropylene 32 Coast Guard Compatibility Classification Substituted allyl 33 Chemical Formula: C_3H_5Cl 34 IMCO United Nations Numerical Designation: 1111 (11)	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Sharp, pungent, irritating, characteristic pungent
5 HEALTH HAZARDS 51 Personal Protective Equipment: Respirator (gas/vapor) or equivalent; full face mask and canister (greater concentration); self-contained breathing apparatus or its equivalent; Rubber or neoprene gloves; apron; boots; clean body covering; other chemical goggles; gas tight goggles; or equivalent full face shield. 52 Symptoms Following Exposure: Causes irritation to eyes, nose and throat. Breathing effects may be delayed. 53 Treatment after Exposure: INHALATION: If effects develop in persons, fresh air, keep warm and quiet. Get medical attention if continued breathing apparatus stops. INGESTION: promptly induce vomiting. Get medical attention immediately. No known antidote; treat symptoms. EYES: immediately flush with plenty of water for at least 15 min. Get medical attention promptly. SKIN: remove clothing and flush affected area thoroughly. 54 Toxicity by Inhalation (Threshold Limit Value): 1 ppm 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade 2.1 (Data not available) 57 Late Toxicity: Lung, liver and kidney damage in experimental animals. 58 Vapor (Gas) Irritant Characteristics: Vapor is an irritant to eyes, nose and throat. Usually tolerate moderate when vapor concentrations. 59 Liquid or Solid Irritant Characteristics: Causes irritation of the skin and may cause secondary burns on long exposure. 510 Odor Threshold: 0.4 ppm	

6 FIRE HAZARDS 61 Flash Point: 20.1°C 62 Flammable Limits in Air: 3.4-11.1% 63 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide. 64 Fire Extinguishing Agents Not to be Used: Water. 65 Special Hazards of Combustion Products: Release of irritating hydrocarbon fumes. 66 Behavior in Fire: Not pertinent. 67 Ignition Temperature: 579°C 68 Electrical Hazard: No pertinent. 69 Burning Rate: Data not available.	8 WATER POLLUTION 81 Aquatic Toxicity: 45 ppm 96 hr LC50 (H. zosterops) 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: Not pertinent.																																				
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: No reaction. 73 Stability During Transportation: Stable. 74 Neutralizing Agents for Acids and Caustics: No pertinent. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: No pertinent.	9 SELECTED MANUFACTURERS Aldrich Chemical Co. 940 West 26th Ave. Milwaukee, Wis. 53233 Dow Chemical Co. Midland, Michigan 48640 Eastman Kodak Co. Rochester, N.Y. 14650																																				
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-2 ATUNW	10 SHIPPING INFORMATION 101 Grades or Purities: 97% 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: No requirement 13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: 76.5 133 Boiling Point at 1 atm: 34.1°C (93.4°F) 134 Freezing Point: -21.1°C (-6°F) 135 Critical Temperature: 46.1°C (115°F) 136 Critical Pressure: 4.72 MPa (68.6 atm) 137 Specific Gravity (liquid at 20°C): 0.91 138 Liquid Surface Tension: 25.5 dynes/cm (0.000255 N/m) 139 Liquid-Water Interfacial Tension: Data not available 140 Vapor (Gas) Specific Gravity: 2.6 141 Ratio of Specific Heats of Vapor (Gas): 1.24 142 Latent Heat of Vaporization: Data not available 143 Heat of Combustion: -4974 Btu/lb (-1436 cal/g) (-22.8 kJ/mol) 145 Heat of Solution: Data not available 146 Heat of Polymerization: Not pertinent.																																				
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable liquid 122 HAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td>4</td> </tr> <tr> <td>Vapor Irritant</td> <td>4</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>2</td> </tr> <tr> <td>Poison</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td>2</td> </tr> <tr> <td>Human Toxicity</td> <td>2</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>2</td> </tr> <tr> <td>Organic Chemicals</td> <td>2</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self-Reactive</td> <td>1</td> </tr> </tbody> </table> 123 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>3</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>1</td> </tr> </tbody> </table>	Category	Rating	Fire	1	Health	4	Vapor Irritant	4	Liquid or Solid Irritant	2	Poison	2	Water Pollution	2	Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity	2	Organic Chemicals	2	Water	0	Self-Reactive	1	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	2	Reactivity (Yellow)	1	NOTES Continued on pages 4 and 5
Category	Rating																																				
Fire	1																																				
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Vapor Irritant	4																																				
Liquid or Solid Irritant	2																																				
Poison	2																																				
Water Pollution	2																																				
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Reactivity	2																																				
Organic Chemicals	2																																				
Water	0																																				
Self-Reactive	1																																				
Category	Classification																																				
Health Hazard (Blue)	3																																				
Flammability (Red)	2																																				
Reactivity (Yellow)	1																																				

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ACF

ALLYL CHLOROFORMATE

Common Synonyms Allyl chloroformate		Watery liquid Colorless Extremely irritating odor Sinks in water. Flammable; irritating vapor is produced.
Fire		FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure		VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. LIQUID Irritating to skin and eyes. Harmful if swallowed.
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Avoid breathing vapors. Remove from area. Dispense and flush.		2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Allyl chloroformate 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $\text{CH}_2=\text{CH}-\text{CH}_2-\text{O}-\text{COCl}$ 3.4 IMCO/United Nations Numerical Designation: 8.122		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Extremely irritating; causes severe pungent
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Vapor proof protective goggles and face shield, plastic or rubber gloves, and tubing gas mask or self-contained breathing apparatus. 5.2 Symptoms Following Exposure: Vapor irritates eyes and respiratory tract. Contact with liquid causes eye and skin irritation and nausea or irritation of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: Remove from exposure, support respiration if necessary, call physician. EYES: If irritated by either vapor or liquid, flush with water for at least 15 min. SKIN: Wash with large quantities of water for at least 15 min. INGESTION: DO NOT induce vomiting. Give water, call physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade III Dose Not Determined. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that persons will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Both severe skin irritant and cause pain and second degree burns after a few minutes contact. 5.10 Odor Threshold: 1.4 ppm		

6 FIRE HAZARDS

- 6.1 Flash Point: 92.1°C (198°F) C
- 6.2 Flammable Limits in Air: Data not available
- 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide
- 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
- 6.5 Special Hazards of Combustion Products: When heated to decomposition emits highly toxic phosphine gas
- 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back
- 6.7 Ignition Temperature: Data not available
- 6.8 Electrical Hazard: Data not available
- 6.9 Burning Rate: 4 M/min. (m)

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: None

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Reacts slowly generating hydrogen chloride
- 7.2 Reactivity with Common Materials: Corrodes metals
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with lime or sodium bicarbonate solution
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

9 SELECTED MANUFACTURERS

- 1. Chemetron Corporation
Organic Chemicals Division
393 Seventh Avenue
New York, N.Y. 10018
- 2. Ono Chemical Co.
540 Nyard Rd.
Muskegon, Mich. 49444
- 3. Polysciences, Inc.
Paul Valley Industrial Park
Warrington, Pa. 18976

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Commercial 97+
- 10.2 Storage Temperature: Keep cool
- 10.3 Inert Atmosphere: No requirements
- 10.4 Venting: Pressure/vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A O N Y

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Corrosive, Flammable Liquid

- 12.2 NAS Hazard Rating for Bulk Water Transportation

Category	Rating
Fire	4
Health	4
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	3
Water Pollution	4
Human Toxicity	4
Aquatic Toxicity	4
Aesthetic Effect	3
Reactivity	3
Other Chemicals	3
Water	0
Self Reaction	0

- 12.3 NFPA Hazard Classifications

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	4
Reactivity (Yellow)	3

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
- 13.2 Molecular Weight: 120.5
- 13.3 Boiling Point at 1 atm: 113.1°C = 235°C = 315°K
- 13.4 Freezing Point: -112.1°C = -50°F = 193°K
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.139 at 20°C (liquid)
- 13.8 Liquid Surface Tension: 125 dynes/cm = 0.025 N/m at 20°C
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: 4.14
- 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0504
- 13.12 Latent Heat of Vaporization: 125,000 Btu/lb = 3,600 cal/g = 2.3 x 10⁴ J/kg
- 13.13 Heat of Combustion: 17,700 Btu/lb = 4,000 cal/g = 1.7 x 10⁴ J/kg
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 4 and 6)

NOTES

ATC

ALLYLTRICHLOROSILANE

Common Synonyms Allylsilane trichloride	Liquid Colorless Sharp, irritating odor Reacts violently with water. Irritating visible vapor cloud is produced.
Fire	Combustible. POISONOUS GASES MAY BE PRODUCED IN FIRE. EXTINGUISH WITH WATER OR FOAM.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. LIQUID Will burn skin and eyes. Harmful if swallowed. DO NOT INHALE VAPOR.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Manual Handbook, CG 446-4) Issue warning: corrosive Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Allylsilane trichloride 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $\text{CH}_2=\text{CH}-\text{CH}_2-\text{SiCl}_3$ 3.4 IMCO/United Nations Numerical Designation: 8 1724	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: sharp pungent irritating like hydrochloric acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Acid vapor type respiratory protection, rubber gloves, chemical goggles, other equipment necessary to protect skin and eyes. 5.2 Symptoms Following Exposure: Inhalation of vapor irritates mucous membranes. Liquid causes severe burns of eyes and skin and severe internal burns if ingested. 5.3 Treatment for Exposure: Get medical attention after all exposures to this compound. INHALATION: remove from exposure, support respiration. EYES: flush with water 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting, give water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 50 to 500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 100°F O.C. 95°F C.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water 6.5 Special Hazards of Combustion Products: Irritating vapors of hydrogen chloride and phosgene may form. 6.6 Behavior in Fire: Difficult to extinguish. Re-ignition may occur. 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 2.2 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously generating hydrogen chloride (hydrochloric acid). 7.2 Reactivity with Common Materials: Corrodes metal because of hydrochloric acid formed. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, time with sodium bicarbonate. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Dow Corning Corporation P.O. Box 592 Midland, Mich. 48640 2 Polysciences, Inc. Paul Valley Industrial Park Warrington, Pa. 18976 3 Pfaltz and Bauer, Inc. 126-04 Northern Boulevard Flushing, N.Y. 11366																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A O	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure vacuum																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="926 1462 1178 1727"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>4</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td> Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>1</td></tr> <tr> <td> Aquatic Toxicity</td><td>1</td></tr> <tr> <td> Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>1</td></tr> <tr> <td> Water</td><td>4</td></tr> <tr> <td> Self Reaction</td><td>4</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	4	Self Reaction	4	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 174.5 13.3 Boiling Point at 1 atm: 241°F = 116.7°C = 390°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.215 at 20°C (liquid) 13.8 Liquid Surface Tension: test 120 dynes/cm = 0.020 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 6 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0863 13.12 Latent Heat of Vaporization: 97 Btu/lb = 4.4 cal/g = 2.1 x 10 ³ J/kg 13.13 Heat of Combustion: test 155,000 Btu/lb = -2400 cal/g = -120 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	1																												
Health																													
Vapor Irritant	4																												
Liquid or Solid Irritant	4																												
Poisons	1																												
Water Pollution																													
Human Toxicity	1																												
Aquatic Toxicity	1																												
Aesthetic Effect	2																												
Reactivity																													
Other Chemicals	1																												
Water	4																												
Self Reaction	4																												
12.3 NFPA Hazard Classifications: Not listed	NOTES (Continued on pages 2 and 3)																												

ACL

ALUMINUM CHLORIDE

Common Synonyms Anhydrous aluminum chloride	Solid crystals or powder Yellow-orange to grayish-white Irritating odor Sinks in water. Poisonous gas is produced on contact with water.
First Aid Inhalation: Move to fresh air. If breathing is difficult, give artificial respiration. If swallowed, give milk or water. If on skin, wash with plenty of water. If in eyes, flush with plenty of water.	Fire Not flammable.
Exposure DUST Irritating to eyes, nose and throat. Harmful if inhaled. May cause pneumonia. If inhaled, get medical attention immediately. If on skin, wash with plenty of water. If in eyes, flush with plenty of water. If swallowed, give milk or water. If on skin, wash with plenty of water. If in eyes, flush with plenty of water. If swallowed, give milk or water.	Water Pollution HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Do not allow to enter water.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush with care. Issue warning: Corrosive.	2 LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Anhydrous aluminum chloride. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $AlCl_3$. 3.4 IMCO United Nations Numerical Designation: 5.0.126.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Orange to yellow through gray to white. 4.3 Odor: Fume hydrogen chloride, i.e., hydrochloric acid.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: All personnel in the area should wear safety clothing including fully closed goggles, rubber or plastic cover gloves, rubber shoes, and coveralls of acid-resistant material. An acid vapor canister mask should be carried in case of emergency. In case of application, it may be advisable to wear this equipment in a resting posture. 5.2 Symptoms Following Exposure: Contact with the skin or eyes in the presence of moisture causes thermal and acid burn. 5.3 Treatment for Exposure: INGESTION: If victim is conscious have him drink water or milk. Do NOT induce vomiting. SKIN: Flush immediately with plenty of water. For eye contact, flush with water for at least 15 mins. and get medical attention immediately. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm hydrogen chloride. 5.5 Short-Term Inhalation Limits: 5 ppm for 5 min.; 10 ppm for 10 min.; 20 ppm for 20 min.; 10 ppm for 40 min. (all for hydrogen chloride). 5.6 Toxicity by Ingestion: No systemic effects but severe burn of mouth. 5.7 Late Toxicity: None recognized. 5.8 Vapor (Gas) Irritant Characteristics: Vapor of hydrogen chloride is moderately irritating such that persons will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant; may cause pain and second degree burns after a few minutes' contact. 5.10 Odor Threshold: 1-5 ppm hydrogen chloride.	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Do not use water on adjacent fires. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Reacts violently with water used in extinguishing adjacent fires. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazards: Not pertinent. 6.9 Burning Rate: Not flammable.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Not pertinent. 8.2 Waterlow Toxicity: Not pertinent. 8.3 Biological Oxygen Demand (BOD): Not pertinent. 8.4 Food Chain Concentration Potential: Not pertinent.										
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently with water, liberating hydrogen chloride gas and heat. 7.2 Reactivity with Common Materials: None if dry. If wet it attacks metals because of hydrochloric acid formed. Flammable hydrogen is formed. 7.3 Stability During Transport: Stable if kept dry and protected from atmospheric moisture. 7.4 Neutralizing Agents for Acids and Caustics: Hydrochloric acid formed by reaction with water can be flushed away with water. Rinse with sodium bicarbonate or lime solution. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1 Allied Chemical Corp. Industrial Chemicals Division Morristown, N. J. 07960 2 Pearlsall Corp. Pearlsall Chemical Co., Inc. 4635 Southwest Freeway Houston, Texas 77022 3 Stauffer Chemical Co. Industrial Chemical Div. Baton Rouge, La. 70821										
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) RR 0	10 SHIPPING INFORMATION 10.1 Grades or Purities: Pure (99.9% technical max.). 10.2 Storage Temperature: Data not available. 10.3 Inert Atmosphere: Data not available. 10.4 Venting: Data not available.										
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> <tr> <td></td> <td>W</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	0	Reactivity (Yellow)	2		W	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 133.34. 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.44 at 25°C (solids). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification										
Health Hazard (Blue)	1										
Flammability (Red)	0										
Reactivity (Yellow)	2										
	W										
NOTES											

(Continued on Page 2 and 3)

ALF

ALUMINUM FLUORIDE

Common Synonyms		Subd powder or granules	White	None
		Sinks in water		
Not Flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED				
Fire				
Exposure		DUST If inhaled: irritating to nose and throat		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1 RESPONSE TO DISCHARGE		2 LABELS		
See Response Methods Handbook, CG 445-4 13-1		13-1		
3 CHEMICAL DESIGNATIONS		4 OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: 3.2 Coast Guard Designability Classification: 3.3 Chemical Formula: 3.4 IMCO United Nations Numerical Designation:		4.1 Physical State (as shipped): 4.2 Color: 4.3 Odor:		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: 5.2 Symptoms Following Exposure: 5.3 Treatment for Exposure: 5.4 Toxicity by Inhalation (Threshold Limit Value): 5.5 Short-Term Inhalation Limits: 5.6 Toxicity by Ingestion: 5.7 Late Toxicity: 5.8 Vapor (Gas) Irritant Characteristics: 5.9 Liquid or Solid Irritant Characteristics: 5.10 Odor Threshold:				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point: 6.2 Flammable Limits in Air: 6.3 Fire Extinguishing Agents: 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: 6.8 Electrical Hazard: 6.9 Burning Rate:		8.1 Aquatic Toxicity: 8.2 Waterfowl Toxicity: 8.3 Biological Oxygen Demand (BOD): 8.4 Food Chain Concentration Potential:	
7 CHEMICAL REACTIVITY		9 SELECTED MANUFACTURERS	
7.1 Reactivity with Water: 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: 7.4 Neutralizing Agents for Acids and Caustics: 7.5 Polymerization: 7.6 Inhibitor of Polymerization:		9.1 9.2 9.3 9.4 9.5 9.6 9.7 9.8 9.9 9.10 9.11 9.12 9.13 9.14 9.15 9.16 9.17 9.18 9.19 9.20 9.21 9.22 9.23 9.24 9.25 9.26 9.27 9.28 9.29 9.30 9.31 9.32 9.33 9.34 9.35 9.36 9.37 9.38 9.39 9.40 9.41 9.42 9.43 9.44 9.45 9.46 9.47 9.48 9.49 9.50 9.51 9.52 9.53 9.54 9.55 9.56 9.57 9.58 9.59 9.60 9.61 9.62 9.63 9.64 9.65 9.66 9.67 9.68 9.69 9.70 9.71 9.72 9.73 9.74 9.75 9.76 9.77 9.78 9.79 9.80 9.81 9.82 9.83 9.84 9.85 9.86 9.87 9.88 9.89 9.90 9.91 9.92 9.93 9.94 9.95 9.96 9.97 9.98 9.99 9.100	
11 HAZARD ASSESSMENT CODE		13 PHYSICAL AND CHEMICAL PROPERTIES	
11.1 11.2 11.3 11.4 11.5 11.6 11.7 11.8 11.9 11.10 11.11 11.12 11.13 11.14 11.15 11.16 11.17 11.18 11.19 11.20 11.21 11.22 11.23 11.24 11.25 11.26 11.27 11.28 11.29 11.30 11.31 11.32 11.33 11.34 11.35 11.36 11.37 11.38 11.39 11.40 11.41 11.42 11.43 11.44 11.45 11.46 11.47 11.48 11.49 11.50 11.51 11.52 11.53 11.54 11.55 11.56 11.57 11.58 11.59 11.60 11.61 11.62 11.63 11.64 11.65 11.66 11.67 11.68 11.69 11.70 11.71 11.72 11.73 11.74 11.75 11.76 11.77 11.78 11.79 11.80 11.81 11.82 11.83 11.84 11.85 11.86 11.87 11.88 11.89 11.90 11.91 11.92 11.93 11.94 11.95 11.96 11.97 11.98 11.99 11.100		13.1 Physical State at 15°C and 1 atm: 13.2 Molecular Weight: 13.3 Boiling Point at 1 atm: 13.4 Freezing Point: 13.5 Critical Temperature: 13.6 Critical Pressure: 13.7 Specific Gravity: 13.8 Liquid Surface Tension: 13.9 Liquid-Water Interfacial Tension: 13.10 Vapor (Gas) Specific Gravity: 13.11 Ratio of Specific Heats of Vapor (Gas): 13.12 Latent Heat of Vaporization: 13.13 Heat of Combustion: 13.14 Heat of Decomposition: 13.15 Heat of Solution: 13.16 Heat of Polymerization:	
12 HAZARD CLASSIFICATIONS		NOTES	
12.1 Code of Federal Regulations: 12.2 NAS Hazard Rating for Bulk Water Transportation: 12.3 NFPA Hazard Classifications: Category: Classification:		12.1 12.2 12.3 12.4 12.5 12.6 12.7 12.8 12.9 12.10 12.11 12.12 12.13 12.14 12.15 12.16 12.17 12.18 12.19 12.20 12.21 12.22 12.23 12.24 12.25 12.26 12.27 12.28 12.29 12.30 12.31 12.32 12.33 12.34 12.35 12.36 12.37 12.38 12.39 12.40 12.41 12.42 12.43 12.44 12.45 12.46 12.47 12.48 12.49 12.50 12.51 12.52 12.53 12.54 12.55 12.56 12.57 12.58 12.59 12.60 12.61 12.62 12.63 12.64 12.65 12.66 12.67 12.68 12.69 12.70 12.71 12.72 12.73 12.74 12.75 12.76 12.77 12.78 12.79 12.80 12.81 12.82 12.83 12.84 12.85 12.86 12.87 12.88 12.89 12.90 12.91 12.92 12.93 12.94 12.95 12.96 12.97 12.98 12.99 12.100	

REVISED 1978

ALN

ALUMINUM NITRATE

Common Synonyms Aluminum nitrate nonahydrate Nitric acid aluminum salt	Solid White Sinks and mixes slowly with water
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat Harmful if inhaled SOLID Irritating to skin and eyes If swallowed will cause nausea or vomiting
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 445-1 Flush with lots of water; flush skin with copious amounts of water	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Aluminum nitrate nonahydrate Nitric acid aluminum salt 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, washcloth, soap and water 5.2 Symptoms Following Exposure: Irritation, severe irritation, and burns if inhaled; irritation and burns if swallowed 5.3 Treatment for Exposure: EYES: Flush with water for at least 15 minutes. Flush with lots of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Irritation, severe irritation and burns if swallowed 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not listed	

6. PHYSICAL HAZARDS 6.1 Flash Point: Not listed 6.2 Flammable Limits in Air: Not listed 6.3 Fire Extinguishing Agents: Not listed 6.4 Fire Extinguishing Agents Not to be Used: Not listed 6.5 Special Hazards of Combustion Products: Data not available 6.6 Behavior in Fire: May cause irritating effects 6.7 Ignition Temperature: Not listed 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not listed	8. WATER POLLUTION 8.1 Aquatic Toxicity: 100 ppm 10 days stickleback killed fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Irritating and corrosive if in contact with water 7.2 Reactivity with Common Materials: May cause irritation if in contact with common materials 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Matheson Chemical Works 224 Westside Ave. P.O. Box 564 Jersey City, N.J. 07310 Allied Chemical Corp. Specialty Chemicals Div. P.O. Box 1078 Morristown, N.J. 07960 J.T. Baker Chemical Co. Phillipsburg, N.J. 08865
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 445-3 NN	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent Grade Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations, Oxidizer 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 375.13 13.3 Boiling Point at 1 atm: Not pertinent decomposition 13.4 Freezing Point: 164.1 = 71.6 = 298.6 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.42 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

Continued on page 2 and 3

ALM

ALUMINUM SULFATE

Common Synonyms Cake aluminum Patent aluminum		Solid	Gray white	Odorless
		Sinks and mixes slowly with water		
AVOID CONTACT WITH DUST AND VAPOR. KEEP FLOUT AWAY While working, avoid breathing dust or vapor. If inhaled, go to fresh air. If on skin, wash with soap and water. If in eyes, flush with water for 15 minutes. If swallowed, drink water. Do not induce vomiting. If on clothing, remove and wash separately. Do not use in food or feed.				
Fire		Not flammable Will not burn. May cause irritation to skin and eyes. If inhaled, go to fresh air. If on skin, wash with soap and water. If in eyes, flush with water for 15 minutes. If swallowed, drink water. Do not induce vomiting. If on clothing, remove and wash separately. Do not use in food or feed.		
Exposure		CAUTION DUST AND VAPOR DUST Irritating to eyes, nose and throat. If inhaled will cause difficulty breathing. If swallowed, hold head back and breathe deeply. If on skin, wash with soap and water. If in eyes, flush with water for 15 minutes. If swallowed, drink water. Do not induce vomiting. If on clothing, remove and wash separately. Do not use in food or feed. SOLID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. If on skin, wash with soap and water. If in eyes, flush with water for 15 minutes. If swallowed, drink water. Do not induce vomiting. If on clothing, remove and wash separately. Do not use in food or feed. HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Do not discharge into water bodies. Do not use in food or feed.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-1) Issue warning - water contaminant Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cake alum Patent alum 3.2 Coast Guard Competibility Classification: Not listed 3.3 Chemical Formula: $Al_2(SO_4)_3 \cdot 18H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Gray white 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator, goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation of dust irritates nose and mouth. Ingestion of large doses causes gastric irritation, nausea, vomiting, and purging. Dust irritates eyes and skin. 5.3 Treatment for Exposure: INHALATION: rinse nose and mouth with water. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral mouse LD ₅₀ = 770 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS		8. WATER POLLUTION	
6.1 Flash Point: Not flammable		8.1 Aquatic Toxicity: 14ppm - 36h, fundulus fetal, fresh water 240ppm - 48h, monoglyph, 11m * *Water is deoxygenated	
6.2 Flammable Limits in Air: Not flammable		8.2 Waterway Toxicity: Data not available	
6.3 Fire Extinguishing Agents: Not pertinent		8.3 Biological Oxygen Demand (BOD): None	
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent		8.4 Food Chain Concentration Potential: None	
6.5 Special Hazards of Combustion Products: Not pertinent			
6.6 Behavior in Fire: Not pertinent			
6.7 Ignition Temperature: Not pertinent			
6.8 Electrical Hazard: Not pertinent			
6.9 Burning Rate: Not pertinent			
		9. SELECTED MANUFACTURERS	
		1. Allied Chemical Corp. Industrial Chemicals Div. Morristown, N. J. 07960	
		2. American Cyanamid Co. Industrial Chemicals and Plastics Div. Wayne, N. J. 07470	
		3. W. R. Grace & Co. Division Chemicals Div. Baltimore, Md. 21204	
7. CHEMICAL REACTIVITY			
7.1 Reactivity with Water: Not reactive			
7.2 Reactivity with Common Materials: May corrode metals in presence of moisture			
7.3 Stability During Transport: Stable			
7.4 Neutralizing Agents for Acids and Caustics: Flush with water			
7.5 Polymerization: Not pertinent			
7.6 Inhibitor of Polymerization: Not pertinent			
		10. SHIPPING INFORMATION	
		10.1 Grades or Purity: Technical	
		10.2 Storage Temperature: Ambient	
		10.3 Inert Atmosphere: No requirement	
		10.4 Venting: Open	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) SS		13. PHYSICAL AND CHEMICAL PROPERTIES	
		13.1 Physical State at 15°C and 1 atm: Solid	
		13.2 Molecular Weight: 666.1	
		13.3 Boiling Point at 1 atm: Not pertinent	
		13.4 Freezing Point: Not pertinent	
		13.5 Critical Temperature: Not pertinent	
		13.6 Critical Pressure: Not pertinent	
		13.7 Specific Gravity: 1.7 at 20°C, solids	
		13.8 Liquid Surface Tension: Not pertinent	
		13.9 Liquid-Water Interfacial Tension: Not pertinent	
		13.10 Vapor (Gas) Specific Gravity: Not pertinent	
		13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent	
		13.12 Latent Heat of Vaporization: Not pertinent	
		13.13 Heat of Combustion: Not pertinent	
		13.14 Heat of Decomposition: Not pertinent	
		13.15 Heat of Solution: -22.1 Btu/lb = -12 kcal/mole = -0.415 x 10 ³ J/kg	
		13.16 Heat of Polymerization: Not pertinent	
12. HAZARD CLASSIFICATIONS			
12.1 Code of Federal Regulations: Not listed			
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed			
12.3 NFPA Hazard Classification: Not listed			
		<i>(continued on pages 5 and 6)</i>	
NOTES			

(continued on pages 4 and 5)

AEA

AMINOETHYLETHANOLAMINE

Common Synonyms: N-(2-Aminoethyl)ethanolamine 2-(2-Aminoethyl)ethanolamine (Ethanolamine) N-Ethyl-Diethanolamine (Diethanolamine) N-Hydroxyethyl-2-Ethanolamine		Liquid	Colorless	Mild ammoniacal odor
		Sinks and mixes with water		
Fire	Combustible			
Exposure	LIQUID Will burn skin and eyes.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Dispense and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-(2-Aminoethyl)ethanolamine N-Ethyl-Diethanolamine N-Ethyl-Diethanolamine N-Hydroxyethyl-2-ethanolamine N-Hydroxyethyl-2-ethanolamine 3.2 Coast Guard Compatibility Classification: Miscellaneous 3.3 Chemical Formula: HOCH ₂ CH ₂ NHCH ₂ CH ₂ NH ₂ 3.4 (IMCO) United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild ammoniacal		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, protective clothing 5.2 Symptoms Following Exposure: Skin contact will cause mild irritation; eye contact will cause more severe irritation 5.3 Treatment for Exposure: INGESTION: Do NOT induce vomiting; call physician immediately. SKIN: Wash area with plenty of water. EYES: Flush thoroughly with running water, preferably for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2.1 (Dose 1 to 5 g/kg) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: High concentrations of vapor may cause a slight irritation of the eyes or respiratory system. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant; may cause pain and second degree burns after a few minutes contact. 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: 26°F (3°C) 6.2 Flammable Limits in Air: LFL: Not known 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause floating 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 690°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available																												
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Dilute with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Dow Chemical Co. Midland, Mich. 48040 Jefferson Chemical Co. 4146 Richmond Ave. Houston, Tex. 77002 Union Carbide Corp. Chemical and Plastics Division 270 Park Ave. New York, N.Y. 10017																												
	10 SHIPPING INFORMATION 10.1 Grade or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open																												
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3 A P Q	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 104.14 13.3 Boiling Point at 1 atm: 260°F = 127°C = 518°K 13.4 Freezing Point: Data not available 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.024 at 20°C (liquids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.021 (liquids) 13.12 Latent Heat of Vaporization: Heat = 294 Btu/lb = 115 cal/g = 4.93 x 10³ J/kg 13.13 Heat of Combustion: 14,500 Btu/lb = 6,580 cal/g = 27.5 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Heat = 4 Btu/lb = 1.6 cal/g = 0.7 x 10³ J/kg 13.16 Heat of Polymerization: Not pertinent																												
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation:<table><tr><td>Category</td><td>Rating</td></tr><tr><td>Fire</td><td>2</td></tr><tr><td>Health</td><td></td></tr><tr><td> Vapor Irritant</td><td>1</td></tr><tr><td> Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td></td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Anesthetic Effect</td><td>1</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td> Other Chemicals</td><td>1</td></tr><tr><td> Water</td><td>0</td></tr><tr><td> Self Reaction</td><td>0</td></tr></table> 12.3 MFPA Hazard Classification: Not listed	Category	Rating	Fire	2	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons		Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Anesthetic Effect	1	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	
Category	Rating																												
Fire	2																												
Health																													
Vapor Irritant	1																												
Liquid or Solid Irritant	1																												
Poisons																													
Water Pollution																													
Human Toxicity	1																												
Aquatic Toxicity	1																												
Anesthetic Effect	1																												
Reactivity																													
Other Chemicals	1																												
Water	0																												
Self Reaction	0																												
NOTES																													

AMA

AMMONIA, ANHYDROUS

Common Synonyms Liquid ammonia		Liquefied compressed gas	Colorless	Ammonia odor
Throat and burn on water. Poisonous; stable vapor cloud is produced.				
Ammonia is a colorless, pungent gas with a characteristic odor. It is highly soluble in water, forming ammonium hydroxide. Ammonia is used in a wide variety of industrial processes, including the production of fertilizers, explosives, and dyes. It is also used as a refrigerant and in the synthesis of many organic compounds. Ammonia is highly flammable and can form explosive mixtures with air. It is also highly corrosive and can cause severe burns on contact with skin or eyes. Inhalation of ammonia vapor can cause respiratory irritation and damage to the lungs. Ammonia is also toxic to aquatic life and can cause environmental damage if released into the environment.				
Fire	Combustible Flash point: -17.8°C (-1°F) Flammable limits in air: 15.7% to 27.4% (vol) Fire extinguishing agents: Water, carbon dioxide, dry chemical			
 Exposure	VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat May cause frostbite May cause severe burns on contact with skin or eyes May cause respiratory irritation and damage to the lungs May cause environmental damage if released into the environment LIQUID Will burn skin and eyes Harmful if swallowed Will cause frostbite May cause severe burns on contact with skin or eyes May cause respiratory irritation and damage to the lungs May cause environmental damage if released into the environment			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes May cause environmental damage if released into the environment			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 694.4 3.1.				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point: -17.8°C (-1°F)		8.1 Aquatic Toxicity: 20-24 ppm 14 days goldfish and 100 ppm 14 days daphnia LC ₅₀	
6.2 Flammable Limits in Air: 15.7% to 27.4% (vol)		8.2 Water owl Toxicity: None	
6.3 Fire Extinguishing Agents: Water, carbon dioxide, dry chemical		8.3 Biological Oxygen Demand (BOD): None	
6.4 Fire Extinguishing Agents Not to be Used: None		8.4 Food Chain Concentration Potential: None	
6.5 Special Hazards of Combustion Products: None			
6.6 Behavior in Fire: None			
6.7 Ignition Temperature: 651°C (1205°F)			
6.8 Electrical Hazard: None			
6.9 Burning Rate: None			
7 CHEMICAL REACTIVITY		9 SELECTED MANUFACTURERS	
7.1 Reactivity with Water: None		Air Liquide	
7.2 Reactivity with Common Materials: None		Air Products	
7.3 Stability During Transport: None		Air Separation	
7.4 Neutralizing Agents for Acids and Caustics: None		Airco	
7.5 Polymerization: None		Airco	
7.6 Inhibitor of Polymerization: None		Airco	
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AAT

AMMONIUM ACETATE

Common Synonyms Acetic acid, ammonium salt		Solid	White	Weak ammonia odor
		Sticky and mixes with water		
Store in airtight container. Keep away from heat and fire. Avoid contact with skin and eyes. Do not inhale vapors. Do not swallow. Do not use in food or drink.				
Fire		Not flammable Irritating gases may be produced when heated Weak acids may be formed when heated		
Exposure		CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause difficult breathing If inhaled, remove to fresh air and breathe deeply If in eyes, flush with plenty of water If on skin, flush with plenty of water If swallowed, drink plenty of water If swallowed, do not induce vomiting If swallowed, do not induce vomiting If swallowed, do not induce vomiting		
Water Pollution		Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes Not recommended for use in water supply		
1 RESPONSE TO DISCHARGE (See Response Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetic acid, ammonium salt 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{NH}_4\text{CH}_3\text{COO}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Weak ammonia		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation of dust irritates nose and mouth. Ingestion irritates mouth and stomach. Contact with dust causes irritation of eyes and mild irritation of skin. 5.3 Treatment for Exposure: INHALATION: Remove to fresh air, breathe deeply. If in eyes, flush with plenty of water. If on skin, flush with plenty of water. If swallowed, drink plenty of water. If swallowed, do not induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				
6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating vapors of ammonia and acetic acid may form in fires 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Not pertinent 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Cautistics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		
8 WATER POLLUTION 8.1 Aquatic Toxicity: 5 ppm, 24 hr, mosquito fish, 11 m, fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 79% in 5 days 8.4 Food Chain Concentration Potential: None		9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Specialty Chemicals Div. P.O. Box 1087R Morristown, N.J. 07960 2. M. J. Chemicals, Inc. 223 Westside Ave. P.O. Box 384 Frederick City, Md. 21703 3. J. T. Baker Chemical Co. Phillipsburg, N.J. 08865		
10 SHIPPING INFORMATION 10.1 Grades or Purity: Reagent, CP, Technical 97.5% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Open		11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NS		
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 20°C and 1 atm: Solid 13.2 Molecular Weight: 77.08 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.17 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -5.5 Btu/lb = -3.2 cal/g = -0.13 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent		

Continued on pages 5 and 6

NOTES

ABZ

AMMONIUM BENZOATE

Common Synonyms Benzoic acid, ammonium salt		Solid	White	Odorless
		Sinks and mixes slowly with water		
See page 6 for possible health effects. Avoid contact with solid and dust. Avoid inhalation and eye contact. See page 6 for health and pollution effects.				
Fire		Combustible Dust cloud may explode if ignited in an enclosed area POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated Wear goggles or TWP. Stand back if fire starts Flush exposed area with water. Do not use water on fire.		
Exposure		CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. Harmful if inhaled Avoid dust. If inhaled, move to fresh air. If in eyes, flush with water. If on skin, wash with water. SOLID Irritating to skin and eyes. Avoid contact. If on skin, wash with water. If in eyes, flush with water. POISONOUS GASES MAY BE PRODUCED IN FIRE Avoid fire. If inhaled, move to fresh air. If in eyes, flush with water. If on skin, wash with water.		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Avoid contact with water. If in water, flush with water.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 444-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Benzoic acid, ammonium salt 3.2 Coast Guard Competibility Classification: Not listed 3.3 Chemical Formula: $\text{C}_6\text{H}_5\text{COONH}_4$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety glasses, gloves 5.2 Symptoms Following Exposure: Inhalation of dust may irritate nose. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION: move to uncontaminated atmosphere. EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Irritating. Toxic ammonia gas may form in fires. 6.6 Behavior in Fire 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Slowly releases ammonia gas, which may collect in closed container 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Ashland Oil, Inc. P. O. Box 2219 Columbus, Ohio 43216 2. Heco, Inc. Delaware Water Gap, Pa. 18327 3. Gallard Schlesinger Chemical Mfg. Co. 584 Mineola Ave. Carle Place, N. Y. 11514
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) SS	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 139.15 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 388°F = 198°C = 471°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.26 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 34 Btu/lb = 19 cal/g = 0.80 x 10³ J/kg 13.16 Heat of Polymerization: Not pertinent
(Continued on pages 5 and 6)	
NOTES	

ABC

AMMONIUM BICARBONATE

Common Synonyms: Acid ammonium carbonate Ammonium hydrogen carbonate Carbolic acid, ammonium salt		Solid White Weak ammonia odor Sinks and mixes slowly with water. Freezing point is 95°F
A white, crystalline powder. It is soluble in water and forms a weakly alkaline solution. It is stable in air and does not decompose at room temperature. It is used as a leavening agent in baking powder and as a fire retardant.		
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated When heated it will decompose to ammonia gas	
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause difficult breathing If eyes are affected, flush with plenty of water If breathing has stopped, artificial respiration If swallowed, drink plenty of water SOLID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes If on skin, wash with plenty of water If in eyes, flush with plenty of water If SWALLOWED, drink plenty of water If SWALLOWED, do not induce vomiting unless told to do so If SWALLOWED, do not eat, drink or have any other food or drink	
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not a threat to water quality Not a pollutant in domestic water	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acid ammonium carbonate Ammonium hydrogen carbonate Carbolic acid, monoammonium salt 3.2 Coast Guard Competibility Classification Not listed 3.3 Chemical Formula: NH_4HCO_3 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Slight ammonia
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Work gloves, dust respirator, safety glasses or chemical safety goggles if dusty 5.2 Symptoms Following Exposure: Inhalation may cause respiratory irritation. Ingestion could be harmful. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: Consult physician in case of ingestion or severe irritation. INHALATION: move to uncontaminated atmosphere. EYES OR SKIN: wash with large amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating and toxic ammonia gas may form in fires 6.6 Behavior in Fire: Decomposes, but reaction is not explosive. Ammonia gas is formed 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack copper, nickel and zinc 7.3 Stability During Transport: Decomposes above 34°C (91°F) with formation of ammonia gas, which may collect in closed containers 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Diamond Shamrock Chemical Co. 300 Union Commerce Building Cleveland, Ohio 44115 2. Allied Chemical Corp. Industrial Chemical Division P. O. Box 1139P Morristown, N. J. 07960 3. J. T. Baker Chemical Co. Phillipsburg, N. J. 08865
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS		10. SHIPPING INFORMATION 10.1 Grades or Purity: Low Reagent 10.2 Storage Temperature: Below 33°C (91°F) 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 79.06 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent (decomposes at 35°C) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.57 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 140 Btu/lb = 80 cal/g = $3.3 \times 10^5 \text{ J/kg}$ 13.16 Heat of Polymerization: Not pertinent
(Continued on page 1 and 2)		
NOTES		

ABF

AMMONIUM BIFLUORIDE

Common Synonyms Ammonium hydrogen fluoride Acid ammonium fluoride Ammonium acid fluoride		Solid	White	Odorless
Sinks and mixes with water				

6 FIRE HAZARDS

- 6.1 Flash Point: Not flammable
- 6.2 Flammable Limits in Air: Not flammable
- 6.3 Fire Extinguishing Agents: Not pertinent
- 6.4 Fire Extinguishing Agents Not to be Used:
Do not apply water to adjacent fires
- 6.5 Special Hazards of Combustion Products:
Toxic ammonia and hydrogen fluoride gases may form in fire
- 6.6 Behavior in Fire
- 6.7 Ignition Temperature: Not pertinent
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterway Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD):
Data not available
- 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1. American Hoechst Corp.
Chemicals and Plastics Division
Route 902, 206 North
Somerville, N.J. 08876
2. The Harshaw Chemical Co.
1941 E. 97th Street
Cleveland, Ohio 44106
3. Allied Chemical Corp.
Specialty Chemicals Division
P.O. Box 1087R
Morristown, N.J. 07960

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Pure 99+%,
Technical 97-98.5%
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3:
SS

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations:
Corrosive solid
- 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 3 |
| Flammability (Red) | 1 |
| Reactivity (Yellow) | 2 |

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
- 13.2 Molecular Weight: 71.04
- 13.3 Boiling Point at 1 atm:
 $46.1^{\circ}\text{F} = 2.9^{\circ}\text{C} = 273^{\circ}\text{K}$
- 13.4 Freezing Point:
 $258.0^{\circ}\text{F} = 125.6^{\circ}\text{C} = 398.8^{\circ}\text{K}$
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.5 at 20°C (solid)
- 13.8 Liquid Surface Tension: Not pertinent
- 13.9 Liquid-Water Interfacial Tension:
Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas):
Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: Not pertinent
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: 1.64 Btu/lb.
 $= 85^{\circ}\text{cal/g} = 350 \times 10^3 \text{ J/kg}$
- 13.16 Heat of Polymerization: Not pertinent

NOTES

Continued on page 1 and 2

ACB

AMMONIUM CARBONATE

Common Synonyms		Solid	White	Strong Ammonia Odor
		Sinks and mixes with water		
SAFETY DATA SHEET 1. IDENTIFICATION 2. HAZARD IDENTIFICATION 3. COMPOSITION/INFORMATION ON INGREDIENTS 4. FIRST AID MEASURES 5. FIRE FIGHTING MEASURES 6. ACCIDENTAL RELEASE MEASURES 7. HANDLING AND STORAGE 8. EXPOSURE CONTROLS/PERSONAL PROTECTION 9. PHYSICAL AND CHEMICAL PROPERTIES 10. STABILITY AND REACTIVITY 11. TOXICOLOGICAL INFORMATION 12. ECOLOGICAL INFORMATION 13. DISPOSAL CONSIDERATIONS 14. TRANSPORT INFORMATION 15. REGULATORY INFORMATION 16. OTHER INFORMATION				
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE When heated			
Exposure	ACUTE TOXICITY DUST Irritating to eyes, nose and throat If inhaled will cause difficult breathing CHRONIC TOXICITY SOLID Irritating to skin and eyes If swallowed will cause nausea ENVIRONMENTAL TOXICITY EC ₅₀ (ALGAE) = 100 mg/L EC ₅₀ (Daphnia) = 100 mg/L EC ₅₀ (Fish) = 100 mg/L EC ₅₀ (Birds) = 100 mg/L EC ₅₀ (Mammals) = 100 mg/L			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes No known adverse effects on humans			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Hartshorn Salt, volatile 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: (NH ₄) ₂ CO ₃ 3.4 IMCG/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Strong ammonia		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Dust respirator, protection against ammonia vapors				
5.2 Symptoms following Exposure: Inhalation causes irritation of nose and throat. Ingestion may cause gastric irritation. Contact with eyes or skin causes irritation.				
5.3 Treatment for Exposure: INHALATION: leave contaminated area. INGESTION: give large amount of water. SKIN: flush with copious amounts of water. EYES: flush with water.				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Data not available				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: 5 ppm (as ammonia gas)				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic ammonia gas will form in fire 6.6 Behavior in Fire: Decomposes, but reaction is not explosive. Ammonia gas is formed 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 24 ppm 3.5 hr goldfish killed; fresh water 10 ppm 24 hr kill; 100 ppm 24 hr kill 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Agrico Chemical Co. National Bank of Tulsa Building Tulsa, Okla. 74103 Allied Chemical Corp. Specialty Chemicals Division P. O. Box 1087R Morristown, N. J. 07960 Mallinckrodt Chemical Works 223 Westside Avenue P. O. Box 384 Jersey City, N. J. 07303
	10 SHIPPING INFORMATION 10.1 Grades or Purity: CP, NF, USP, Reagent, Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open

11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3 SS	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 96 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.5 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	

NOTES

AMC

AMMONIUM CHLORIDE

Common Synonyms Ammonium chloride Sal ammoniac Salmar Amchloride Ammonerite	Solid White Odorless Sinks and mixes slowly with water
See detailed information on this chemical in the MSDS Handbook. Avoid contact with skin and eyes. Wash thoroughly with water if contact occurs. Do not inhale dust or fumes.	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE. Irritating gases may be produced when heated. Wear goggles and wear a respirator breathing apparatus.
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If swallowed will cause nausea and vomiting. If swallowed, do not induce vomiting. If swallowed, drink plenty of water. SOLID Irritating to skin and eyes. If swallowed will cause nausea. If swallowed, do not induce vomiting. If swallowed, drink plenty of water. POISONOUS GASES MAY BE PRODUCED IN FIRE. Irritating gases may be produced when heated. Wear goggles and wear a respirator breathing apparatus.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Do not discharge into waterways.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Amchlor, Ammonerite, Ammonium chloride, Sal ammoniac, Salmar. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: NH_4Cl 3.4 IMCO/United Nations Numerical Designation: Not listed.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Gloves of any material, safety glasses or chemical safety goggles, dust mask or respirator as necessary. 5.2 Symptoms Following Exposure: Inhalation of fumes irritates respiratory passages. Ingestion irritates mouth and stomach. Fumes are irritating to eyes. Contact with skin may cause irritation. 5.3 Treatment for Exposure: INHALATION: remove to fresh air. INGESTION: give large amount of water, get medical attention if irritation persists. EYES OR SKIN: flush with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 mg/m ³ 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, oral rat LD ₅₀ = 1.650 mg/kg. 5.7 Lethal Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Odorless.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to Be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic and irritating ammonia and hydrogen chloride gases may form in fire. 6.6 Behavior in Fire: May volatilize and condense on cool surfaces. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Date: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 6 ppm 96 hr. sunfish TL ₅₀ fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Pennwalt Corp. Three Parkways Philadelphia, Pa. 19102 2. Allied Chemical Corp. Industrial Chemicals Division P. O. Box 1139 R. Morristown, N. J. 07960 3. Mallinckrodt Chemical Works 223 Westside Avenue P. O. Box 164 Jersey City, N. J. 07303
10. SHIPPING INFORMATION 10.1 Grades or Purity: USP Reagent Technical 99.4% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 53.5. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.53 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 130 Btu/lb = 72 cal/g = 3.0 x 10 ⁵ J/kg. 13.16 Heat of Polymerization: Not pertinent.
(Continued on page 4 and 5) NOTES	

ACI

AMMONIUM CITRATE

Common Synonyms Diammonium citrate Ammonium citrate Citric acid Diammonium salt		Solid	White	Weak Ammonia Odor
		Sinks and mixes with water		
Fire		Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE		
Exposure		DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG-44) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium citrate d basic Citric acid diammonium salt Diammonium citrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $(\text{NH}_4)_2\text{HC}_3\text{H}_5\text{O}_7$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): solid 4.2 Color: White 4.3 Odor: Slight ammoniacal		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved dust respirator, eye goggles 5.2 Symptoms Following Exposure: Inhalation causes respiratory irritation. Ingestion causes diarrhea. Contact with eyes causes mild irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. EYES: flush with water or physiological saline. get medical care if irritation persists. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS

- 6.1 Flash Point: Not pertinent (combustible solids)
6.2 Flammable Limits in Air: Not pertinent
6.3 F + Extinguishing Agents: Water
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Toxic ammonia gas may form in fire
6.6 Behavior in Fire:
6.7 Ignition Temperature: Not pertinent
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials:
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
8.2 Waterway Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

1. Pfizer Chemicals Div.
235 E. 42nd St.
New York, N.Y. 10017
2. Allied Chemical Corp.
Specialty Chemicals Div.
P.O. Box 1067R
Morristown, N.J. 07960
3. J. T. Baker Chemical Co.
Phillipsburg, N.J. 08865

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Reagent
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 44B-3)
SS

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 226
13.3 Boiling Point at 1 atm: Not pertinent (decomposes)
13.4 Freezing Point: Not pertinent
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 1.48 at 20°C (solid)
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Data not available
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

NOTES

AFR

AMMONIUM FLUORIDE

Common Synonyms: Neutral ammonium fluoride	Solid White Odorless Sinks and mixes with water
	SAFETY DATA SHEET 1. IDENTIFICATION 2. HAZARD IDENTIFICATION 3. COMPOSITION/INFORMATION ON INGREDIENTS 4. FIRST AID MEASURES 5. FIRE FIGHTING MEASURES 6. ACCIDENTAL RELEASE MEASURES 7. HANDLING AND STORAGE 8. EXPOSURE CONTROLS/PERSONAL PROTECTION 9. PHYSICAL AND CHEMICAL PROPERTIES 10. STABILITY AND REACTIVITY 11. TOXICOLOGICAL INFORMATION 12. ECOLOGICAL INFORMATION 13. DISPOSAL CONSIDERATIONS 14. TRANSPORT INFORMATION 15. REGULATORY INFORMATION 16. OTHER INFORMATION
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE
 Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID POISONOUS IF SWALLOWED Will burn skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE	2. LABELS
3. CHEMICAL DESIGNATIONS	4. OBSERVABLE CHARACTERISTICS
5. HEALTH HAZARDS	

6. FIRE HAZARDS	8. WATER POLLUTION
7. CHEMICAL REACTIVITY	9. SELECTED MANUFACTURERS
12. HAZARD CLASSIFICATIONS	13. SHIPPING INFORMATION
14. HAZARD ASSESSMENT CODE	13. PHYSICAL AND CHEMICAL PROPERTIES

NOTES

AFM

AMMONIUM FORMATE

Common Synonyms Formic acid ammonium salt		Solid	White	Weak ammonia odor
		Sinks and mixes slowly with water		
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated			
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous, if it enters water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Formic acid ammonium salt 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: HCOONH ₄ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Weak ammonia		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion irritates mouth and stomach. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: Remove to fresh air. INGESTION: Give large amounts of water per medical direction. EYES: Flush with water for at least 15 min. SKIN: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 2,250 mg/kg (mouse) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Toxic and irritating ammonia and carbon dioxide gases may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. R N A Corporation 660 New Milford Rd. Andover, N.Y. 10902 2. Mallinckrodt Chemical Works 223 Westside Avenue P.O. Box 384 Jersey City, N.Y. 07304 3. Gallard Schlegel Chemical Mfg. Co. 584 Mineola Avenue Carle Place, N.Y. 11514
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Analytical grade Organic chemical grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) N	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 61.06 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 21°F = 16°C = 289°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.25 at 20°C, solid 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 84 Btu/lb = 47 kcal/g = 1.97 × 10⁵ J/kg 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code or Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	<i>(continued on pages 1 and 4)</i>
NOTES	

(continued on pages 1 and 2)

AGC

AMMONIUM GLUCONATE

Common Synonyms		Solubility	White	Weak ammoniacal odor
Smells and mixes with water				
Fire		Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE.		
Exposure		DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. Harmful if swallowed.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE (See Appendix L—Toxicity Information, CG 446-4) Dispense and flush.		2 LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: $\text{NH}_4\text{C}_6\text{H}_{11}\text{O}_7$ 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: White. 4.3 Odor: Weak ammonia.		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Respirator for nuisance dust. 5.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Contact with eyes causes mild irritation. 5.3 Treatment for Exposure: INHALATION: remove to fresh air. EYES AND SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

11. HAZARD ASSESSMENT CODE

(See Appendix A—Hazard Assessment Information, CG 446-3)
N5

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed.
12.2 H.S. Hazard Rating for Bulk Water Transportation: Not listed.
12.3 NFPA Hazard Classifications: Not listed.

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid.
13.2 Molecular Weight: 213.
13.3 Boiling Point at 1 atm: Not pertinent.
13.4 Freezing Point: Not pertinent.
13.5 Critical Temperature: Not pertinent.
13.6 Critical Pressure: Not pertinent.
13.7 Specific Gravity: > 1 at 20°C (solid).
13.8 Liquid Surface Tension: Not pertinent.
13.9 Liquid-Water Interfacial Tension: Not pertinent.
13.10 Vapor (Gas) Specific Gravity: Not pertinent.
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.
13.12 Latent Heat of Vaporization: Not pertinent.
13.13 Heat of Combustion: Data not available.
13.14 Heat of Decomposition: Not pertinent.
13.15 Heat of Solution: Data not available.
13.16 Heat of Polymerization: Not pertinent.

(Continued on pages 3 and 4)

NOTES

6. FIRE HAZARDS

- 6.1 Flash Point: Not pertinent.
6.2 Flammable Limits in Air: Not pertinent.
6.3 Fire Extinguishing Agents: Water.
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent.
6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire.
6.6 Behavior in Fire:
6.7 Ignition Temperature: Not pertinent.
6.8 Electrical Hazard: Not pertinent.
6.9 Burning Rate: Not pertinent.

8. WATER POLLUTION

- 8.1 Ac. Toxicity: Data not available.
8.2 Waterway Toxicity: Data not available.
8.3 Biological Oxygen Demand (BOD): Data not available.
8.4 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

- 1 Pfizer Incorporated
Chemicals Div.
235 E. 42nd St.
New York, N.Y. 10017
2 Pfaltz and Bauer, Inc.
126-04 Northern Blvd.
Flushing, N.Y. 11355
3 Schwartz Mann
Orangeburg, N.Y. 10962

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
7.2 Reactivity with Common Materials:
7.3 Stability During Transport: Stable.
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
7.5 Polymerization: Not pertinent.
7.6 Inhibitor of Polymerization: Not pertinent.

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Pure.
10.2 Storage Temperature: Ambient.
10.3 Inert Atmosphere: No requirement.
10.4 Venting: Open.

AMH

AMMONIUM HYDROXIDE

(< 28% AQUEOUS AMMONIA)

Common Synonyms: Aqueous water Liquid ammonia	Waters: liquid colorless Ammonia: colorless floats and mixes with water. Irritating vapor is produced.
1. Fire Not flammable	
2. Exposure VAPOR Irritating to skin, eyes, nose and throat. If inhaled will cause nausea, vomiting, difficult breathing, or loss of consciousness. LIQUID Will burn skin and eyes. Harmful if swallowed.	
3. Water Pollution HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.	
4. 1 RESPONSE TO DISCHARGE See Response Methods Manual, CG 445-4. Isolation: 100 ft (30 m) downwind. Protective actions: Decontamination:	5. 2. LABEL 
6. 3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonia, Ammonium Hydroxide, Aqueous Ammonia, Liquid Ammonia 3.2 Coast Guard Compatibility Classification: A 3.3 Chemical Formula: NH_4OH 3.4 IMCO United Nations Numerical Designation: 1512	7. 4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent
8. 5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber boots, gloves, and suit; and goggles; and a respirator with a full facepiece and a high efficiency particulate filter. 5.2 Symptoms Following Exposure: Irritation to skin, eyes, nose and throat; coughing; wheezing; shortness of breath; chest pain; nausea; vomiting; difficulty breathing; loss of consciousness. 5.3 Treatment for Exposure: INHALATION: Move to fresh air. If breathing is difficult, give oxygen. INGESTION: DO NOT induce vomiting. Give water to drink. EYES: Flush with water for at least 15 minutes. SKIN: Flush with water for at least 15 minutes. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm 5.5 Short-Term Inhalation Limits: 10 ppm (15 min) 5.6 Toxicity by Ingestion: Grade 3, oral rat, LD₅₀ = 140 mg/kg 5.7 Late Toxicity: Do not know. 5.8 Vapor (Gas) Irritant Characteristics: Very irritating to skin, eyes, nose and throat. 5.9 Liquid or Solid Irritant Characteristics: Very irritating to skin, eyes, nose and throat. 5.10 Odor Threshold: 1 ppm	

9. 6 FIRE HAZARDS 6.1 Flash Point: Not applicable 6.2 Flammable Limits in Air: Not applicable 6.3 Fire Extinguishing Agents: Not applicable 6.4 Fire Extinguishing Agents Not to be Used: Not applicable 6.5 Special Hazards of Combustion Products: Not applicable 6.6 Behavior in Fire: Not applicable 6.7 Ignition Temperature: Not applicable 6.8 Electrical Hazard: Do not use electrical equipment 6.9 Turning Rate: Not applicable	10. 8 WATER POLLUTION 8.1 Aquatic Toxicity: Not applicable 8.2 Waterway Toxicity: Not applicable 8.3 Biological Oxygen Demand (BOD): Not applicable 8.4 Food Chain Concentration Potential: Not applicable
11. 9 SELECTED MANUFACTURERS Ammonia Co. Inc. Cyanamid Inc. Fisher Scientific H. K. Walker & Co. Kaiser Chemical Monsanto Co. Rohm and Haas Co. Union Carbide Corp. W. R. Grace & Co. Yamamoto Chemical Co.	
12. 7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not applicable 7.2 Reactivity with Common Materials: Not applicable 7.3 Stability During Transport: Not applicable 7.4 Neutralizing Agents for Acids and Caustics: Not applicable 7.5 Polymerization: Not applicable 7.6 Inhibitor of Polymerization: Not applicable	
13. 10 SHIPPING INFORMATION 10.1 Grades or Purity: Not applicable 10.2 Storage Temperature: Not applicable 10.3 Inert Atmosphere: Not applicable 10.4 Venting: Not applicable	
14. 11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 445-4. A P H S	15. 13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 35.05 13.3 Boiling Point at 1 atm: 38°C 13.4 Freezing Point: -33°C 13.5 Critical Temperature: 132.4°C 13.6 Critical Pressure: 11.2 atm 13.7 Specific Gravity: 0.88 13.8 Liquid Surface Tension: 22.3 dyne/cm 13.9 Liquid-Water Interfacial Tension: Not applicable 13.10 Vapor (Gas) Specific Gravity: 0.59 13.11 Ratio of Specific Heats of Vapor (Gas): Not applicable 13.12 Latent Heat of Vaporization: 1050 cal/g 13.13 Heat of Combustion: Not applicable 13.14 Heat of Decomposition: Not applicable 13.15 Heat of Solution: Not applicable 13.16 Heat of Polymerization: Not applicable
16. 12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations (Hazardous Materials): Not applicable 12.2 NAS Hazard Rating for Bulk Water Transportation: Not applicable 12.3 NFPA Hazard Classifications: Not applicable	
NOTES	

AID

AMMONIUM IODIDE

Common Synonyms: Solid White Odorless Sinks and mixes with water	
Fire Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated	
Exposure DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed	
Water Pollution Effects of low concentrations in aquatic life are unknown May be dangerous if it enters water masses	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4 Spill marking, water's immediate cleanup and flow	2. LABELS No hazard label required under Federal regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: None known 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: NH_4I 3.4 IMCO/United Nations Numerical Designation: N/A	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Not necessary, goggles or face shield, other protection 5.2 Symptoms Following Exposure: Irritation, coughing, sore throat and irritation of skin with excessive irritation 5.3 Treatment for Exposure: INHALATION: Remove to fresh air. INGESTION: Give water immediately. Has been reported to irritate stomach. INHALATION: Give water immediately. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not listed	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating fumes. Hydrogen iodide, iodine and water vapor may be produced. 6.6 Behavior in Fire: Compound may sublime in fire and undergo oxidation. 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS American Alkali Corp. Chlor-Alkali and Poly-Sol Division Somerset, N.J. 08856 2. Mallinckrodt Chemical Works 221 Westside Avenue P.O. Box 144 Jersey City, N.J. 07310 3. J.T. Baker Chemical Co. Phillipsburg, N.J. 08855
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.4 N/A	10. SHIPPING INFORMATION 10.1 Grades or Purity: NE Reagent 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Vending: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 144.94 13.3 Boiling Point at 1 atm: Not pertinent (solid mass) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.44 (20°C/4°C) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 4.1 kcal/mole (20°C) g/mole x 10 ⁻³ kcal/g 13.16 Heat of Polymerization: Not pertinent
NOTES	

ALT

AMMONIUM LACTATE

Common Synonyms (DL) Lactic acid, ammonium salt Ammonium lactate syrup		Solid or liquid	White	Odorless
		Sinks and mixes with water		
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE.			
Exposure	DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods for: Joint CG 446-4) Disperse and Flush		2. LABELS No hazard labels required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium lactate syrup (DL) Lactic acid, ammonium salt 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: CH ₃ CH(OH)COONH ₄ 3.4 HBCO/Unified Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or liquid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat, contact with eyes causes irritation 5.3 Treatment for Exposure: INHALATION: remove to fresh air. EYES: flush with water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 LD ₅₀ Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (if combustible solids) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water can 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may be formed in a fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Corrosives: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Tanacet Chemical Corp. P. O. Box 385 Lyndhurst, N. J. 07071 2. Pfaltz and Bauer, Inc. 125-04 Northern Boulevard Flushing, N. Y. 11358 3. Gallard Schlegel Chemical Mfg. Co. 544 Mincola Avenue Carle Place, N. Y. 11514	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS		10. SHIPPING INFORMATION 10.1 Grades or Purity: Pure 99% strength water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	
12. HAZARD CLASSIFICATIONS 12.1 Code or Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 107.11 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.2 at 15°C, liquid 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent	
NOTES			

ALS

AMMONIUM LAURYL SULFATE

Common Synonyms Dodecyl sulfate, ammonium salt Lauryl ammonium sulfate		Liquid Light yellow May float or sink and mix with water
Not flammable if possible. Keep away from heat and fire. Harmful if swallowed. May be dangerous if it enters water makes. Not flammable if possible.		
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Overheated solids may produce toxic light gases	
Exposure	LIQUID Irritating to skin and eyes. Harmful if swallowed. May be dangerous if it enters water makes. Not flammable if possible.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water makes. Not flammable if possible.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2 LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Dodecyl sulfate, ammonium salt, Lauryl ammonium sulfate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_{12}H_{25}OSO_2NH_4 \cdot H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light yellow 4.3 Odor: Data not available
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, goggles or face shield 5.2 Symptoms Following Exposure: Contact with liquid irritates eyes and may have drying effect on the skin. Prolonged contact will cause skin irritation. 5.3 Treatment for Exposure: EYES OR SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short Term Inhalation Limits: Data not available. 5.6 Toxicity by Injection: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS

- 5.1 Flash Point: Not pertinent (non combustible water solution)
 6.2 Flammable Limits in Air: Not pertinent
 6.3 Fire Extinguishing Agents: Not pertinent
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen and sulfur may form in fires.
 6.6 Behavior in Fire:
 6.7 Ignition Temperature: Not pertinent
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
 8.2 Waterway Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD): Data not available
 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

- 1 Richardson Company
 Organic Chemicals Division
 100 New Street
 Paterson, N.J. 07654
 2 Stepan Chemical Co.
 Edens and Wierleka
 Northfield, Ill. 60093

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
 7.2 Reactivity with Common Materials:
 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
 7.5 Polymerization: Not pertinent
 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: 28-30% solution in water
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 A P

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 283 (solute only)
 13.3 Boiling Point at 1 atm: Not pertinent
 13.4 Freezing Point: Not pertinent
 13.5 Critical Temperature: Not pertinent
 13.6 Critical Pressure: Not pertinent
 13.7 Specific Gravity: 1.03 at 20°C (liquid)
 13.8 Liquid Surface Tension: Data not available
 13.9 Liquid-Water Interfacial Tension: Not pertinent
 13.10 Vapor (Gas) Specific Gravity: Not pertinent
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
 13.12 Latent Heat of Vaporization: Not pertinent
 13.13 Heat of Combustion: Not pertinent
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 4 and 6)

NOTES

AMB

AMMONIUM MOLYBDATE

Common Synonyms Molybdic acid (55%)	Solid Colorless to greenish-yellow or white Odorless Sinks and mixes with water
See also: Molybdenum compounds Molybdenum compounds Molybdenum compounds Molybdenum compounds Molybdenum compounds	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE When heated, it may decompose to form toxic molybdenum oxides.
Exposure	ALL FORMS OF AMMONIUM MOLYBDATE DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Inhalation may cause irritation of the respiratory tract. SOLID Irritating to skin and eyes. Harmful if swallowed. Ingestion may cause irritation of the gastrointestinal tract. ENVIRONMENTAL If swallowed, it may cause irritation of the gastrointestinal tract. If swallowed, it may cause irritation of the gastrointestinal tract. If swallowed, it may cause irritation of the gastrointestinal tract. If swallowed, it may cause irritation of the gastrointestinal tract.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not recommended for use in water treatment.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446.4) Issue warning - water contaminant. Should be removed. Chemical and physical treatment.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms Molybdic acid (55%) 3.2 Coast Guard Compatibility Classification Not listed 3.3 Chemical Formula (NH ₄) ₂ MoO ₄ · 4H ₂ O (for C.P. and Reagent grades only) 3.4 IMCO/United Nations Numerical Designation Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped) Solid 4.2 Color White or greenish yellow colorless to yellow 4.3 Odor None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment Dust mask, goggles, face shield, rubber gloves. 5.2 Symptoms Following Exposure Inhalation causes irritation of nose and throat. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION move to fresh air. EYES: flush with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value) 5 mg/m ³ (as molybdenum) 5.5 Short-Term Inhalation Limits Data not available 5.6 Toxicity by Ingestion Grade 3 oral rat LD ₅₀ = 333 mg/kg 5.7 Late Toxicity Data not available 5.8 Vapor (Gas) Irritant Characteristics Data not available 5.9 Liquid or Solid Irritant Characteristics Data not available 5.10 Odor Threshold Data not available	

6. FIRE HAZARDS 6.1 Flash Point Not flammable 6.2 Flammable Limits in Air Not flammable 6.3 Fire Extinguishing Agents Not pertinent 6.4 Fire Extinguishing Agents Not to be Used Not pertinent 6.5 Special Hazards of Combustion Products Toxic oxides of nitrogen may form in fire. 6.6 Behavior in Fire 6.7 Ignition Temperature Not pertinent 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity Data not available 8.2 Waterfowl Toxicity Data not available 8.3 Biological Oxygen Demand (BOD) Data not available 8.4 Food Chain Concentration Potential Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water No reaction 7.2 Reactivity with Common Materials 7.3 Stability During Transport Stable 7.4 Neutralizing Agents for Acids and Caustics Not pertinent 7.5 Polymerization Not pertinent 7.6 Inhibitor of Polymerization Not pertinent	9. SELECTED MANUFACTURERS 1. J. T. Baker Chemical Co. Phillipsburg, N. J. 08855 2. Climax Molybdenum Company One Greenwich Plaza Greenwich, Conn. 06830 3. Varfacoid Chemical Co. 666 South Front St. Elizabeth, N. J. 07202
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446.3) NN	10. SHIPPING INFORMATION 10.1 Grades or Purity Reagent, C.P. A closely related substance is ammonium molybdic acid (55%). 10.2 Storage Temperature Ambient 10.3 Inert Atmosphere No requirement 10.4 Venting Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations Not listed 12.2 NAE Hazard Rating for Bulk Water Transportation Not listed 12.3 NFPA Hazard Classifications Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm Solid 13.2 Molecular Weight 339.6 13.3 Boiling Point at 1 atm Not pertinent 13.4 Freezing Point Not pertinent 13.5 Critical Temperature Not pertinent 13.6 Critical Pressure Not pertinent 13.7 Specific Gravity 1.4 at 20°C (solid) 13.8 Liquid Surface Tension Not pertinent 13.9 Liquid-Water Interfacial Tension Not pertinent 13.10 Vapor (Gas) Specific Gravity Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas) Not pertinent 13.12 Latent Heat of Vaporization Not pertinent 13.13 Heat of Combustion Not pertinent 13.14 Heat of Decomposition Not pertinent 13.15 Heat of Solution Data not available 13.16 Heat of Polymerization Not pertinent
NOTES <i>(Continued on page 4 and 5)</i>	

AMN

AMMONIUM NITRATE

Common Synonyms Nitrate	Solid pellets or flakes White to light gray or brown Odorless Sinks and mixes with water
Call Fire Department & keep people away Evacuate area as far as possible Do not eat, drink, or breathe dust or fumes Notify local health department	
Fire	May cause fire and explode on contact with combustibles CONTAINERS MAY EXPLODE IN FIRE POISONOUS GASES MAY BE PRODUCED WHEN HEATED Water soluble and non-toxic in small quantities Toxic in large quantities Combustible in dust form Do not use water to extinguish fire Use dry chemical, carbon dioxide, or foam
Exposure	CAUTION: FORMULATED AMN DUST Irritating to eyes, nose, and throat If inhaled, may cause coughing or difficult breathing May be dangerous if it enters water intakes Not a health hazard in solid form Not a hazard to plants or animals
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not a health hazard in solid form Not a hazard to plants or animals
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 445-41 Dispose as instructed	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: None 3.2 Coast Guard Commodity Classification: Ammonia 3.3 Chemical Formula: NH ₄ NO ₃ 3.4 IMO/CO United Nations Numerical Designation: 1943	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White to light gray or brown 4.3 Odor: None
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Wear self-contained breathing apparatus 5.2 Symptoms Following Exposure: Irritation of eyes and mucous membranes Attention: Ingestion or inhalation causes urination and acid urine. Large amount causes systemic acidosis and methemoglobinemia (abnormal hemoglobin) 5.3 Treatment for Exposure: Remove from exposure — symptoms reversible 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Not pertinent 5.7 Late Toxicity: Not pertinent 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Not pertinent 5.10 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Use flooding amounts of water in early stages of fire When large quantities are involved, no massive fires, control efforts should be continued to prevent a fire from expanding 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Do not use vacuum devices which may draw in oxygen 6.6 Behavior in Fire: May explode in fire Support fire, shut off the main gas supply 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not flammable 6.9 Burning Rate: Not flammable	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not a reactor 7.2 Reactivity with Common Materials: Not a reactor 7.3 Stability During Transport: If heated, strongly decomposes, giving off a gas and gases which support combustion. Undergoes detonation if heated under confinement 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Allied Chemical Corp. Agricultural Div. Marlinton, N. E. 26070 2. Hercules Inc. Explosives & Chemical Propulsion Dept. Bessemer, Ala. 35820 3. Monsanto Co. Monsanto Commercial Products Co. Agricultural Div. 800 No. 1st. Indus. Bldg. St. Louis, Mo. 63102								
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 445-45 NS	10 SHIPPING INFORMATION 10.1 Grades or Purity: Pure grade fertilizer grade 33.5% nitrogen 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Data not available 10.4 Venting: Data not available								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 NAS Hazard Rating for Bulk Water Transportation: Not flammable 12.3 NFPA Hazard Classifications <table border="1" data-bbox="995 1469 1234 1557"> <thead> <tr> <th>Category</th><th>Classification*</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table> * For additional information see classification	Category	Classification*	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	2	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 80.05 13.3 Boiling Point at 1 atm: 210.9°C 13.4 Freezing Point: 16.6°C or 61.9°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.72 (20°C/4°C) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification*								
Health Hazard (Blue)	2								
Flammability (Red)	1								
Reactivity (Yellow)	2								
NOTES * For additional information see classification									

REVISED 1978

ANP

AMMONIUM NITRATE-PHOSPHATE MIXTURE

Common Synonyms	Solid Gravish white Odorless Sinks and mixes with water
Fire	Not flammable Will increase the intensity of a fire POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated Containers may explode in fire
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning: oxidizing material Disperse and flush	2. LABEL 
3 CHEMICAL DESIGNATIONS 31 Synonyms: No common synonyms 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: NH_4NO_3 , $(\text{NH}_4)_2\text{HPO}_4$, $\text{NH}_4\text{H}_2\text{PO}_4$, CaHPO_4 , KCl , K_2SO_4 34 IMCO/United Nations Numerical Designation: 9	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: Gravish white 43 Odor: Characteristic
5. HEALTH HAZARDS 51 Personal Protective Equipment: Self contained breathing apparatus must be used when fighting fires. At other times a dust mask is adequate 52 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact with eyes causes irritation 53 Treatment for Exposure, INHALATION: move to fresh air. EYES: flush with water for 15 min 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Data not available 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: Odorless	

6 FIRE HAZARDS 61 Flash Point: Not pertinent 62 Flammable Limits in Air: Not pertinent 63 Fire Extinguishing Agents: Water 64 Fire Extinguishing Agents Not to be Used: Steam, inert gases, foam dry chemical 65 Special Hazards of Combustion Products: Toxic and irritating oxides of nitrogen may form in fires 66 Behavior in Fire: Will increase intensity of fire when in contact with combustible material. Containers may explode 67 Ignition Temperature: Not pertinent 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not pertinent	8. WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: Corrodes metals to same degree as ordinary fertilizer; the reaction is not hazardous 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Chevron Chemical Co. 940 Hendley Street Richmond, Calif. 94804
11. HAZARD ASSESSMENT CGDE (See Hazard Assessment Handbook, CG 446-3) SS	10 SHIPPING INFORMATION 101 Grades or Purities: Several grades of varying composition, all of which contain less than 70% of ammonium nitrate, the only hazardous ingredient 102 Storage Temperature: Ambient 103 Inert Atmosphere: Ventilated (natural) 104 Venting: Open
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Oxidizing material 122 HAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: Not pertinent (mixture) 133 Boiling Point at 1 atm: Not pertinent 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.8 at 20°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Data not available 1315 Heat of Solution: Data not available 1316 Heat of Polymerization: Not pertinent
NOTES	

(Continued on pages 5 and 6)

ANS

AMMONIUM NITRATE-SULFATE MIXTURE

Common Synonyms	Solid	Grayish white	Odorless
Sinks and mixes with water			
Small quantities of water will cause the mixture to become very moist. The mixture will not freeze at -20°C (-4°F). The mixture will not ignite at 200°C (392°F). The mixture will not explode at 200°C (392°F).			
Fire	Not flammable Will increase the intensity of a fire POISONOUS GASES MAY BE PRODUCED IN FIRE. Irritating gases may be produced when heated Containers may explode in fire		
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed		
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - oxidizing material Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{NH}_4\text{NO}_3 \cdot (\text{NH}_4)_2\text{SO}_4$ 3.4 IMCO/United Nations Numerical Designation: 91		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Grayish white 4.3 Odor: Characteristic	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self contained breathing apparatus must be used when fighting fires. At other times a dust mask is adequate. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. EYES: flush with water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: LD_{50} (rat) 1.0 g/kg (ammonium sulfate) 5.7 Lethal Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Odorless			

6. FIRE HAZARDS

- 6.1 Flash Point: Not pertinent
6.2 Flammable Limits in Air: Not pertinent
6.3 Fire Extinguishing Agents: Water
6.4 Fire Extinguishing Agents Not to be Used: Steam, inert gases, foam, dry chemical
6.5 Special Hazards of Combustion Products: Toxic and irritating oxides of nitrogen may form in fires.
6.6 Behavior in Fire: Will increase intensity of fire when in contact with combustible material. Containers may explode.
6.7 Ignition Temperature: Not pertinent
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

Chevron Chemical Co.
940 Hensley Street
Richmond, Calif. 94604

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: Corrodes metals to same degree as ordinary fertilizer; the reaction is not hazardous.
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Several grades of varying composition, all of which contain less than 73% of ammonium nitrate, the only hazardous ingredient.
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: Ventilated (natural)
10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
SS

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: ORM-C
12.2 NAB Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: Not pertinent
13.3 Boiling Point at 1 atm: Not pertinent
13.4 Freezing Point: Not pertinent
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 1.8 at 20°C (solid)
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Not pertinent
13.14 Heat of Decomposition: Data not available
13.15 Heat of Solution: Data not available
13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

NOTES

ANU

AMMONIUM NITRATE-UREA SOLUTION

Common Synonyms		Liquid	Colorless	Slight ammonia odor
		Sinks and mixes with water		
Safety Data Sheet				
Hazardous Waste Identification				
Fire	Not flammable			
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed Sinks and mixes with water			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Sinks and mixes with water			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-1 Dispense and Flush		2. LABELS No label required under Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Solid nitrogen solutions Nitrate nitrogen solution (thin pressure) 3.2 Coast Guard Compatibility Classification Miscellaneous 3.3 Chemical Formula: NH ₄ NO ₃ · NH ₂ CONH ₂ · H ₂ O 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weak ammonia		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Goggles, face shield, chemical gloves				
5.2 Symptoms Following Exposure: Liquid: Irritates eyes, nose, throat, skin, and lungs. High free ammonia: Irritates eyes, nose, throat, skin, and lungs.				
5.3 Treatment for Exposure: EYES: Wash with plenty of water for 10-15 minutes. SKIN: Wash with plenty of water for 10-15 minutes.				
5.4 Toxicity by Inhalation (Threshold Limit Value): Dermal: Irritation				
5.5 Short-Term Inhalation Limits: Dermal: Irritation				
5.6 Toxicity by Ingestion: Grade 2 (DANGER)				
5.7 Late Toxicity: None				
5.8 Vapor (Gas) Irritant Characteristics: Vapor: Irritates eyes, nose, throat, and lungs.				
5.9 Liquid or Solid Irritant Characteristics: Ammonium Nitrate: Irritates eyes, nose, throat, and lungs. Urea: Irritates eyes, nose, throat, and lungs.				
5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS

- 6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Water: Not flammable. Ammonia: Not flammable. Urea: Not flammable.
6.7 Ignition Temperature: Not pertinent
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: Not pertinent

9. SELECTED MANUFACTURERS

Solutia, Inc. (Ammonia Chemicals)
1000 N. 10th St.
W. R. Grace & Co.
American Chemical Group
P.O. Box 777
Memphis, Tenn. 38101

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Data not available. Previous editions of this handbook listed 25% free ammonia, 30% free ammonia, 35% free ammonia, 40% free ammonia, 45% free ammonia, 50% free ammonia, 55% free ammonia, 60% free ammonia, 65% free ammonia, 70% free ammonia, 75% free ammonia, 80% free ammonia, 85% free ammonia, 90% free ammonia, 95% free ammonia, 100% free ammonia.
10.2 Storage Temperature: Ammonia

Continued on page 4

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)
AP

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
12.2 NAS Hazard Rating for Bulk Water Transportation
- | Category | Rating |
|------------------|--------|
| Flue | 1 |
| Health | 1 |
| Airway Irritant | 1 |
| Eye/Irritant | 1 |
| Respiratory | 1 |
| Water Pollution | 1 |
| Human Toxicity | 2 |
| Aquatic Toxicity | 2 |
| Neurotoxicity | 2 |
| Reactivity | 2 |
| Other Chemicals | 2 |
| Water | 2 |
| Self-Reaction | 2 |
- 12.3 NFPA Hazard Classifications: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- Physical State at 15°C and 1 atm: Liquid
2. Molecular Weight: Not pertinent
13.3 Boiling Point at 1 atm: 100°C (212°F)
13.4 Freezing Point: -35°C (-23°F)
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 1.34 (at 15°C)
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Not pertinent
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: 0.10 (at 15°C)
13.16 Heat of Polymerization: Not pertinent

Continued on page 5

10. SHIPPING INFORMATION (Cont'd)

- 10.3 Inert Atmosphere: Not required
10.4 Venting: Open if > 25% free ammonia, then pressure vacuum

AOL

AMMONIUM OLEATE

Common Synonyms Oleic acid, ammonium salt Lardless soap	Solid paste Yellow brown Weak ammonia odor Sinks and mixes with water
Stop discharge if possible. Keep people away. Avoid contact with skin. Do not eat and do not swallow. Notify local health and pollution control agencies.	
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical or water.
Exposure	CALL FOR MEDICAL AID SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED: and if not unconscious, have victim drink water. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do not give anything by mouth.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify pollution control authorities.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonia soap Oleic acid, ammonium salt 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_{18}H_{33}OONH_4 \cdot H_2O$ 3.4 INCO/United Nations Numerical Designation: Not listed	2. LABELS No hazard label required by Code of Federal Regulations.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Contact with eyes causes irritation. Prolonged contact may cause skin irritation. 5.3 Treatment for Exposure: EYES OR SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	
4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Paste, solid. 4.2 Color: Yellow-brown. 4.3 Odor: Weak ammonia.	

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Water, dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Emkay Chemical Co. 319 Second Street Elizabeth, N. J. 07206 2. Pfaltz and Bauer, Inc. 126-04 Northern Blvd. Flushing, N. Y. 11368
10. SHIPPING INFORMATION 10.1 Grades or Purity: 70% in water. Technical. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Ventilated (natural). 10.4 Venting: Open.	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or liquid. 13.2 Molecular Weight: 299.5 (solute). 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: > 1 at 20°C (liquid or solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Data not available. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Data not available. 12.3 MFPA Hazard Classifications: Data not available.	
NOTES	

(Continued on pages 1 and 6)

AOX

AMMONIUM OXALATE

Common Synonyms Oxalic acid, diammonium salt Diammonium oxalate Ammonium oxalate hydrate		Solid White Odorless
Seaks and mixes slowly with water		
AVOID CONTACT WITH SOLIDS AND DUST. KEEF PROFILE AWAY Wear eye respirator and gloves when working with solids including gloves. Stop the use of solids. Call fire department. Isolate and remove materials if possible. Notify state health and safety officials if necessary.		
Fire		Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and wear protective clothing. Extinguish with water.
 Exposure		CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing. If inhaled, remove person to fresh air. If severe, call for medical aid. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Will burn skin and eyes. If on skin, remove by flushing with plenty of water. If IN EYES, flush with plenty of water. If IN EYES, flush with plenty of water. If SWALLOWED, do not induce vomiting. If SWALLOWED, do not induce vomiting. If SWALLOWED, do not induce vomiting. If SWALLOWED, do not induce vomiting.
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify state health and safety officials if necessary.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Issue warning: poison water contaminant. Restrict access. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium oxalate hydrate; Diammonium oxalate; Oxalic acid; diammonium salt. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: $(\text{NH}_4)_2\text{C}_2\text{O}_4 \cdot \text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: White. 4.3 Odor: None.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved dust respirator; rubber or plastic coated gloves; chemical goggles. 5.2 Symptoms Following Exposure: Ingestion or excessive inhalation of dust causes system poisoning; possible symptoms include pain in throat, esophagus and stomach; mucous membranes turn white; vomiting; severe purging; weak pulse; card or vascular collapse; neuromuscular symptoms. Contact with eyes causes irritation. Contact with skin causes irritation or severe burns. 5.3 Treatment for Exposure: Speed is essential. INHALATION: remove to fresh air. INGESTION: call physician immediately; induce vomiting. EYES: flush with water and seek medical attention. SKIN: flush with water. OTHER: watch for swelling of the gottis and delayed constriction of the esophagus. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Kidney damage. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Uliquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Odorless.		

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: No pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Pfizer Chemical Div. 235 E. 42nd Street New York, N.Y. 10017 2. Heco Inc. Delaware Water Gap, Pa. 1832 3. American Hoechst Corp. Chemicals and Plastics Div. Rt. 202-206 North Somerville, N.J. 08876
	10. SHIPPING INFORMATION 10.1 Grade or Purity: Pure 98-100% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-3) SS-11	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 142.11 13.3 Boiling Point at 1 atm: Not pertinent (decomposes at 70°C) 13.4 Freezing Point: Not pertinent (decomposes at 70°C) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.40 at 18.5°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 101 Btu/lb = 56 cal/g = 2.3×10^3 J/kg 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 MFPA Hazard Classifications: Not listed	
(Continued on pages 4 and 6)	
NOTES	

APB

AMMONIUM PENTABORATE

Common Synonyms: Ammoniate pentaborate tetrahydrate Ammonium decaborate octahydrate	Solid White Odorless Sinks and mixes slowly with water
Not a hazard to water, land, or air Avoid contact with water, land, or air Avoid contact with food, feed, or water Not a hazard to fish, birds, or mammals	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and gloves when handling apparatus
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Remove person to fresh air and rest. If severe, call doctor. If on skin, wash with plenty of water. If in eyes, hold open and flush with plenty of water. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected area with plenty of water. If in eyes, hold open and flush with plenty of water. If swallowed, drink plenty of water. If on skin, wash with plenty of water. If in eyes, hold open and flush with plenty of water. If swallowed, drink plenty of water. If on skin, wash with plenty of water. If in eyes, hold open and flush with plenty of water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Water is a health hazard if drunk. Not a hazard to land water, stream
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium decaborate octahydrate Ammonium pentaborate tetrahydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{NH}_4\text{B}_5\text{O}_{14} \cdot 4\text{H}_2\text{O}$ or $(\text{NH}_4)_5\text{B}_5\text{O}_{14} \cdot 8\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Disposable type respirator, side shield safety spectacles, full brimmed hard hat, goggles, ammonia gas mask. 5.2 Symptoms Following Exposure: Inhalation of dust may result in non-specific irritation of upper respiratory tract. Ingestion of large quantities may produce symptoms of non-specific irritation of the gastrointestinal tract: nausea, vomiting, cramps, diarrhea. Contact with dust causes moderate eye irritation and minor skin irritation. 5.3 Treatment for Exposure: INHALATION: move from contaminated atmosphere, if respirators discomfort persists, see a physician. INGESTION: give large amounts of water or warm salty water to induce vomiting and continue until vomitus is clear. obtain medical attention if abdominal discomfort persists. EYES: flush with large quantities of running water for a minimum of 15 min. obtain medical help if irritation persists. SKIN: immediately flush affected areas with water. obtain medical help if irritation persists. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 mg/m ³ as TSP, not listed. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. U.S. Borax and Chemical Corp. 3075 Wilshire Blvd. Los Angeles, Calif. 90010 2. American Hoechst Corp. Chemicals and Plastics Div. Rt. 206-206 North Somerville, N.J. 08876 3. Stauffer Chemical Co. Industrial Chemical Div. Westport, Conn. 06881
	10. SHIPPING INFORMATION 10.1 Grade or Purity: Pure 99% Radio 99.95% Technical 99.8% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 272.0 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.58 at 15°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not pertinent 12.3 NFPA Hazard Classifications: Not pertinent	(Continued on pages 5 and 6)
NOTES	

AMP

AMMONIUM PERCHLORATE

Common Synonyms		Solid crystals	White	Odorless
		Sinks and mixes with water		
Wear goggles and wear contained breathing apparatus Avoid eye and skin contact with discharged material. Notify local health and pollution control agencies.				
Fire	May cause fire and explode on contact with combustibles CONTAINERS MAY EXPLODE IN FIRE POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and wear contained breathing apparatus Extinguish with water Combat large fires from protected location with water or foam			
Exposure	HAZARD FOR AQUATIC LIFE SOLID Irritating to eyes and skin Harmful if swallowed Flush affected areas with plenty of water IF IN EYES: Hold eyelids open and flush with plenty of water IF SWALLOWED: Do not induce vomiting. Have victim drink water if possible			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife agencies Notify operator of nearby water intakes			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-1) Issue warning - oxidizing material Dispense and flush		2. LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: NH4ClO4 3.4 IMCO United Nations Numerical Designation: 1.1 (1442)		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Data not available 5.2 Symptoms Following Exposure: Irritating to skin and mucous membranes 5.3 Treatment for Exposure: Data not available 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 2, oral rat LD50 = 3500 mg/kg 5.7 Late Toxicity: Not pertinent 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Water from protected locations 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic gases are produced in fire 6.6 Behavior in Fire: May explode when exposed in fire or exposed to shock or friction 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None									
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: If contaminated with combustibles, material can become an explosive which is sensitive to shock and friction. Readily detonates or explodes 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Ker-McGee Chemical Corp. Ker-McGee Bldg. Oklahoma City, Oklahoma 73102 2. Pacific Engineering & Production Co. Henderson, Nevada 89008 3. Gr. Fredrickson Chemical Co. P.O. Box 21344 Columbus, Ohio 43221									
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) NS		10 SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Data not available 10.4 Venting: Data not available									
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification*</th></tr><tr><td>Health Hazard (Blue)</td><td>0 - 2</td></tr><tr><td>Flammability (Red)</td><td>0 - 1</td></tr><tr><td>Reactivity (Yellow)</td><td>4 - 4</td></tr></table> *First column refers to most hazardous situation		Category	Classification*	Health Hazard (Blue)	0 - 2	Flammability (Red)	0 - 1	Reactivity (Yellow)	4 - 4	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 117.49 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.78 at 15°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Classification*										
Health Hazard (Blue)	0 - 2										
Flammability (Red)	0 - 1										
Reactivity (Yellow)	4 - 4										
NOTES											

REVISED 1978

APE

AMMONIUM PERSULFATE

Common Synonyms Ammonium persulfate Peroxy disulfuric acid, ammonium salt		Solid	Light straw to colorless	Mild unpleasant odor
		Sinks and mixes with water		
See the safety data sheet for more information. Call for MSDS Form Avoid contact with skin and dust. Isolate and remove the spilled material. Notify your local health department for disposal.				
Fire	Not flammable Will increase the intensity of a fire POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and avoid contact with the eyes. Evacuate area and call for help.			
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat Harmful if inhaled Breathing irritants can cause difficulty in breathing. If irritation occurs, get fresh air and call for help. SOLID Irritating to skin and eyes Harmful if swallowed. Remove contaminated clothing and shoes. If irritation occurs, get fresh air and call for help. IF SWALLOWED: Do not induce vomiting. If swallowed, rinse mouth with water. IF SWALLOWED: Do not induce vomiting. If swallowed, rinse mouth with water. IF SWALLOWED: Do not induce vomiting. If swallowed, rinse mouth with water.			
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify your local health department for disposal. Notify your local health department for disposal.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4.) Toxic warning: avoid breathing material. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium persulfate Peroxydisulfuric acid, ammonium salt 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: (NH4)2S2O8 3.4 IBCO/United Nations Material Designation: 5.1, 1244		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Light straw to colorless 4.3 Odor: Slight acid		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: U.S. Bureau of Mines approved toxic dust mask, chemical goggles, rubber gloves, nonpermeated shoes. 5.2 Symptoms Following Exposure: Inhalation produces slight toxic effects. Contact with dust irritates eyes and causes skin rash. 5.3 Treatment for Exposure: INHALATION: Remove to fresh air. EYES: Wash with water for 20 min. call a physician. SKIN: Wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, oral LD50 = 120 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen and sulfur gases fumes may form in fire 6.6 Behavior in Fire: Decomposes with loss of oxygen that increases intensity of fire 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 120 ppm 48 hr daphnia 11 ppm fresh water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Contact with grease, wood and other combustibles may result in a fire 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. FMC Corporation 6810 River Rd. and Sawyer Ave. Tonawanda, N.Y. 14150 2. Allied Chemical Corp. Specialty Chemicals Co. P.O. Box 1007R Morristown, N.J. 07960 3. J.T. Baker Chemical Co. Phillipsburg, N.J. 08865
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Reagent, pure 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Vialing: Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3.) 11	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 228.20 13.3 Boiling Point at 1 atm: Not pertinent (decomposes at 120°C) 13.4 Freezing Point: Not pertinent (decomposes at 120°C) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.98 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Data not available 13.15 Heat of Solution: 77 Btu/lb = 41 cal/g = 1.7 x 10⁵ J/kg 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing solid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

AMMONIUM PHOSPHATE

Common Synonyms: Monoammonium orthophosphate Ammonium phosphates, diamer Secondary ammonium phosphate Diammonium hydrogen phosphate Diammonium orthophosphate	Solid White Weak ammonia odor Sinks and mixes with water
No acute or chronic toxicity was observed in rats or mice by oral or inhalation routes. No irritation was observed in the eyes or skin of rats. No irritation was observed in the respiratory tract of rats.	
Fire	Not flammable Irritating fumes may be produced when heated
Exposure	CALL FOR MEDICAL AID PELT Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If in contact with skin, wash with water If in contact with clothing, remove clothing and wash with water SOLID Irritating to skin and eyes Harmful if swallowed If swallowed, do not induce vomiting If swallowed, drink with water If in contact with skin, wash with water If in contact with clothing, remove clothing and wash with water If swallowed, do not induce vomiting If swallowed, drink with water
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes No data available on biodegradability No data available on persistence
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Expense and flush	2. LABELS No hazard labels required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium phosphate, diamer Diammonium hydrogen phosphate Diammonium orthophosphate Monoammonium orthophosphate Secondary ammonium phosphate 3.2 Corrosion/Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{NH}_4\text{H}_2\text{PO}_4$ and $(\text{NH}_4)_2\text{HPO}_4$ (Consult page 4)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): solid 4.2 Color: White 4.3 Odor: Diammonium - faint ammonia Monoammonium - faint acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, protective gloves and goggles. When diammonium phosphate is stored in closed area, self contained breathing apparatus is required to protect against ammonia fumes. 5.2 Symptoms Following Exposure: Irritation of mucous membranes. Inhalation of monoammonium form causes irritation of mucous membranes. With diammonium form, ammonia vapors are evolved, which cause pulmonary edema and asphyxiation. Contact with solid or with ammonia gas causes irritation of eyes and skin. 5.3 Treatment for Exposure: INHALATION: If exposed to ammonia fumes from diammonium phosphate, give artificial respiration and oxygen. Provide enclosed respiration. EYES: Flush with water for at least 15 min. IRRITATION PERIODS: Get medical attention. SKIN: Wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Low Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: (None)	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating fumes of ammonia and oxides of nitrogen may form in fires. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 155 ppm NH ₄ ⁺ at head mussels 100% 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. F. T. Baker Chemical Co. Phillipsburg, N. J. 08865 2. Mobil Oil Corporation 4501 42nd Street New York, N. Y. 10017 3. Occidental Chemical Co. P. O. Box 196 Lathrop, Calif. 95330
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NN	10. SHIPPING INFORMATION 10.1 Grade or Purity: Reagent Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Ventilated (forced) 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 MFPA Hazard Classification: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: Monoammonium: 115 Diammonium: 132 13.3 Boiling Point at 1 atm: Not pertinent (begins to decompose at 100°C) 13.4 Freezing Point: Not pertinent (begins to decompose at 100°C) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: diammonium 1.8 at 20°C (solid) Monoammonium 1.6 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 42 Btu/lb + 23 cal/g + 0.97 x 10 ³ J/g 13.16 Heat of Polymerization: Not pertinent (continued on pages 1 and 4)
3. CHEMICAL DESIGNATIONS (Cont'd) 3.4 UNCO/United Nations Numerical Designation: Not listed	

ASL

AMMONIUM SILICOFLUORIDE

Common Synonyms Ammonium Fluoroborate	Solid White Odorless Sinks and mixes slowly with water
AVOID CONTACT WITH NOSE AND DON'T GET IT STUFFED AWAY WITH A TONGUE OR FINGER. IF IT GETS IN YOUR EYE, WASH IT OUT WITH WATER. IF IT GETS ON YOUR SKIN, WASH IT OFF WITH WATER. IF IT GETS ON YOUR CLOTHING, REMOVE IT IMMEDIATELY.	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated
 Exposure	AVOID MEDICAL USE DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED It is irritating to the eyes, nose, throat, and skin. If swallowed, it may cause severe irritation of the digestive tract and may be fatal. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing immediately. Flush skin and eyes with water for at least 15 minutes. IF SWALLOWED, DO NOT INDUCE VOMITING. Rinse mouth with water and take to a hospital immediately. IF SWALLOWED, DO NOT INDUCE VOMITING. Rinse mouth with water and take to a hospital immediately.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water bodies. Do not discharge into water bodies.
1. RESPONSE TO DISCHARGE (See Response Memory Handbook, CG 446-4) Issue warning: water contamination. Protect access. Evacuate and flush.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium Fluoroborate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $(NH_4)_2SiF_6$ 3.4 HACO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust: respiratory and resistant clothing and non-rubber gloves, goggles and safety shoes. 5.2 Symptoms Following Exposure: Inhalation: Irritation, cough, pulmonary irritation and, in fatal in some cases. Ingestion may be fatal. Contact with dust causes irritation of eyes and irritation or ulceration of skin. 5.3 Treatment for Exposure: INHALATION: remove patient to fresh air. INGESTION: cause vomiting by giving warm water or mustard water. Have patient drink large quantities of warm water. If necessary, give stimulant such as strong coffee. Keep patient warm. EYES: Flush with water for 15 minutes. Holding eyelids open. SKIN: Wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 2.5 mg/m ³ 5.5 Short-Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 3. LD 50: 300 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agent: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating hydrogen fluoride, silicon tetrafluoride and oxides of nitrogen may form in fires 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Agrico Chemical Co. P.O. Box 177 Pierce (Polk) County, Ia 53607 2. Essex Chemical Co. Chemicals Division 140 S. Broad Street Clinton, N.J. 07015 3. W. R. Grace & Co. Agricultural Chemical Group Baltimore, Md. 21201
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-2) NN	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 288.14 13.3 Boiling Point at 1 atm: Not pertinent (Decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.0 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 44 Btu/lb (44 cal/g) = 20 kJ/kg 13.16 Heat of Polymerization: Not pertinent
NOTES	

Continued on pages 1 and 2

AMR

AMMONIUM STEARATE

Common Synonyms Ammonium Stearate derivative Stearic acid, ammonium salt		Solid paste or liquid White to yellow Weak ammoniac odor May float or sink in water
Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and solid. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible solid. Solution not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water dry chemical foam or carbon dioxide.	
Exposure	CALL FOR MEDICAL AID LIQUID OR SOLID: Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operation of nearby water intakes.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 445-4. Discharge instructions.		2. LABELS See Response Methods Handbook, CG 445-4. Labels: Federal, DOT, etc.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium stearate derivative, Stearic acid, ammonium salt. 3.2 Coast Guard Competibility Classification: Not listed. 3.3 Chemical Formula: $C_{17}H_{35}NO_2$, H_{35} 3.4 HMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Paste, solid or liquid. 4.2 Color: White to yellow. 4.3 Odor: Slight ammoniac.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles and gloves. 5.2 Symptoms following Exposure: Not known. 5.3 Treatment for Exposure: INHALATION: INGESTION: IF SWALLOWED: IF IN EYES: IF ON SKIN: Wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not listed. 5.5 Short-Term Inhalation Limits: Not listed. 5.6 Toxicity by Ingestion: Not listed. 5.7 Acute Toxicity: Not listed. 5.8 Vapor (Gas) Irritant Characteristics: Not listed. 5.9 Liquid or Solid Irritant Characteristics: Not listed. 5.10 Odor Threshold: Not listed.		

6. FIRE HAZARDS 6.1 Flash Point: Greater than 100°C (approximate value for most fatty acids). 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: None. 6.5 Special Hazards of Combustion Products: Toxic amount of ammonia, carbon monoxide, carbon dioxide. 6.6 Behavior in Fire: None. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: None. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS The United States Chemical Co. 1 Superior Avenue Cape Cod, MA 02542 2 United Chemicals 10000 and 10001 Elizabeth, N.J. 07208
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 445-3. A P N S		10. SHIPPING INFORMATION 10.1 Grades or Purity: 99% dispersion in water (technical grade). 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not required. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or liquid. 13.2 Molecular Weight: 311.5. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes before boiling). 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.9 at 20°C (liquids). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Data not available. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES		

Continued on page 7 and 8

ASM

AMMONIUM SULFAMATE

Common Synonyms Amisate Sulfamic acid, monoammonium salt Ammonium amidosulfonate Ammonium amidosulphate AMS		Solid White or brownish gray Quotless Sinks and mixes with water
Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and full contained breathing apparatus.	
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Push affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse, and flush.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Amisate, Ammonium amidosulfonate, Ammonium amidosulphate, AMS, Sulfamic acid monoammonium salt. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: $\text{NH}_4\text{SO}_3\text{NH}_2$. 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: White or brownish gray. 4.3 Odor: None.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion causes gastrointestinal disturbances. Dust irritates eyes. 5.3 Treatment for Exposure: INHALATION: remove to fresh air. INGESTION: give large amount of water, get medical attention. EYES: flush with water for 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 mg/m. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral rat LD ₅₀ = 1,600 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

5. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fires. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.		8. WATER POLLUTION 8.1 Aquatic Toxicity: 289 ppms, 24 hr. catfish. 50% kill, fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Heco, Inc. Delaware Water Gap, Pa. 18327. 2. Gallard-Schlesinger Chemical Mfg. Co. 584 Mincola Ave. Carle Place, N.Y. 11514. 3. Pfaltz and Bauer, Inc. 126-04 Northern Blvd. Flushing, N.Y. 11368.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS		10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent, 99.0% Commercial, 80%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 114.13. 13.3 Boiling Point at 1 atm: Decomposes above 200°C. 13.4 Freezing Point: 265°F = 131°C = 404°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: > 1 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.
NOTES		

(Continued on Pages 5 and 6)

AMS

AMMONIUM SULFATE

Common Synonyms	Solid	White	Odorless
Sinks and mixes with water			
Twiltie and remove discharged material Notify local health and pollution control agencies			
Fire	Not flammable		
Exposure	Not harmful		
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes. Notify local health and wildlife officials Notify operators of nearby water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 444-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 31 Synonyms: No common synonyms 32 Coast Guard Competibility Classification: Not applicable 33 Chemical Formula: $(\text{NH}_4)_2\text{SO}_4$ 34 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: White 43 Odor: None	
5. HEALTH HAZARDS 51 Personal Protective Equipment: Data not available 52 Symptoms Following Exposure: Data not available 53 Treatment for Exposure: Data not available 54 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 55 Short-Term Inhalation Limits: Not pertinent 56 Toxicity by Ingestion: Grade 3; LD ₅₀ = 58 mg/kg (rat) 57 Lethal Toxicity: Not pertinent 58 Vapor (Gas) Irritant Characteristics: Not pertinent 59 Liquid or Solid Irritant Characteristics: Not pertinent 510 Odor Threshold: Not pertinent			

6. FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Not flammable 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not flammable		8. WATER POLLUTION 81 Aquatic Toxicity: 1290 ppm/96 hr/mosquitofish/fresh- water/TL _m 292 ppm/96 hr/Daphnia magna/fresh- water/TL _m 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): None 84 Food Chain Concentration Potential: None	
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1 Allied Chemical Corp. Agricultural Div. Morristown, N. J. 07960 2 Occidental Petroleum Corp. Occidental Chemical Co. Western Division Lathrop, Calif. 95330 3 Valley Nitrogen Producers, Inc. Fresno, Calif. 93717	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) SS		10. SHIPPING INFORMATION 101 Grades or Purity: Data not available 102 Storage Temperature: Data not available 103 Inert Atmosphere: Data not available 104 Venting: Data not available	
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed 122 HAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 132.14 133 Boiling Point at 1 atm: Not pertinent 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.76 at 15°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent	
NOTES			

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ASF

AMMONIUM SULFIDE

Common Synonyms Ammonium sulfide solution Ammonium hydrogen sulfide solution Ammonium sulfhydrate solution	Liquid Colorless to yellow Strong odor of rotten eggs and ammonia Mixes with water. Irritating vapor is produced. Boiling point is 104°F
Avoid contact with skin, eyes, or clothing. Wear protective clothing and equipment. See also MSDS for Ammonium Sulfide.	
Fire	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. When heated, it releases toxic and irritating hydrogen sulfide gas.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, headache, coughing, or difficult breathing. LIQUID Will burn skin and eyes. If swallowed will cause nausea. IF SWALLOWED: Give large amount of water. Do not induce vomiting. IF IN EYES: Flush with large amounts of water. IF SWALLOWED: Give large amount of water. Do not induce vomiting.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CO 444-4) Issue warning: air-contaminant, water-contaminant. Restrict access. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium hydrogen sulfide solution, Ammonium sulfhydrate solution, Ammonium sulfide solution. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: (NH ₄) ₂ S, NH ₄ SH, H ₂ S. 3.4 IMCO/United Nations Numerical Designation: Not listed.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Yellow to orange (fuming solution); colorless to yellow. 4.3 Odor: Strong odor of sulfide and ammonia.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, rubber or plastic gloves, splash goggles, rubber shoes. 5.2 Symptoms Following Exposure: Inhalation of 500 ppm for 30 min. produces headaches, dizziness, bronchial pneumonia; 600 ppm for 30 min. can cause death. Ingestion causes severe irritation of mucous membranes and stomach. Contact with liquid causes severe burns of eyes and severe skin irritation. May be absorbed through skin and cause hydrogen sulfide poisoning. 5.3 Treatment for Exposure: Get medical attention following all overexposures to this compound. INHALATION: move victim to fresh air, give artificial respiration, oxygen, consult physician. INGESTION: give large amount of water. EYES OR SKIN: wash with large quantities of water for 15 min., consult physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 72°F C C 6.2 Flammable Limits in Air: 4% - 46% (hydrogen sulfide) 6.3 Fire Extinguishing Agents: Water, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Toxic hydrogen sulfide gas is released when solution is heated. If ignited, this will form irritating sulfur dioxide gas. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 100 ppm/72 hr/goldfish/killed/fresh water; 248 ppm/48 hr/moquitosfish/TI ₅₀ /fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Severely corrodes copper, zinc and their alloys. 7.3 Stability During Transport: Stable, but toxic hydrogen sulfide and ammonia gases may collect in enclosed spaces. 7.4 Neutralizing Agents for Acids and Caustics: Dilute with water. Do not attempt to neutralize with acid. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Argus Chemical Corp. Halby Division 600 Terminal Avenue New Castle, Del. 19720 2. J. T. Baker Chemical Co. Phillipsburg, N. J. 08865 3. Chemical Products Corporation Cartersville, Ga. 30120
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CO 444-3) A-P	10. SHIPPING INFORMATION 10.1 Grade or Purity: Technical, 45-50% in water; Reagent, 52-60% in water. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Ventilated (natural). 10.4 Venting: Open (flame arrester).
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or liquid. 13.2 Molecular Weight: 68.14 (solute). 13.3 Boiling Point at 1 atm: 104°F = 40°C = 313°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.99-1.01 at 20°C (liquid). 13.8 Liquid Surface Tension: Data not available. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 95.0 Btu/lb = 52.8 cal/g = 2.21 x 10 ⁵ J/kg. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

(Continued on pages 5 and 6)

AMF

AMMONIUM SULFITE

Common Synonyms		Solid	White	Odorless
		Sinks and mixes slowly with water		
Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and self-contained breathing apparatus			
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes: hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID Irritating to skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: Do nothing except keep victim warm.			
Water Pollution	Dangerous to aquatic life in high concentration. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41 Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: (NH ₄) ₂ SO ₃ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles, or face shield; rubber gloves 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water; get medical attention. EYES: flush with water for 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point: Not flammable		8.1 Aquatic Toxicity: 240 ppm/48 hr/mosquitofish/11 m/fresh water	
6.2 Flammable Limits in Air: Not flammable		8.2 Waterfowl Toxicity: Data not available	
6.3 Fire Extinguishing Agents: Not pertinent		8.3 Biological Oxygen Demand (BOD): Data not available	
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent		8.4 Food Chain Concentration Potential: None	
6.5 Special Hazards of Combustion Products: Toxic sulfur dioxide and oxides of nitrogen may form in fires			
6.6 Behavior in Fire:			
6.7 Ignition Temperature: Not pertinent			
6.8 Electrical Hazard: Not pertinent			
6.9 Burning Rate: Not pertinent			
		9. SELECTED MANUFACTURERS	
		1 J. T. Baker Chemical Co. Phillipsburg, N. J. 08865	
		2 Pfaltz and Bauer, Inc. 126-04 Northern Blvd. Flushing, N. Y. 11368	
7. CHEMICAL REACTIVITY			
7.1 Reactivity with Water: No reaction			
7.2 Reactivity with Common Materials:			
7.3 Stability During Transport: Stable			
7.4 Neutralizing Agents for Acids and Caustics: Dilute with water. Do not attempt to neutralize with acids			
7.5 Polymerization: Not pertinent			
7.6 Inhibitor of Polymerization: Not pertinent			
		10 SHIPPING INFORMATION	
		10.1 Grades or Purity: Anhydrous, Purified monohydrate	
		10.2 Storage Temperature: Ambient	
		10.3 Inert Atmosphere: No requirement	
		10.4 Venting: Open	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS		13. PHYSICAL AND CHEMICAL PROPERTIES	
		13.1 Physical State at 15°C and 1 atm: Solid	
		13.2 Molecular Weight: 134.2	
		13.3 Boiling Point at 1 atm: Not pertinent	
		13.4 Freezing Point: Not pertinent	
		13.5 Critical Temperature: Not pertinent	
		13.6 Critical Pressure: Not pertinent	
		13.7 Specific Gravity: > 1.1 at 20°C (solid)	
		13.8 Liquid Surface Tension: Not pertinent	
		13.9 Liquid-Water Interfacial Tension: Not pertinent	
		13.10 Vapor (Gas) Specific Gravity: Not pertinent	
		13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent	
		13.12 Latent Heat of Vaporization: Not pertinent	
		13.13 Heat of Combustion: Not pertinent	
		13.14 Heat of Decomposition: Not pertinent	
		13.15 Heat of Solution: 20.5 Btu/lb = 14 cal/g = 0.477 x 10 ³ J/kg	
		13.16 Heat of Polymerization: Not pertinent	
12. HAZARD CLASSIFICATIONS			
12.1 Code of Federal Regulations: Not listed			
12.2 NAS Hazard Rating for Bulk Water Transportation: Data not available			
12.3 NFPA Hazard Classifications: Data not available			

ATR

AMMONIUM TARTRATE

Common Synonyms 1 Tartaric acid, ammonium salt		Solid	White	Odorless
		Sinks and mixes with water		
Stop discharge as soon as possible. Keep people away. Call for decontamination. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water.			
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat Harmful if inhaled If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED, induce vomiting. DO NOT induce vomiting if swallowed. If SWALLOWED, give plenty of water to drink. If SWALLOWED, give plenty of water to drink.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operators of nearby water intakes.			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Tartaric acid, ammonium salt 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₄ H ₆ N ₂ O ₆ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Contact with solid may irritate eyes 5.3 Treatment for Exposure: EYES: flush with water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen or ammonia gas may form in fires 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Ganes Chemical Works, Inc. 611 Broad Street Carlstadt, N. J. 07072 2. American Hoechst Corp. Chemicals and Plastics Division Rt. 202, 206 North Somerville, N. J. 08876 3. Gallard Schlesinger Chemical Mfg. Co. 584 Mineola Ave. Carle Place, N. Y. 11514	
		10. SHIPPING INFORMATION 10.1 Grades or Purity: Analytical Pure 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	

11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 445-2) SS		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 184 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.66 (25°C/4°C) (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Data not available 12.3 NFPA Hazard Classifications: Data not available			

(Continued on pages 5 and 6)

NOTES

AMT

AMMONIUM THIOCYANATE

Common Synonyms: Ammonium isothiocyanate Ammonium rhodanide Ammonium rhodanide Ammonium thiocyanate Thiocyanic acid, ammonium salt	Solid or solution (in water): White Odor: a Sinks and mixes with water
No. of charge if combustible: Keep people away Call fire department Action: To fight: Report to fire department Action: To fight: Report to fire department Action: To fight: Report to fire department Action: To fight: Report to fire department	
Fire	Combustible Solid: Solution not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and wear a flame-resistant respirator. Extinguish with water.
Exposure	CALL FOR MEDICAL AID VAPOR OR DUST: Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If eyes are irritated, flush with plenty of water. If nose is irritated, wipe with moist absorbent tissue. If mouth is irritated, gargle with water. LIQUID OR SOLID: Irritating to skin and eyes. If swallowed will cause nausea or vomiting. If on skin, wash with plenty of water. If in eyes, flush with plenty of water. If swallowed, do not induce vomiting. If swallowed, do not induce vomiting. If swallowed, do not induce vomiting. If swallowed, do not induce vomiting.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. No known chronic toxicity to fish. No known chronic toxicity to birds.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-2) Issue warning: water contaminant Disperse and flush	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium rhodanide, Ammonium rhodanide, Ammonium isothiocyanate, Ammonium thiocyanate, Thiocyanic acid, ammonium salt 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: NH ₄ SCN 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid, or solution in water 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber or plastic gloves, rubber or plastic apron, standard goggles 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes dizziness, cramps, nervous disturbances. Dust irritates eyes. Can be absorbed through skin. Prolonged contact may produce various skin eruptions, dizziness, cramps, nausea, and mild to severe disturbance of the nervous system. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water, get medical attention. EYES OR SKIN: wash with water, consult physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, oral rat LD ₅₀ = 854 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: Solid may be combustible, solution is not flammable 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agent: Water 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Decompose to form ammonia, hydrogen sulfide, and hydrogen cyanide. Oxides of nitrogen may also form. All of these products are toxic. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 280-300 ppm/1 hr, orange-spotted sunfish/killed, fresh water; 420 ppm/48 hr, mosquitofish/11 m/fresh water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): < 0.010 lb/lb 5 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Argus Chemical Corp. Halby Division 680 Terminal Ave. New Castle, Del. 19720 2. Mallinckrodt Chemical Works 223 Westside Avenue P.O. Box 384 Jersey City, N.J. 07303 3. J.T. Baker Chemical Co. Phillipsburg, N.J. 08865
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 445-3) A P S S	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent Technical 50-65% solution in water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or liquid 13.2 Molecular Weight: 76.12 13.3 Boiling Point at 1 atm: (solid on solid decomposes) 219°F = 110°C = 388°K 13.4 Freezing Point: (solid) 320°F = 160°C = 433°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: > 1.1 at 20°C (solid); 1.1-1.15 at 20°C (solid on) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 133 Btu/lb = 75 cal/g = 3.1 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent
NOTES	

(Continued on pages 2 and 3)

ATF

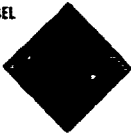
AMMONIUM THIOSULFATE

Common Synonyms Ammonium hyposulfite		Solid or solution (in water)	Colorless liquid or white solid	Ammonia odor
Sinks and mixes with water				
Stop discharge if possible. Keep people away. Avoid contact with liquid and solid. Avoid contact with dust and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and use confined breathing apparatus.			
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. If eyes hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLUTION OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If EYES hold eyelids open and flush with plenty of water. SWALLOWED: Do not induce vomiting. If victim is conscious, give water orally. If SWALLOWED: Do not induce vomiting. If victim is unconscious, give water orally. Do nothing except keep victim warm.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operating nearby water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Issue warning, water contaminant. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium hypo, Ammonium hyposulfite. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: $(\text{NH}_4)_2\text{S}_2\text{O}_3$. 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid, or solution in water. 4.2 Color: Clear, colorless. 4.3 Odor: Ammonia.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Respirator, rubber gloves, safety glasses, face shield, rubber apron, shield or suit as needed, try to prevent skin contact. 5.2 Symptoms Following Exposure: Inhalation of dust may irritate respiratory system. Ingestion could be harmful. Contact with eyes or skin may cause irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: get medical attention at once. EYES: flush with plenty of water for at least 15 min. and get immediate medical attention. SKIN: wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic ammonia, hydrogen sulfide, and oxides of nitrogen and sulfur may form in fires 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0.62 lb/lb 5 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable, but toxic ammonia gas may collect in enclosed spaces 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Allied Chemical Corp. Industrial Chemicals Div. P. O. Box 1139R Morristown, N. J. 07960 2 Narco Corporation 12520 Cerise Avenue Hawthorne, Calif. 90250 3 Gallard-Schlesinger Chemical Mfg. Co. 584 Mincola Avenue Carle Place, N. Y. 11514
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-3) A-P-S-S	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical, Analytical, Technical, 60% solution in water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Ventilated (natural) 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or liquid 13.2 Molecular Weight: 148.2 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
1C continued on pages 3 and 4	
NOTES	

AML

AMYL ACETATE

Common Synonyms: Acetic acid (any) ester	Watery liquid Colorless to yellow Banana odor Floats on water. Flammable. Irritant. Vapor is produced.
Shut off ignition sources and call fire department. Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Spray upward and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, may cause nausea, headache or dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Remove clothing and flush skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3) Toxic warning: High flammability. Mechanical containment. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Amyl acetate, mixed isomers. Pentyl acetates. 3.2 Coast Guard Competibility Classification: Ester. 3.3 Chemical Formula: $\text{CH}_3\text{COOC}_5\text{H}_{11}$ 3.4 IMCO United Nations Numerical Designation: 1.2 1104	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless to yellow. 4.3 Odor: Pleasant banana-like mild, characteristic banana or pear-like odor.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supplied mask, chemical cartridge respirator, protective gloves, goggles, safety shower, and eye bath. 5.2 Symptoms Following Exposure: Irritation of eyes, nose and throat; headache, nausea, headache. 5.3 Treatment for Exposure: INHALATION: move victim to fresh air; call physician; administer oxygen. SKIN OR EYES: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 500 ppm. 5.5 Short-Term Inhalation Limits: 200 ppm for 15 min. 5.6 Toxicity by Ingestion: Grade I; LD50 = 6.5 g/kg (rat). 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.067 ppm.	

6. FIRE HAZARDS 6.1 Flash Point: (est.) 69°F (21°C) (est.) 91°F (33°C) 6.2 Flammable Limits in Air: 1.1% - 7.5% (v) 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water in straight hose stream with water and spread fire and should not be used. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 522°F (272°C) 6.8 Electrical Hazard: No ignition. 6.9 Burning Rate: 4 ft/min (v)	8. WATER POLLUTION 8.1 Aquatic Toxicity: 120 ppm 48 hr daphnia; 11 ppb, 96 hr daphnia; 180 ppm 96 hr scenedesmus; 11 ppb, 96 hr water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 0.3 - 0.8 lb in 5 days. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Commercial Solvents Corp. 245 Park Avenue New York, N.Y. 10017 2. DuPont Industries, Inc. 1425 Walnut St. Philadelphia, Pa. 19102 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A 1 1	10. SHIPPING INFORMATION 10.1 Grades or Purity: 95% min. technical commercial. 10.2 Storage Temperature: Ambient (room). 10.3 Inert Atmosphere: No reaction with. 10.4 Venting: Data not available.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Category Classification Health Hazard (Blue) 1 Flammability (Red) 3 Reactivity (Yellow) 0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 116.16. 13.3 Boiling Point at 1 atm: 284.1°F = 140.1°C = 419.3 K. 13.4 Freezing Point: < -134°F = < -92.2°C = < 233 K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.876 at 20°C (liquids). 13.8 Liquid Surface Tension: 12 dynes/cm = 0.012 N/m at 30°C. 13.9 Liquid-Water Interfacial Tension: 100-150 dynes/cm = 0.01-0.015 N/m at 15°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 140 Btu/lb = 32.4 kcal/kg = 13.4 kJ/kg. 13.13 Heat of Combustion: -13,460 Btu/lb = -7421 kcal/kg = -3065 kJ/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

REVISED 1978

AAN

n-AMYL ALCOHOL

Common Synonyms n-Pentanol 1-Pentanol n-Buthanol	Liquid Colorless Mild, sweet odor Floats on water. Flammable; irritating vapor is produced.
	Avoid all fire sources and call fire department. Stop discharge if possible; keep people away. Avoid contact with liquid and vapor. May be washed off with water; wash with soap and water. Do not inhale vapors or discharge material. Notify local health and pollution control agencies.
Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Fight fires with dry chemical, alkali, foam, carbon dioxide. Water may be ineffective on fire. Do not expose containers with water.
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause coughing, nausea, headache, or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to eyes. Harmful if swallowed. Not irritating to skin. Flush affected areas with plenty of water. IF IN EYES, flush eyelids open and flush with plenty of water. IF SWALLOWED, flush mouth with water. DO NOT INDUCE VOMITING. Have victim drink water or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify port and local water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Manual, CG 446-4) Dispense and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: n-Amyl alcohol n-Butyl alcohol 1-Pentanol Pentanol, 1-ol 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: C ₅ H ₁₂ O 3.4 IMCO United Nations Numerical Designation: 1.2, 1.20	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like alcohol, causes coughing
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Face splash shield, goggles, protective clothing, and cartridge respirator. 5.2 Symptoms Following Exposure: Irritation to skin, eyes, and respiratory tract; headache and vertigo; dizziness and nausea; vomiting and diarrhea. Double vision, deafness, delirium, and occasionally fatal poisoning preceded by severe nervous symptoms have been reported. Coma, glycosuria, and methemoglobinemia can occur. 5.3 Treatment for Exposure: SKIN: remove chemicals by thorough washing with soap and water. EYES: wash promptly with large quantities of water for at least 15 mins. Call a doctor. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: 150 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2.1 Dose 5 to 5 g/kg. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: 0.12 ppm.	

6. FIRE HAZARDS 6.1 Flash Point: 77°F (25°C) 6.2 Flammable Limits in Air: 1.1-7.7% 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 600°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Moderate.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 155 mg/l, 5 days. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Alcoa Chemical Corp. Specialty Chemical Division Marine Hook, Pa. 16001 2. Eastman Chemical Company Baker House, La. 70621 3. Frank Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Manual, CG 446-3) A-P-O-T-U	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.7% plus 0.3% 2-methyl-1-pentanol. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not recommended. 10.4 Venting: Open flame atmosphere.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid. 12.2 HAS Hazard Rating for Bulk Water Transportation: <table data-bbox="980 1410 1219 1668"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>1</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>0</td></tr> <tr> <td> Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>2</td></tr> <tr> <td> Aquatic Toxicity</td><td>2</td></tr> <tr> <td> Residue Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>2</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	0	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Residue Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 88.1 13.3 Boiling Point at 1 atm: 200.2°F = 93.4°C = 371.4°K. 13.4 Freezing Point: -110°F = -78.9°C = 194°K. 13.5 Critical Temperature: 505°F = 263°C = 536°K. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity (33°F at 33°F, liquids): 13.8 Liquid Surface Tension: 25.60 dynes/cm = 0.260 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 4 dynes/cm = 0.039 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.06. 13.12 Latent Heat of Vaporization: 211 Btu/lb = 120 kcal/g = 5049 J/g. 13.13 Heat of Combustion: -66,700 Btu/lb = -3070 kcal/g = -12,845 kJ/g. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	1																												
Health																													
Vapor Irritant	1																												
Liquid or Solid Irritant	0																												
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12.3 MFPA Hazard Classifications: <table data-bbox="980 1841 1219 1905"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	0	NOTES																				
Category	Classification																												
Health Hazard (Blue)	1																												
Flammability (Red)	1																												
Reactivity (Yellow)	0																												

(continued on pages 7 and 8)

AMY

n-AMYL CHLORIDE

Common Synonyms Amyl chloride 1-Chloropentane n-Butylcarbamyl chloride 1-Pentyl chloride Chloride of amyl	Liquid Colorless to purple Pleasant odor Floats on water. Flammable vapor is produced.
First Aid Inhalation: Remove to fresh air. If breathing is difficult, give artificial respiration. If unconscious, give artificial respiration. If swallowed, give water. If on skin, wash with soap and water. If in eyes, flush with water.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Irritating gases may be produced when heated. Fight fire with dry chemical, foam, carbon dioxide, or water.
Exposure	VAPOR Irritating to eyes, nose and throat. LIQUID Irritating to skin and eyes. Harmful if swallowed. May cause drowsiness and loss of consciousness. If swallowed, give water. If on skin, wash with soap and water. If in eyes, flush with water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Mechanical containment Chemical and physical treatment	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Amylchloride, Chloropentane, n-Butylcarbamyl chloride, 1-Pentyl chloride, Chloride of amyl. 3.2 Coast Guard Compatibility Classification: Halogenated compounds (5). 3.3 Chemical Formula: CH ₃ (CH ₂) ₄ Cl 3.4 IMCO/United Nations Numerical Designation: 1.2 +10*	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to deep purple 4.3 Odor: Aromatic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes mild irritation of mucous membranes. Irritation of hand or contact with skin or eyes causes mild irritation. 5.3 Treatment for Exposure: INHALATION: Remove to fresh air, apply artificial respiration if required. EYES: Flush with water. SKIN: Wash well with soap and water. INGESTION: Induce vomiting, give water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Grade 1 LD ₅₀ 1.5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Moderate hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 55°F (13°C) 6.2 Flammable Limits in Air: 1.4 - 8% 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride and toxic phosgene may be formed in fires. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 500°F 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 4.4 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterbody Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive. 7.2 Reactivity with Common Materials: Not reactive. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agent for Acids and Bases: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14650 2. Lachar Chemicals, Inc. 2020 Ashland Avenue Chicago Heights, Ill. 60411 3. Platts and Bower, Inc. 126-04 Northern Boulevard Flushing, N.Y. 11355																																				
13. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-3) A T 1	10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arresters.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAF Hazard Rating for Bulk Water Transportation: <table data-bbox="887 1448 1128 1729"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td>0</td></tr> <tr> <td>Vapor Irritant</td><td>0</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>0</td></tr> <tr> <td>Pressure</td><td>0</td></tr> <tr> <td>Water Pollution</td><td>0</td></tr> <tr> <td>Corrosive Toxicant</td><td>0</td></tr> <tr> <td>Aquatic Toxicant</td><td>0</td></tr> <tr> <td>Acute Effect</td><td>0</td></tr> <tr> <td>Reactivity</td><td>0</td></tr> <tr> <td>Other Chemicals</td><td>0</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 MFPA Hazard Classifications: <table data-bbox="887 1729 1128 1836"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Red)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health	0	Vapor Irritant	0	Liquid or Solid Irritant	0	Pressure	0	Water Pollution	0	Corrosive Toxicant	0	Aquatic Toxicant	0	Acute Effect	0	Reactivity	0	Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Red)	1	Flammability (Red)	0	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 106.4. 13.3 Boiling Point at 1 atm: 22.5°C (72.5°F) ± 0.5°C. 13.4 Freezing Point: -126.7°C (-196°F) ± 0.5°C. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.8834 at 20°C (liquid). 13.8 Liquid Surface Tension: 24.9 dynes/cm ± 0.0249 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 19.1 dynes/cm ± 0.0191 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: 1.7. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0650. 13.12 Latent Heat of Vaporization: 112.1 Btu/lb ± 1.121 kJ/kg. 13.13 Heat of Combustion: 11,500 Btu/lb ± 1,150 kJ/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	1																																				
Health	0																																				
Vapor Irritant	0																																				
Liquid or Solid Irritant	0																																				
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Category	Classification																																				
Health Hazard (Red)	1																																				
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Reactivity (Yellow)	0																																				
NOTES (Continued on pages 2 and 3)																																					

AMM

n-AMYL MERCAPTAN

Common Synonyms 1-Pentanethiol Amyl hydrosulfide Amyl sulfide Amyl thiol	Liquid Colorless to yellow Strong garlic odor Floats on water. Flammable vapor is produced.
Note: This information is for identification purposes only. It is not intended to be used for hazard assessment or for the purpose of determining the appropriate protective measures.	
Fire	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Containers may explode in fire. Fire extinguishers: Water, foam, dry chemical, carbon dioxide. Fire hazard: High.
Exposure	VAPOR May be irritating to the respiratory tract. LIQUID Irritating to skin and eyes. May cause severe burns if in contact with skin for extended periods. May cause severe eye irritation if in contact with eyes for extended periods. May cause severe damage to the mucous membranes of the mouth and throat if swallowed. May cause severe damage to the lungs if inhaled for extended periods.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fading to shorting. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response to Discharge Handbook, CG 446-4. Issue warning: High flammability. Mechanical containment. Should be removed. Clean up and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Pentanethiol, Amyl hydrosulfide, Amyl sulfide, Amyl thiol. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: CH ₃ (CH ₂) ₄ SH. 3.4 HBCO/United Nations Numerical Designation: 1.2 (1.1).	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless, water white to yellow. 4.3 Odor: Strong offensive garlic.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Plastic gloves, goggles. 5.2 Symptoms Following Exposure: Irritation may cause nausea because of offensive odor. Contact with eyes or skin causes slight irritation. Ingestion may cause vomiting. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, apply artificial respiration if required. SKIN: wash with water. See a physician. SKIN: wash with soap and water. INGESTION: induce vomiting if it does not occur spontaneously. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: 0.3 mg/m ³ .	

6. FIRE HAZARDS 6.1 Flash Point: 55°F (11°C). 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: No further hazards are formed. 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 4.7 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterway Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Bases: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Pennwalt Corporation Industrial Chemicals Department Three Parkway Philadelphia, Pa. 19102 2. Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14640 3. Aldrich Chemical Co. 940 West St. Paul Ave. Milwaukee, Wis. 53211								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3. A 1.1	10. SHIPPING INFORMATION 10.1 Grades or Purity: 95.0-95.5% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure vacuum.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 104.2. 13.3 Boiling Point at 1 atm: 124°F = 51°C = 324°K. 13.4 Freezing Point: -104°F = -76°C = 197°K. 13.5 Critical Temperature: 410°F = 211°C = 482°K. 13.6 Critical Pressure: 508 psia = 34.5 atm = 3.45 MPa (m). 13.7 Specific Gravity: 0.8192 at 25°C (liquid). 13.8 Liquid Surface Tension: 26.8 dynes/cm = 0.0268 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 16.1 dynes/cm = 0.0161 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: 1.59. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.052. 13.12 Latent Heat of Vaporization: 17.1 Btu/lb = 94.5 cal/g = 3.97 x 10 ³ J/kg. 13.13 Heat of Combustion: 17,070 Btu/lb = 9,440 cal/g = 3.97 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	3								
Reactivity (Yellow)	0								
NOTES (continued on pages 2 and 3)									

AMK

n-AMYL METHYL KETONE

Synonyms Methyl amyl ketone 2-Heptanone 2-Amyloxypropane Methyl pentyl ketone Pentyl methyl ketone	Physical State Liquid Color White Odor Penetrating fruity odor Specific Gravity Floats and mixes slowly with water
First Aid Inhalation: Remove from exposure area. If breathing is difficult, give oxygen. If unconscious, move to fresh air and call for medical help. Skin Contact: Wash with soap and water. If irritation persists, call for medical help. Eye Contact: Flush with water for 15 minutes. Call for medical help.	
Fire	Flammability Flash Point: 11°F (12°C) Ignition Temperature: 110°F (43°C) Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide Fire Extinguishing Agents Not to be Used: Water may be ineffective Special Hazards of Combustion Products: None
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause dizziness, headache, or difficult breathing LIQUID Irritating to skin and eyes If swallowed will cause nausea or vomiting Repeated exposure may cause skin irritation Prolonged contact with skin may cause dryness or cracking Ingestion may cause nausea or vomiting Inhalation may cause dizziness, headache, or difficulty breathing
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Toxic warning: water contamination Mechanical contamination Should be removed Chemical and physical treatment	2. LABELS No label and label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Heptanone 2-Ketooxane, Methylamyl ketone, Methylpentyl ketone, Pentyl methyl ketone 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: CH ₃ CH ₂ CH ₂ CH ₂ CH ₂ COCH ₃ 3.4 IMCO/United Nations Numerical Designation: 1112, 11	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: colorless 4.3 Odor: Characteristic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Gloves and goggles 5.2 Symptoms Following Exposure: Inhalation of concentrated vapor may have narcotic effect. Repeat or prolonged contact with eyes causes irritation. Prolonged and repeated contact with skin may cause defatting with resultant irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: get medical attention. EYES: flush with water for 15 to 20 min. SKIN: flush affected areas with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm (suggested) 5.5 Short-Term Inhalation LC ₅₀ : Data not available 5.6 Toxicity by Ingestion: Code 2 oral LD ₅₀ = 6,700 mg/kg rat 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: 0.07 pp	

6. FIRE HAZARDS 6.1 Flash Point: 11°F (12°C) 6.2 Flammable Limits in Air: 1.1% - 7.4% 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in FLUJ: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterford Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0.4% in 10 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Will attack some forms of plastic 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Eastman Chemical Products, Inc., Industrial Chemicals Div., Kingsport, Tenn. 37602 2. Aldrich Chemical Co., 540 W. North Paul Ave., Milwaukee, Wis. 53233 3. Pfaltz and Bauer, Inc., 126-66 Northern Blvd., Flushing, N. Y. 11354
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-2) N 1-A	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical Pure 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Airtight containers 10.4 Venting: Open flame arresters
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 114.14 13.3 Boiling Point at 1 atm: 104.7°F = 40.4°C = 424°R 13.4 Freezing Point: -119°F = -83°C = 214°R 13.5 Critical Temperature: Data not available 13.6 Critical Pressure: Data not available 13.7 Specific Gravity: 0.8204 at 15°C (liquid) 13.8 Liquid Surface Tension: 26.17 dynes/cm = 0.02617 N/m at 25°C 13.9 Liquid-Water Interfacial Tension: 12.4 dynes/cm = 0.0124 N/m at 25°C 13.10 Vapor (Gas) Specific Gravity: 3.42 13.11 Ratio of Specific Heats of Vapor (Gas): 1.02 ± 1.05 13.12 Latent Heat of Vaporization: 144.9 Btu/lb = 52.7 cal/g = 2.21 x 10 ³ J/kg 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

(continued on page 4 and 5)

ANT

n-AMYL NITRATE

Common Synonyms Mixed primary amyl nitrates Diesel Ignition Improver		Liquid	Colorless to light straw	Ether like odor
		May float or sink in water		
Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Shut off ignition sources. Call fire department. Stay upwind. Use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE May explode if exposed to heat or flames Wear goggles and self contained breathing apparatus Extinguish with dry chemical foam or carbon dioxide Water may be ineffective on fire Cool exposed containers with water			
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled will cause headache If in eyes, hold eyelids open and flush with plenty of water If breathing is stopped, give artificial respiration If breathing is difficult, give oxygen LIQUID Irritating to skin and eyes. If swallowed will cause nausea or headache Remove contaminated clothing and shoes Flush affected areas with plenty of water If IN EYES, hold eyelids open and flush with plenty of water If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: air contaminant Restrict access Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Diesel ignition improver, Mixed primary amyl nitrates 3.2 Crane Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₁₁ H ₂₃ ONO ₂ 3.4 IMCO/United Nations Numerical Designation: 3.3/1112		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light straw, water white 4.3 Odor: Ethereal		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Respirator with canister for vapors at high concentrations 5.2 Symptoms Following Exposure: Inhalation or ingestion may cause headache, methemoglobin and nausea. Liquid and vapor irritate eyes. Contact with skin may cause slight irritation 5.3 Treatment for Exposure: INHALATION: move to fresh air, support respiration, get medical attention. INGESTION: induce vomiting, get medical attention. EYES: irrigate thoroughly with water. SKIN: wash with soap and water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point 120°F (40°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in a fire 6.6 Behavior in Fire: Overheated material may detonate 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
	9. SELECTED MANUFACTURERS Ethyl Corporation Industrial Chemicals Div. 451 Florida St. Baton Rouge, La. 70801								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May form combustible mixture with wood or other combustibles. Liquid will attack some plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents & Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	10. SHIPPING INFORMATION 10.1 Grades or Purity: Mixture containing n-amylnitrate 60%, isop-amylnitrate 5%, 2-methylbutylnitrate 35% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-1-U X Y	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 133 13.3 Boiling Point at 1 atm: 292-314°F = 144-156°C = 417-429°K 13.4 Freezing Point: -190°F = -123°C = 150°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.0 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: 4.59 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Data not available 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification*</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>1 2</td></tr><tr><td>Flammability (Red)</td><td>2 2</td></tr><tr><td>Reactivity (Yellow)</td><td>0 0</td></tr></tbody></table> OSV OSV * First column refers to nonfire situation	Category	Classification*	Health Hazard (Blue)	1 2	Flammability (Red)	2 2	Reactivity (Yellow)	0 0	
Category	Classification*								
Health Hazard (Blue)	1 2								
Flammability (Red)	2 2								
Reactivity (Yellow)	0 0								
NOTES									

iso-AMYL NITRITE

Common Synonyms Isopentyl nitrite Amyl nitrite 3-Methylbutyl nitrite		Liquid Colorless to light yellow Pleasant fruity odor
Floats on water. Poisonous gas is produced on contact with water.		
Shut off ignition sources. Call fire department. Wear goggles, self-contained breathing apparatus and rubber overclothing. Notify police. Avoid contact with skin, eyes, nose, mouth. Stop breathing if possible. Notify and remove disoriented personnel. Notify local health and pollution control agencies.		
Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. DO NOT USE WATER ON FIRE Use exposed container with water.	
 Exposure	CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat. May cause dizziness. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. If swallowed will cause dizziness, headache or loss of consciousness. Remove contaminated clothing and shoes. Flush skin, nose and eyes with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Do not drink water. DO NOT INDUCE VOMITING.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operators of downstream intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning, high flammability. Restrict access. Disperse and flush.		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Isopentyl nitrite Amyl nitrite 3-Methylbutyl nitrite 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $(CH_3)_2CHCH_2CH_2ONO$ 3.4 IMCO/United Nations Numerical Designation: 111113		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light yellow, transparent 4.3 Odor: Pleasant, fragrant, fruity
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective goggles or face shield, self-contained breathing apparatus, protective gloves and clothing. 5.2 Symptoms Following Exposure: Inhalation or ingestion causes flushing of the face, pulsatile headache, disturbing tachycardia, cyanosis (methemoglobinemia), weakness, confusion, restlessness, faintness, and collapse. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION or INGESTION: place patient in recumbent position, if necessary administer oxygen. For treatment of severe methemoglobinemia, transfuse with whole blood or give 1 V. or 1 M. a dose of 1.2 mg/kg methylene blue or an oral dose of 4.5 mg/kg 1-YES; after contact with liquid, irrigate with large quantities of water for 15 min; call physician. SKIN: after contact with liquid, wash with large amounts of water. Call physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade I, LD ₅₀ 5 to 15 g/kg. 5.7 Late Toxicity: Methemoglobinemia may occur. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS 6.1 Flash Point: 0°F (0°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen are formed 6.6 Behavior in Fire: Containers may explode 6.7 Ignition Temperature: 410°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 1.4 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Decomposes on exposure to air, light, or water, evolving toxic oxides of nitrogen which are orange in color 7.2 Reactivity with Common Materials: May corrode metals if wet 7.3 Stability During Transport: Stable if kept sealed and not exposed to light 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14650 2. Aldrich Chemical Co. 940 West St. Paul Avenue Milwaukee, Wis. 53233 3. Pfaltz and Bauer, Inc. 126-04 Northern Boulevard Flushing, N.Y. 11368																																				
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial, USP 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U V W	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 117.1 13.3 Boiling Point at 1 atm: 210°F = 99°C = 372°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.8758 at 20°C (liquid) 13.8 Liquid Surface Tension: (est.) 20 dynes/cm = 0.020 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (est.) 40 dynes/cm = 0.040 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: 4 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0709 13.12 Latent Heat of Vaporization: 212 Btu/lb = 118 cal/g = 4.94 × 10⁵ J/kg 13.13 Heat of Combustion: -12,500 Btu/lb = -6,930 cal/g = -290 × 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation:<table><tr><td>Category</td><td>Rating</td></tr><tr><td>Fire</td><td>3</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>0</td></tr><tr><td>Liquid or Solid Irritant</td><td>4</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Vesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>3</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>4</td></tr></table> 12.3 NFPA Hazard Classifications:<table><tr><td>Category</td><td>Classification</td></tr><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td></td></tr><tr><td>Reactivity (Yellow)</td><td>2</td></tr></table>	Category	Rating	Fire	3	Health		Vapor Irritant	0	Liquid or Solid Irritant	4	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Vesthetic Effect	2	Reactivity		Other Chemicals	3	Water	0	Self Reaction	4	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)		Reactivity (Yellow)	2	(Continued on pages 5 and 6)
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ATS

n-AMYLTRICHLOROSILANE

Common Synonyms Trichloropentylsilane Pentyl trichlorosilane Trichloroamylsilane	Liquid Colorless Sharp irritating odor Reacts violently with water. Irritating visible vapor cloud is produced.
Avoid contact with liquid and vapor. Keep people away. Wear eye protection. Obtain breathing apparatus and rubber gloves. Use self-contained breathing device. If possible, stop discharge if possible. Call fire department. Notify local health and pollution control agencies.	
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE Wear goggles and self-contained breathing apparatus. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operator of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: corrosive Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Trichloropentylsilane Pentyltrichlorosilane Trichloroamylsilane 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $\text{CH}_3(\text{CH}_2)_4\text{SiCl}_3$ 3.4 IMCO/United Nations Numerical Designation: 8/1/28	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sharp, like hydrochloric acid pungent acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Acid vapor type respiratory protection, rubber gloves, chemical worker's goggles. 5.2 Symptoms Following Exposure: Inhalation causes irritation of mucous membrane. Contact of liquid with eyes or skin causes severe burns, and ingestion causes severe burns of mouth and stomach. 5.3 Treatment for Exposure: Get medical attention immediately after exposure to this compound. INHALATION: remove from exposure, support respiration. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: give large amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral rat LD_{50} = 2,340 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 145°F (63°C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water, foam. 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride and toxic phosgene may be formed. 6.6 Behavior in Fire: Difficult to extinguish. Re-ignition may occur. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 2.5 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously to generate toxic hydrogen chloride gas (hydrochloric acid). 7.2 Reactivity with Common Materials: Corrodes metal. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: After flushing with water, rinse with sodium bicarbonate solution or lime water. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Union Carbide Corporation Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017 2. Dow Corning Corporation P.O. Box 592 Midland, Mich. 48640 3. PCR, Inc. P.O. Box 1466 Gainesville, Fla. 32603																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A O	10. SHIPPING INFORMATION 10.1 Grades or Purities: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure/vacuum.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive. 12.2 NAS Hazard Rating for Bulk Water Transportation <table data-bbox="982 1447 1217 1710"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>2</td></tr> <tr><td>Health</td><td></td></tr> <tr><td> Vapor Irritant</td><td>3</td></tr> <tr><td> Liquid or Solid Irritant</td><td>4</td></tr> <tr><td> Poisons</td><td>1</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td> Human Toxicity</td><td>3</td></tr> <tr><td> Aquatic Toxicity</td><td>3</td></tr> <tr><td> Acute Effect</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td> Other Chemicals</td><td>3</td></tr> <tr><td> Water</td><td>4</td></tr> <tr><td> Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed.	Category	Rating	Fire	2	Health		Vapor Irritant	3	Liquid or Solid Irritant	4	Poisons	1	Water Pollution		Human Toxicity	3	Aquatic Toxicity	3	Acute Effect	2	Reactivity		Other Chemicals	3	Water	4	Self Reaction	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 205.6. 13.3 Boiling Point at 1 atm: 320°F = 160°C = 433°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.157 at 25°C (liquid). 13.8 Liquid Surface Tension: (est.) 20 dynes/cm = 0.020 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 1. 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available. 13.12 Latent Heat of Vaporization: (est.) 86.8 Btu/lb = 48.2 cal/g = 2.02×10^5 J/kg. 13.13 Heat of Combustion: (est.) -6,630 Btu/lb = -3,680 cal/g = -1.54×10^7 J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: (est.) 180 Btu/lb = 100 cal/g = 4.6×10^3 J/kg. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	2																												
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Self Reaction	1																												
NOTES (Continued on pages 5 and 6.)																													

ANL

ANILINE

Common Synonyms Aniline Aniline oil Phenylamine Blue oil	Only liquid Colorless to yellowish brown Weak odor Sinks slowly in water
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear chemical protective suit with self-contained breathing apparatus. Stop discharge if possible. Wash upwind and use water spray to "knock down" vapor. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Combustible POISONOUS GAS IS PRODUCED WHEN HEATED Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Extinguish with water, dry chemical, foam or carbon dioxide. Cool exposed containers with water.
 Exposure	CALL FOR MEDICAL AID LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison water contaminant. Restrict access. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Aniline/benzene Aniline oil Blue oil Phenylamine 3.2 Coast Guard Compatibility Classification: Aromatic amine 3.3 Chemical Formula: C ₆ H ₅ NH ₂ 3.4 IMCO/United Nations Numerical Designation: 6.1 + 5.2	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): liquid 4.2 Color: colorless to pale brown 4.3 Odor: aromatic amine like; characteristic regular, strongly amine like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Respirator for organic vapors; splashproof goggles; rubber gloves; boots. 5.2 Symptoms Following Exposure: ACUTE EXPOSURE: Blue discoloration of finger tips, cheeks, lips, and nose; nausea; vomiting; headache and drowsiness followed by delirium, coma and shock. CHRONIC EXPOSURE: Loss of appetite; loss of weight; headaches; visual disturbances; skin lesions. 5.3 Treatment for Exposure: Remove victim to fresh air and call a physician at once. SKIN: EYE CONTACT: immediately flush skin or eyes with plenty of water for at least 15 min. If vasovagal is present, shower with soap and warm water, with special attention to scalp and fingernails. Administer oxygen until physician arrives. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm 5.5 Short-Term Inhalation Limits: 50 ppm for 10 min; 5 ppm for 8 hr. 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 50 to 500 mg/kg. 5.7 Late Toxicity: None recognized. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.5 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 168°F O.C. 188°F C.C. 6.2 Flammable Limits in Air: 1.3% (L) 11.1% (U) 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic vapors are generated when heated. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 1418°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 30 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 1020 ppm 1 hr. - fish killed; fresh water; 10 ppm 96 hr. - scud deaths; 11 ppm fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 180% 5 days. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water and rinse with dilute acetic acid. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Baxchem Corp. Mobay Chemical Co. Division Penn. Lincoln Plank. West Pittsburgh, Pa. 15207 2. E. I. duPont de Nemours and Co. Explosives Department Wilmington, Del. 19898 3. First Mississippi Corp. First Chemical Corp. Pascagoula, Miss. 39567																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-P-Q T-U-V-X	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 99.5% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure vacuum.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous liquid or solid, Class B. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="898 1433 1134 1692"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>1</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td> Poisons</td><td>3</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>3</td></tr> <tr> <td> Aquatic Toxicity</td><td>2</td></tr> <tr> <td> Aesthetic Effect</td><td>4</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>3</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="898 1735 1134 1800"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	3	Water Pollution		Human Toxicity	3	Aquatic Toxicity	2	Aesthetic Effect	4	Reactivity		Other Chemicals	3	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	2	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 93.13. 13.3 Boiling Point at 1 atm: 363.6°F = 184.2°C = 457.4°K. 13.4 Freezing Point: 21°F = -6.1°C = 267.1°K. 13.5 Critical Temperature: 798.1°F = 425.6°C = 698.8°K. 13.6 Critical Pressure: 770 psia = 52.4 atm = 5.31 MN/m ² . 13.7 Specific Gravity: 1.022 at 20°C (liquids). 13.8 Liquid Surface Tension: 45.5 dynes/cm = 0.455 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 55 dynes/cm = 0.0055 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1. 13.12 Latent Heat of Vaporization: 198 Btu/lb = 110 cal/g = 4.61 x 10 ³ J/kg. 13.13 Heat of Combustion: -14,940 Btu/lb = -6320 cal/g = -248.3 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
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REVISED 1978

ASC

ANISOYL CHLORIDE

Common Synonyms p-Anisoyl chloride		Liquid	Yellow to brown Sharp penetrating odor
		Reacts with water Irritating vapor is produced Freezing point is 72° F	
Wear goggles and self-contained breathing apparatus Stop discharge if possible. Keep people away. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire	Combustible POISONOUS GASES MAY BE PRODUCED WHEN HEATED Extinguish with dry chemicals. Carbon dioxide DO NOT USE WATER ON ADJACENT FIRES		
Exposure	Call for medical aid VAPOR Irritating to eyes, nose and throat Move victim to fresh air LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES: hold eyelids open and flush with plenty of water IF SWALLOWED: do not induce vomiting. Have victim drink water or milk.		
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: corrosive Restrict access Disperse and flush		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: p-Anisoyl chloride 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: p-CH ₃ OC ₆ H ₄ COCl 3.4 IMCO/United Nations Numerical Designation: N 1122		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow-brown 4.3 Odor: Sharp penetrating	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles and face shield, plastic gloves, protective clothing 5.2 Symptoms Following Exposure: Vapor irritates mucous membranes. Contact of liquid with eye or skin causes severe irritation. Ingestion causes severe irritation of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: remove to fresh air. EYES: flush with water for at least 15 min; get medical attention. SKIN: flush with water; wash well with soap and water. INGESTION: do NOT induce vomiting; give large amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water, foam 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride fumes may be formed 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts slowly to generate hydrogen chloride (hydrochloric acid). The reaction is not hazardous. 7.2 Reactivity with Common Materials: Corrodes metal slowly. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Eastman Kodak Co. Eastman Organic Chemicals Rochester, N. Y. 14650 2 Aldrich Chemical Co. 940 West St. Paul Avenue Milwaukee, Wis. 53233 3 Pfaltz and Bauer, Inc. 126-04 Northern Boulevard Flushing, N. Y. 11368
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.5) A O X	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 171.6 13.3 Boiling Point at 1 atm: 504°F = 262°C = 515°K 13.4 Freezing Point: 72°F = 22°C = 295°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.25 at 20°C (liquid) 13.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (est.) -5000 Btu/lb = -5830 cal/g = -244 X 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: (est.) 90 Btu/lb = 50 cal/g = 2.1 X 10⁵ J/kg 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

(Continued on pages 5 and 6)

ATH

ANTHRACENE

Common Synonyms Anthracene Paranaphthalene Green oil		Solid	White to yellow	Weak aromatic odor
		Sinks in water		
Stop discharge if possible. Keep people away. Avoid contact with solids and liquids. Isolate and remove discharge. Notify local health and pollution control agencies.				
Fire		Combustible Dust cloud may explode if ignited in an enclosed area Extinguish with water, dry-chemical foam or carbon dioxide		
Exposure		CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If in eyes, hold eyelids open and flush with plenty of water If breathing has stopped, give artificial respiration If breathing is difficult, give oxygen SOLID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 31 Synonyms: Anthracene (Green oil) Paranaphthalene 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: C ₁₄ H ₁₀ 34 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: White to yellow 43 Odor: Weak aromatic		
5. HEALTH HAZARDS 51 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves 52 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Contact with eyes causes irritation. 53 Treatment for Exposure: INHALATION: move to fresh air. EYES: flush with water for 15 min. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Data not available 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: Data not available				

6. FIRE HAZARDS 61 Flash Point: Not pertinent (combustible solid) 62 Flammable Limits in Air: Not pertinent 63 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 64 Fire Extinguishing Agents Not to be Used: 65 Special Hazards of Combustion Products: 66 Behavior in Fire: 67 Ignition Temperature: 1004°F 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not pertinent	8. WATER POLLUTION 81 Aquatic Toxicity: 5 ppm 24 hr trout & bluegill no effect 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Gallard Schlesinger Chemical Mfg. Co. 584 Mineola Avenue Carle Place, N.Y. 11514 2 Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233 3 Eastman Organic Chemicals Rochester, N.Y. 14650								
	10. SHIPPING INFORMATION 101 Grades or Purity: Various fluorescence grades, Scintillation grade, Technical grade, 90-98% 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 178.23 133 Boiling Point at 1 atm: 646.2°F = 341.2°C = 614.4°K 134 Freezing Point: 421.7°F = 216.5°C = 489.7°K 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.24 at 20°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: -17,100 Btu/lb = -9,510 cal/g = -398 × 10³ J/kg 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent								
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: <table border="1"><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td></td></tr><tr><td>Flammability (Red)</td><td></td></tr><tr><td>Reactivity (Yellow)</td><td></td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)		Flammability (Red)		Reactivity (Yellow)		
Category	Classification								
Health Hazard (Blue)									
Flammability (Red)									
Reactivity (Yellow)									
NOTES									

(Continue on pages 1 and 6)

APC

ANTIMONY PENTACHLORIDE

Common Synonyms Antimony (V) chloride Antimony perchloride		Liquid	Colorless to brown	Unpleasant odor																												
		Sinks in water. Irritating vapor is produced. Freezing point is 370°F.																														
As this is a toxic substance, it should be handled with care. See the MSDS for more information. No data is available for this substance. Do not use water or foam on adjacent fires.																																
Fire	Not flammable POISONOUS GASES ARE PRODUCED WHEN HEATED DO NOT USE WATER ON ADJACENT FIRES																															
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing May irritate the throat If in eyes: flush with plenty of water If in mouth: spit out and swallow water If swallowed: drink plenty of water LIQUID Will burn skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness If on skin: flush with plenty of water If in eyes: flush with plenty of water If in mouth: spit out and swallow water If swallowed: drink plenty of water DO NOT INDUCE VOMITING																															
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes. No data is available for this substance.																															
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning - corrosive Restrict access Dispense and flush		2. LABEL 																														
3. CHEMICAL DESIGNATIONS 31 Synonyms: Antimony (V) chloride Antimony perchloride 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: SbCl ₅ 34 IMCO/United Nations Numerical Designation: N 1750		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless to medium brown, yellow red brown 43 Odor: Pungent, offensive																														
5. HEALTH HAZARDS 51 Personal Protective Equipment: Organic vapor acid gas type canister mask, rubber, neoprene vinyl etc. gloves, chemical safety goggles, plus face shield where appropriate, acid resistant clothing, plus apron for splash protection, rubber safety shoes or boots, hard hat 52 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact of liquid with eyes or skin causes severe burns. Ingestion causes vomiting and severe burns of mouth and stomach. Overexposure by any route can cause bloody stools, slow pulse, low blood pressure, coma, convulsions, cardiac arrest. 53 Treatment for Exposure: INHALATION: remove to clean air, rinse mouth and gargle with water. If overexposure is serious, get prompt medical attention. EYES: flush eyes and eye lids thoroughly with large amounts of water, get prompt medical attention. SKIN: flush thoroughly with water, remove contaminated clothing, wash affected area with soap and water. If overexposure is serious, get prompt medical attention. INGESTION: dilute by drinking water. If vomiting occurs, administer more water. If overexposure is serious, get prompt medical attention. 54 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ as antimony 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 1.115 mg/kg (rat) 900 mg (ca pig) 57 Late Toxicity: An irritant posing no long term results 58 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.																																
6. FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used: Do not use water or foam on adjacent fires. 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Irritating fumes of hydrogen chloride given off when water or foam is used to extinguish adjacent fire. 67 Ignition Temperature: Not pertinent 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not pertinent																																
7. CHEMICAL REACTIVITY 71 Reactivity with Water: Reacts to form hydrogen chloride gas (hydrochloric acid) 72 Reactivity with Common Materials: Causes corrosion of metal 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Soda ash or soda ash lime mixture 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent																																
8. WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterlow Toxicity: Data not available 83 Biological Oxygen Demand (BOD): None 84 Food Chain Concentration Potential: None																																
9. SELECTED MANUFACTURERS 1. Hooker Chemical Corporation Specialty Chemicals Division 4700 Buffalo Avenue Niagara Falls, N.Y. 14302 2. J. I. Baker Chemical Co. Phillipsburg, N.J. 08865 3. Mallinckrodt Chemical Works 221 West Side Avenue Jersey City, N.J. 07304																																
10. SHIPPING INFORMATION 101 Grades or Purities: 99+ 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirements 104 Venting: Pressure/vacuum																																
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A O		13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: 299.64 133 Boiling Point at 1 atm: (est.) 337°F = 175°C = 448°K 134 Freezing Point: 371 = 111°C = 226°K 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 2.354 at 20°C (liquid) 138 Liquid Surface Tension: (est.) 15 dyne/cm = 0.015 N/m at 20°C 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: 68.9 Btu/lb = 38.3 cal/g = 1.60 X 10 ⁵ J/kg 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: -211.9 Btu/lb = -117.2 cal/g = -4.92 X 10 ⁵ J/kg 1316 Heat of Polymerization: Not pertinent																														
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Corrosive 122 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>0</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>3</td></tr><tr><td>Liquid or Solid Irritant</td><td>4</td></tr><tr><td>Poisons</td><td>3</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>2</td></tr><tr><td>Aquatic Toxicity</td><td>3</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>3</td></tr><tr><td>Water</td><td>3</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table> 123 NFPA Hazard Classifications: Not listed		Category	Rating	Fire	0	Health		Vapor Irritant	3	Liquid or Solid Irritant	4	Poisons	3	Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	3	Water	3	Self Reaction	0	(Continued on page 5 and 6)		
Category	Rating																															
Fire	0																															
Health																																
Vapor Irritant	3																															
Liquid or Solid Irritant	4																															
Poisons	3																															
Water Pollution																																
Human Toxicity	2																															
Aquatic Toxicity	3																															
Aesthetic Effect	2																															
Reactivity																																
Other Chemicals	3																															
Water	3																															
Self Reaction	0																															
5. HEALTH HAZARDS (Cont'd.) 59 Liquid or Solid Irritant Characteristics: Severe skin irritant, causes second- and third-degree burns on short contact and is very injurious to the eyes. 510 Odor Threshold: Data not available																																

(Continued on page 6)

APF

ANTIMONY PENTAFLUORIDE

Common Synonyms	Liquid Colorless Sharp odor
Reacts violently with water. Poisonous gas is produced on contact with water. Freezing point is 450° F.	
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES ARE PRODUCED WHEN HEATED. DO NOT USE WATER OR FOAM ON FIRE OR ON ADJACENT FIRES. Extinguish with dry chemicals or carbon dioxide.
 Exposure	CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Moves quickly to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify nearest fire-fighting water supplies.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning: extremely air contaminant. Restrict access. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: SbF ₅ . 3.4 IMCO/United Nations Numerical Designation: N 1732.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Pungent.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Acid gas type canister mask, rubber gloves, protective clothing, safety goggles and face shield. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact of liquid with eyes or skin causes severe burns. Ingestion causes vomiting and severe burns of mouth and throat. Overexposure by any route can cause bloody stools, slow pulse, low blood pressure, coma, convulsions, cardiac arrest. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, rinse mouth with water, give oxygen if necessary to assist breathing, get medical attention. EYES: irrigate with copious amounts of water for at least 15 min., get medical attention. SKIN: flush with copious amounts of water, wash well with soap and water. INGESTION: dilute by drinking water; if vomit occurs, drink more water; get medical attention promptly. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m as antimony. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Antimony poisoning may result. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable (but see 7.2). 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Do not use water or foam on adjacent fires. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Gives off toxic hydrogen fluoride fumes when water is used to extinguish adjacent fire. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously to form toxic hydrogen fluoride (hydrofluoric acid). 7.2 Reactivity with Common Materials: When moisture is present, causes severe corrosion of metals (except steel) and glass. If confined and wet can cause explosion. May cause fire in contact with combustible material. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water; rinse with sodium bicarbonate or lime solution. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS Ozark-Mahoning Company Special Chemicals Division 1870 South Boulder Tulsa, Okla. 4119 Ventron Corp. Alfa Products Division P. O. Box 159 Beverly, Mass. 01915 PCR, Inc. P. O. Box 1466 Gainesville, Fla. 32602
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) V O	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure vacuum.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 216. 13.3 Boiling Point at 1 atm: 289° = 143°C = 416°K. 13.4 Freezing Point: 45° F = 7°C = 260°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.340 at 30°C (liquid). 13.8 Liquid Surface Tension: 42.120 dynes/cm = 0.020 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 44,170 Btu/lb = 44 cal/g = 1.8 X 10 ⁵ J/kg. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

(Continued on pages 4 and 6)

APT

ANTIMONY POTASSIUM TARTRATE

Common Synonyms Tartaric acid Tartaric antimony Tartaric antimony Potassium antimony tartrate	Solid Sinks in water	White	Odorless
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY Wear dust respirator or at least wear something that filters dust Notify the proper authorities if you have discharged material Notify your health and pollution control agencies			
Fire	Not flammable		
Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing, headache, coughing, or difficult breathing In case of eye contact, flush with plenty of water In case of skin contact, wash with plenty of water If SWALLOWED, do not induce vomiting. Have victim drink water If SWALLOWED, do not induce vomiting. Have victim drink water If SWALLOWED, do not induce vomiting. Have victim drink water		
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Notify the proper authorities if you have discharged material		
1. RESPONSE TO DISCHARGE See Appendix Methods Manual, CG 446-4 Issue warning: harmful water contaminant Restrict access Dispose: no flush		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS Synonyms: Potassium antimony tartrate, Tartaric antimony, Tartaric antimony Coast Guard Compatibility Classification: Not listed Chemical Formula: K₂SB₂O₆ (K₂SB₂O₆) IMCO/United Nations Numerical Designation: N/A		4. OBSERVABLE CHARACTERISTICS Physical State (as shipped): Solid Color: white Odor: None	
5. HEALTH HAZARDS Personal Protective Equipment: Dust respirator, rubber or plastic coated gloves, chemical goggles, safety shoes, closed toe shoes, full body protective suit Symptoms Following Exposure: Inhalation causes inflammation of membranes of nose and throat, upper respiratory irritation, headache, dizziness. Ingestion causes gastroenteritis and upper respiratory irritation. Skin contact with dust causes irritation. Further symptoms of irritation include nervous complaints, fatigue, dizziness, muscle pain and neurological pain Treatment for Exposure: INHALATION: Move to fresh air. INGESTION: Call physician immediately. Use water to rinse mouth and spit out. If glasses or contact lenses are worn, remove them. Flush with water for 15 minutes. Consult a physician. SKIN: Flush with water. Wash well with soap and water Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m³ as antimony Short-Term Inhalation Limit: Data not available Toxicity by Ingestion: Grade I oral rat LD₅₀ = 115 mg/kg Late Toxicity: Data not available Vapor (Gas) Irritant Characteristics: Data not available Liquid or Solid Irritant Characteristics: Data not available Odor Threshold: Odorless			

6 FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aquatic Toxicity: 20 ppm* (96 hr.) fathead minnow, 11 m. fresh (soft) water. 12 ppm* (96 hr.) fathead minnow, 11 m. fresh (hard) water. *as antimony. 8.2 Waterflow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: High.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Not pertinent. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1 Pfizer Chemicals Div. 234 E. 42nd St. New York, N.Y. 10017 2 The Harshaw Chemical Co. 1945 E. 97th St. Cleveland, Ohio 44106 3 Mallinckrodt Chemical Works 223 Westside Ave. P.O. Box 334 Jersey City, N.J. 07303
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Manual, CG 446-3). NS	10. SHIPPING INFORMATION 10.1 Grade or Purity: Pure 99.10% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: ORM-A 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 334. 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.60 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on page 1 and 2)	

ATM

ANTIMONY TRICHLORIDE

Common Synonyms: Butter of antimony Antimony (III) Chloride	Solub: White to pale yellow Sharp unpleasant odor Sinks and mixes violently with water
AVOID CONTACT WITH SOLID AND DUST. KEEF PEOPLE AWAY Wear dust respirator and rubber over-knitting nitrile gloves. Stop discharge if possible. Isolate and remove discharged material. Notify local health authorities if toxic effects are seen.	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE. Irritating gases may be produced when heated. Wear goggles and suit for protection breathing apparatus. DO NOT USE WATER ON ADDITIONAL FIRES.
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing. If in eyes, flush eyes with plenty of water. If breathing is difficult, give artificial respiration. If breathing is difficult, give oxygen. SOLID Will burn skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, do not induce vomiting. Give plenty of water. OR MILK. IF SWALLOWED AND IN CONJUNCTION WITH ORAL OR NASAL CONJUNCTIONS, do nothing except keep person warm.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify personnel of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant corrosive Disperse and flush	2. LABEL  3. CHEMICAL DESIGNATIONS 3* Synonyms: Antimony butter Antimony (III) chloride Butter of antimony 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: SbCl ₃ 34 IMCO/United Nations Numerical Designation: 9.111
5. HEALTH HAZARDS <i>Note: The respiratory system is the usual avenue of entrance of antimony and its compounds into the body.</i> 5.1 Personal Protective Equipment: Bu. Mines approved respirator, chemical safety goggles, shield, leather or rubber safety shoes, rubber apron, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation of small amounts may cause irritation of the nose, throat and air passages, large exposures result in severe air passage irritation. Ingestion causes vomiting, purging with bloody stools, slow pulse and low blood pressure, slow shallow breathing, coma and convulsions, sometimes followed by death. Contact with eyes causes severe eye burns or at least severe eye irritation. Contact of dry chemical with skin may result in deep chemical burns. 5.3 Treatment for Exposure: INHALATION: move victim at once to fresh air and keep him warm but not hot; call a physician immediately; nasal passages may be irrigated from a gently flowing hose. INGESTION: induce vomiting by giving large quantities of warm salt water; have a physician see the patient at once. EYES: flush with copious amounts of water for at least 15 min.; call physician at once. SKIN: flush with large quantities of flowing water followed by washing of skin surfaces with soap and water; remove all contaminated clothing promptly. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ as antimony. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral rat LD ₅₀ = 675 mg/kg.	

(Continued on page 4.)

6. FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used:** Do not use water on adjacent fires.
6.5 **Special Hazards of Combustion Products:** Toxic and irritating antimony oxide and hydrogen chloride may form in fires.
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not pertinent

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 17 ppm* 96 hr fathead minnow TL₅₀ (fresh hard) water
9 ppm* 96 hr fathead minnow TL₅₀ (fresh soft) water
*as antimony
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** High

9. SELECTED MANUFACTURERS

- J. T. Baker Chemical Co.
Phillipsburg, N. J. 08855
- Stauffer Chemical Company
Specialty Chemical Division
Westport, Conn. 06880
- Gallard Schlegel Chemical Mfg. Co.
524 Monaca Ave.
Corte Madera, N. Y. 11314

10. SHIPPING INFORMATION

- 10.1 **Grades or Purities:** Commercial 99+%; Analytical Anhydrous
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** Padded
10.4 **Venting:** Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
RR

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Corrosive solid
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
12.3 **MFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid
13.2 **Molecular Weight:** 228
13.3 **Boiling Point at 1 atm:** 433°F = 223°C = 496°K
13.4 **Freezing Point:** 163°F = 73°C = 346°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.14 at 20°C (solid)
13.8 **Liquid Surface Tension:** Not pertinent
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
13.12 **Latent Heat of Vaporization:** Not pertinent
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** -70 Btu/lb
= -16 cal/g = -1.6 x 10⁵ J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

5. HEALTH HAZARDS (Cont'd)

- 5.7 **Late Toxicity:** Data not available
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
5.9 **Liquid or Solid Irritant Characteristics:** Data not available
5.10 **Odor Threshold:** Data not available

ATT

ANTIMONY TRIFLUORIDE

Common Synonyms		Solid Crystals	White	Odorous
		Sinks in water		
As a contaminant with a 5.1 Isolate and remove discharged material. Notify local health and industrial waste agencies.				
Fire		No flammable		
Exposure		CALL FOR MEDICAL AID SOLID Irritating to skin and eyes. Harmful if swallowed. Remove or decontaminate clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water if possible.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Feeding to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify appropriate health water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4.) Issue warning - water contaminant Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: SbF ₃ 3.4 IMCO United Nations Numerical Designation: 6.1 1549		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved respirator, rubber gloves 5.2 Symptoms Following Exposure: Resemble those of lead and arsenic poisoning. ACUTE POISONING: irritation of the mouth, nose, stomach and intestines, vomiting, purging with bloody stools, slow pulse and low blood pressure, slow, shallow breathing, coma and convulsions, sometimes followed by death from cardiac and respiratory exhaustion. CHRONIC POISONING: dryness of throat, pain on swallowing, occasional vomiting and persistent nausea, susceptibility to fainting, weakness, loss of appetite and weight, giddiness, dermatitis, either pustular or ulcerative, anemia. 5.3 Treatment for Exposure: If any symptoms, however slight, are noticed the affected individual should be removed from contact with the chemical and placed under the care of a physician who is versed in the treatment necessary. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 3.1 Dose 50 to 500 mg. Air (residue per) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes contact 5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: 200 ppm, 521 hr. time, carp, rainbow trout, killed, fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Feed Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Special Chemicals Div. Wilmington, Delaware Marcus Hook, Pa. 19361 2. Ozark-Mahoning Co. 1870 South Boulder Ave. Tulsa, Oklahoma 74119
	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99% 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Data not available 10.4 Venting: Data not available
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Manual, CG 444-3.) SS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 253.74 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: 55.5°C = 132°C = 165°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 4.14 at 21°C (68°F) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	(continued on pages 4 and 5)
NOTES	

REVISED 1978

ATX

ANTIMONY TRIOXIDE

Common Synonyms: Distomony trioxide Senarmontite Valentinite Euxenite Wernersgitzite	Solid White Odorless Sinks in water
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear dust respirator and rubber overclothing including gloves. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Not flammable
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing, difficult breathing or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED If swallowed will cause dizziness, nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES: hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS: have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notice local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning: poison. Restrict access. Should be removed. Chemical and physical treatment.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Distomony trioxide Euxenite, Flowers of antimony Senarmontite, Valentinite Wernersgitzite 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: As_2O_3 3.4 IMCO/United Nations Numerical Designation: N.T. 1529	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, safety goggles, dust mask. 5.2 Symptoms Following Exposure: Inhalation causes inflammation of upper and lower respiratory tract, including pneumonia. Ingestion causes irritation of the mouth, nose, stomach and intestines, vomiting, purging with bloody stools, slow pulse and low blood pressure, slow shallow breathing, coma and convulsions, sometimes followed by death. Contact with eyes causes conjunctivitis. Contact with skin causes dermatitis and rashes. 5.3 Treatment for Exposure: If any of the symptoms of poisoning even slight, are noticed, the affected individual should be removed from contact with the chemical and placed under care of a physician. INGESTION: induce vomiting. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. 5.4 Toxicity by Inhalation (Threshold ¹ - ml Value): 0.5 mg/m ³ as antimony. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Toxicity oral rat LD ₅₀ = 20,000 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: *Supports white fish head in water. 11 hard or soft fresh water. *No test shown. 8.2 Waterway Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: High.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. J. I. Bayer Chemical Co. Piquetteburg, N. J. 08065 2. McGraw Chemical Co. 1250 Terminal Tower Cleveland, Ohio 44113 3. Garland-Nordlinger Chemical Mfg. Co. 584 Main Ave. Carle Place, N. Y. 11514
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-2) 11	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent, 99.99% (Special grade). 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAC Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 290.0. 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 4.5 at 25°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on pages 4 and 5)	

ASA

ARSENIC ACID

Common Synonyms Orthoarsenic acid Arsenic peroxide	Solid crystals or solution White or colorless Odorless Sinks and mixes with water. Freezing point is 95° F
AVOID CONTACT WITH SOLUTION, SOLID AND DUST KEEP PEOPLE AWAY Wear rubber overalls, including gloves. No open flame or smoking. Isolate and remove discharged materials. Notify local health and pollution control agencies.	
Fire	Not flammable
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen. SOLUTION OR SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink milk or water. If SWALLOWED and victim is UNCONSCIOUS, DO NOT HAVE VOMITING INDUCED. If SWALLOWED and victim is UNCONSCIOUS, DO NOT HAVE GASTRIC LAVAGE. If SWALLOWED and victim is UNCONSCIOUS, DO NOT HAVE GASTRIC LAVAGE.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify local health and pollution control agencies.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - poison water contaminant. Restrict access. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Arsenic peroxide, Orthoarsenic acid. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: As ₂ O ₃ or H ₃ AsO ₃ , As ₂ O ₅ . 3.4 IMCO/United Nations Numerical Designation: 1.1 (1991)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid, a concentrated water solution is sometimes shipped. 4.2 Color: White. 4.3 Odor: None.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Clothing below and over, oxide powder or harm, and other skin areas, rubber gloves, U.S. Bureau of Mines approved dust respirator. 5.2 Symptoms Following Exposure: Irritation causes irritation, stomach weakness, other gastrointestinal symptoms. Overdose can cause arsenic poisoning, but symptoms are delayed. 5.3 Treatment for Exposure: Get medical attention after all exposures to this compound. Be alert for arsenic poisoning symptoms. SKIN: wash well with soap and water. INGESTION: induce vomiting, drink freely (milk, water, milk or raw egg, give a cathartic). 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m ³ as a sens. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 4 oral LD ₅₀ = 40 mg/kg (mouse, rat). 5.7 Late Toxicity: Arsenic compounds may be carcinogenic. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are irritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Arsenic acid. If spilled on clothing and allowed to remain may cause staining and reddening of the skin. 5.10 Odor Threshold: Odorless.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfront Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: With corrodes metal and may give off toxic, arsing gas. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with sodium bicarbonate or lime solution. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. J. T. Baker Chemical Co. Phillipsburg, N. J. 08865 2. Gallard Schlenker Chemical Manufacturing Corp. 584 Mine de Avenue Canal Place, N. Y. 11514 3. Cerus, Inc. 1340 W. Silver Spring Rd. Menomonee Falls, Wis. 53051																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NS	10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure vacuum.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous, Class B. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="982 1433 1221 1692"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>0</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>0</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td> Poisons</td><td>4</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>4</td></tr> <tr> <td> Aquatic Toxicity</td><td>1</td></tr> <tr> <td> Aesthetic Effect</td><td>1</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>2</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	0	Health		Vapor Irritant	0	Liquid or Solid Irritant	1	Poisons	4	Water Pollution		Human Toxicity	4	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 229.5. 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.2 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 1.1 Btu/lb = 1.1 cal/g = 0.01 × 10 ³ J/kg. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	0																												
Health																													
Vapor Irritant	0																												
Liquid or Solid Irritant	1																												
Poisons	4																												
Water Pollution																													
Human Toxicity	4																												
Aquatic Toxicity	1																												
Aesthetic Effect	1																												
Reactivity																													
Other Chemicals	2																												
Water	0																												
Self Reaction	0																												
12.3 NFPA Hazard Classifications: Not listed.	(continued on page 2 and 3)																												

NOTES

ARD

ARSENIC DISULFIDE

Common Synonyms Realgar Red arsenic glass Red arsenic sulfide Red orpiment Rubi arsenic	Color Red brown Odorless Sinks in water
AVOID CONTACT WITH DUST AND FUME using proper controls. Avoid breathing dust or fumes. Wash with soap and water immediately after contact. Do not eat, drink, or use tobacco while handling this material. Notify your supervisor if you experience any symptoms.	
Fire	Not Flammable May become flammable if heated above 300°C (572°F)
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Harmful to skin May cause irritation Repeated or prolonged exposure may cause skin lesions SOLID POISONOUS IF SWALLOWED Will burn eyes and skin Repeated or prolonged exposure may cause skin lesions Flammable if heated above 300°C (572°F) Do not breathe dust or fumes. Wash with soap and water immediately after contact. Do not eat, drink, or use tobacco while handling this material. Notify your supervisor if you experience any symptoms.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify your supervisor if you experience any symptoms.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison water contaminant Restrict access Should be removed Chemical and physical treatment	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Realgar, Red arsenic glass, Red arsenic sulfide, Red orpiment, Rubi arsenic 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: As ₂ S ₂ 3.4 IMCO/United Nations Numerical Designation: 4.1 155	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Red brown 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved respirator, goggles, rubber gloves, clean protective clothing 5.2 Symptoms Following Exposure: Irritation and subsequent poisoning are not common. Repeated inhalation causes irritation of nose, laryngitis, mild bronchitis. Ingestion causes weakness, loss of appetite, gastrointestinal disturbances, peripheral neuritis, occasional hepatitis. Contact with eyes causes irritation. Irritates skin, especially where moist; if not treated, may cause ulceration. 5.3 Treatment for Exposure: Consult physician after all overexposure to this compound. INHALATION: move to fresh air. INGESTION: induce vomiting by giving warm salt water repeat until vomit is clear. EYES: flush with water for at least 15 min. SKIN: wash well with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m (as arsenic) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 LD ₅₀ < 50 mg/kg 5.7 Late Toxicity: Possible skin and lung cancer 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Odorless	

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Poisonous fumes of the compound may be formed in fire. If heated, will form sulfur dioxide gas. 6.6 Behavior in Fire: May ignite at very high temperatures 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterbody Toxicity: Data not available 8.3 Ecological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Gallard Schriesheim Chemical Mfg. Co. 544 Minerva Ave. Carl Place, N.Y. 11514 2. Electronic Space Products, Inc. 4545 Robertson Blvd. Los Angeles, Calif. 90034 3. Research Organic, Inc. Organic Chemicals San Valley, Calif. 91342
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) 11	10. SHIPPING INFORMATION 10.1 Grade or Purity: 99+%, Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Vending: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisons solid 12.2 NA's Hazard Rating for Bulk Water Transportation: Not listed 12.3 MFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 214 13.3 Boiling Point at 1 atm: 1024°F = 541°C = 818°K 13.4 Freezing Point: 145°F = 107°C = 340°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 3.5 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

(continued on pages 2 and 3)

AST

ARSENIC TRICHLORIDE

Common Synonyms Fuming liquid arsenic Arsenic (III) trichloride Arsenic chloride Arsenous chloride Caustic arsenic chloride	Liquid Colorless Unpleasant odor Sinks and reacts in water. Poisonous visible vapor cloud is produced.
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP FLOUT AWAY. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Isolate and remove discolored material. Notify local health and police authorities if released.	
Fire	Not Flammable POISONOUS GASES ARE PRODUCED WHEN HEATED
 Exposure	CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED Move victim to fresh air. Breathing is difficult; give oxygen. LIQUID POISONOUS IF SWALLOWED Irritating to skin and eyes. Remove contaminated clothing. Flush affected area with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk and have vomit induced by stomach pumping. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notifies local health and police authorities. Notifies port authorities if water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison, water contaminant, corrosive. Restrict access. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Arsenic (III) trichloride; Arsenic chloride; Arsenous chloride; Butte of arsenic; Caustic arsenic chloride; Caustic oil of arsenic; Fuming liquid arsenic. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: AsCl ₃ 3.4 IMCO/United Nations Numerical Designation: 6.1 (56)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety goggles and face shield; acid type canister gas mask; rubber gloves; protective clothing. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact of liquid with eyes or skin causes severe irritation. Ingestion causes weakness and severe irritation of mouth and stomach. Oxidation can cause arsenic poisoning, but symptoms are delayed. 5.3 Treatment for Exposure: Get medical attention after all exposures to the compound. Be alert for arsenic poisoning symptoms. INHALATION: remove to fresh air; give artificial respiration if needed. EYES: flush with water for at least 15 min. SKIN: flush with water. INGESTION: give large amounts of water; then induce vomiting: give lime water, milk, or raw egg; give a cathartic. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m ³ as arsenic. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3, oral rat LD ₅₀ = 1.8 mg/kg; fatal human dose 70-180 mg depending on weight. 5.7 Late Toxicity: Arsenic compounds may be carcinogenic. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable
 6.2 **Flammable Limits in Air:** Not flammable
 6.3 **Fire Extinguishing Agents:** Not pertinent
 6.4 **Fire Extinguishing Agents Not to be Used:** Avoid water on adjacent fires.
 6.5 **Special Hazards of Combustion Products:** Irritating and toxic hydrogen chloride formed when involved in fire.
 6.6 **Behavior in Fire:** Becomes gaseous and causes irritation. Forms hydrogen chloride (hydrochloric acid) by reaction with water used on adjacent fires.
 6.7 **Ignition Temperature:** Not pertinent
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Reacts with water to generate hydrogen chloride (hydrochloric acid).
 7.2 **Reactivity with Common Materials:** Corrodes metal.
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; rinse with sodium bicarbonate or lime solution.
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterfowl Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Cerac, Inc.
 13460 W. Silver Spring Rd.
 Menomonee Falls, Wis. 53051
 2. Ventron Corporation
 Alfa Products
 P. O. Box 159
 Beverly, Mass. 01915
 3. Gallard Schlessinger Chemical Manufacturing Co.
 584 Mineola Avenue
 Carle Place, N.Y. 11514

10. SHIPPING INFORMATION

- 10.1 **Grades or Purity:** Commercial
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Pressure/vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessor Handbook, CG 446-3)
 A O

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Poisonous, Class B
 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
 12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid
 13.2 **Molecular Weight:** 181.3
 13.3 **Boiling Point at 1 atm:** 266.4°F = 130.2°C = 403.4°K
 13.4 **Freezing Point:** 9°F = -13°C = 260°K
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 2.156 at 25°C (liquid)
 13.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 20°C
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 13.12 **Latent Heat of Vaporization:** 88.31 Btu/lb = 49 Or. cal/g = 2.054 X 10⁵ J/kg
 13.13 **Heat of Combustion:** Not pertinent
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** (est.) -18 Btu/lb = -10 cal/g = -0.42 X 10⁵ J/kg
 13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

ATO

ARSENIC TRIOXIDE

Common Synonyms Arsenous acid Arsenous acid anhydride Arsenous oxide Arsenic sesquioxide White arsenic	Solid crystals or powder White Odorless Sinks and mixes slowly with water
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Stay upwind. Use water spray to knock down dust. Isolate and remove discharge material. Notify local health and pollution control agencies.	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Irritating to eyes, nose and throat Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS, DO NOT HAVE CON- VULSIONS. Do nothing except keep victim warm.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning - poison water contaminant. Restrict access. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Arsenous acid; Arsenous acid anhydride; Arsenous oxide; Arsenic sesquioxide; White arsenic. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: As ₂ O ₃ . 3.4 IMCO/United Nations Numerical Designation: 6.1/1561.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: White. 4.3 Odor: Like garlic; none.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Bureau of Mines approved respirator; protective gloves; eye protection; full protective overalls. 5.2 Symptoms Following Exposure: Ingestion causes irritation of mucous membrane; weakness; loss of appetite; gastrointestinal disturbances. Overdose can cause arsenic poisoning, but symptoms are delayed. 5.3 Treatment for Exposure: Get medical attention after all exposures to this compound. Be alert for arsenic poisoning symptoms. SKIN: wash thoroughly with soap and water - remove contaminated clothing and shower with soap and water. Irritations except for rashes which disappear in a day or two should have medical attention. INGESTION: vomiting should be induced and a physician should be called at once; drink freely of lime water, sweet milk or raw eggs followed by castor oil or any brisk cathartic. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m as arsenic. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 4 - oral mouse LD ₅₀ - 45 mg/kg. 5.7 Late Toxicity: Arsenic compounds may be carcinogenic. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Odorous.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic fumes of arsenic trioxide and arsine may be formed in fire situations. 6.6 Behavior in Fire: May volatilize and form toxic fumes of arsenic trioxide. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 53 mg/l - 50% salmon/barramundi.* *Type of water not specified. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. American Smelting and Refining Company 120 Broadway New York, N.Y. 10005 2. Gallard-Schlesinger Chemical Manufacturing Co. 584 Mineola Avenue Carle Place, N.Y. 11514 3. Ventron Corp. Alfa Products P.O. Box 159 Beverly, Mass. 01915.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) H 355	10. SHIPPING INFORMATION 10.1 Grade or Purity: Refined 99% Crude 95%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure/vacuum.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous, Class B. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 197.5. 13.3 Boiling Point at 1 atm: 855°F = 457°C = 730°K. 13.4 Freezing Point: 599°F = 315°C = 588°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 3.7 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.
NOTES Continued on pages 5 and 6.	

ART

ARSENIC TRISULFIDE

Common Synonyms Arsenic yellow King's gold King's yellow Orpiment Yellow arsenic sulfide		Solid	Yellow orange	Odorless
AVOID CONTACT WITH SOLID AND DUST. Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Isolate and remove discharge of material. Notify local health and pollution control agencies.				
Fire	Not flammable Wear chemical protective suit with self-contained breathing apparatus			
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Harmful to skin Move to fresh air If on the skin has stopped, give artificial respiration. If on the skin is difficult to remove SOLID POISONOUS IF SWALLOWED Will burn eyes and skin Remove contaminated clothing and shoes Flush affected areas with plenty of water If IN EYES, hold eyelids open and flush with plenty of water If SKIN ALLOWED, and victim is CONSCIOUS, have victim drink water or milk, and follow stomach instructions If SWALLOWED, do not vomit unless INSTRUCTIONS OR HAVING CON- SCIOUS, do not take any except oral medicine			
Water Pollution	HAZARDOUS TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Notify local health and pollution agencies Notify appropriate authorities if water intake			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning: poison water contaminant Restrict access Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Arsenic yellow, King's gold, King's yellow, Orpiment, Yellow arsenic sulfide 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: As ₂ S ₃ 3.4 IMCO/United Nations Numerical Designation: 6.1/1557		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow orange 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self contained breathing apparatus, goggles, rubber gloves, clean protective clothing 5.2 Symptoms Following Exposure: (Acute and sub-acute poisoning are not common.) Repeated inhalation causes irritation of nose, laryngitis, mild bronchitis. Ingestion causes weakness, loss of appetite, gastrointestinal disturbances, peripheral neuritis, occasional hepatitis. Contact with eyes causes irritation. Irritates skin, especially where moist; if not treated, may cause ulceration. 5.3 Treatment for Exposure: Consult physician after all overexposures to this compound INHALATION: move to fresh air. INGESTION: induce vomiting by giving warm salt water, repeat until vomit is clear. EYES: flush with water for at least 15 min. SKIN: wash well with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m ³ (as arsenic) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4.1 D ₅₀ < 50 mg/kg 5.7 Late Toxicity: Possible skin and lung cancer 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Odorless				

6. FIRE HAZARDS 6.1 Flash Point Not pertinent 6.2 Flammable Limits in Air Not pertinent 6.3 Fire Extinguishing Agents Water 6.4 Fire Extinguishing Agents Not to be Used. Not pertinent 6.5 Special Hazards of Combustion Products: Poisonous fumes of the compound may be formed in fires 6.6 Behavior in Fire May ignite at very high temperatures 6.7 Ignition Temperature Not pertinent 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity. Data not available 8.2 Waterfowl Toxicity Data not available 8.3 Biological Oxygen Demand (BOD) Data not available 8.4 Food Chain Concentration Potential Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport. Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Gallard Schlegel Chemical Mfg. Co. 581 Mincola Ave. Carle Place, N. Y. 11514 2. Cera, Inc. 13450 W. Silver Spring Rd. Mequon, Wis. 53051 3. Varfac and Chemical Co. 666 S. Front Street Elizabeth, N. J. 07202
	10. SHIPPING INFORMATION 10.1 Grade or Purity: Technical Pure 99+%; Optical grade 99.99+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 443-3) II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm Solid 13.2 Molecular Weight: 246 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: 572°K = 300°C = 574°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure Not pertinent 13.7 Specific Gravity: 3.43 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations Poisonous solid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications Not listed	
NOTES (Continued on pages 5 and 6)	

ASP

ASPHALT

Common Synonyms: Asphaltic bitumen Bitumen Petroleum asphalt		Thick liquid (generally heated) Dark Brown to black Tar odor
Stop discharge if possible Avoid contact with liquid Call fire department Isolate and remove discharged material Notify local health and pollution control agencies		May float or sink in water. Rubbery solid is produced when cooled
Fire	Combustible	Ext. flush with water. Do not use foam or other side sale Food exposed: flush with water
Exposure	LIQUID Will burn skin and eyes	Flush affected areas with plenty of water
Water Pollution	Effect of low concentrations on aquatic life is unknown POULING TO SL. RELINE May be dangerous if it enters water intakes Notify local health and pollution control agencies Notify petroleum control water intakes	
1. RESPONSE TO DISCHARGE (See Response Methods Manual CG 446-4) Mechanical containment Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Asphalt cements Asphalt bitumen Bitumen Petroleum asphalt 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not pertinent 3.4 IMCO/United Nations Numerical Desig.: 3.2 1999 3.3 1999		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Dark brown to black 4.3 Odor: Tarry
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing, face and eye protection when handling hot material 5.2 Symptoms Following Exposure: Contact with skin may cause dermatitis. Inhalation of vapors may cause moderate irritation of nose and throat. Hot liquid burns skin. 5.3 Treatment for Exposure: Severe burns may result from contact with hot asphalt. If molten asphalt strikes the exposed skin, cool the skin immediately by quenching with cold water. A burn should be covered with a sterile dressing and the patient should be taken immediately to a hospital. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 mg/m 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1 LD ₅₀ 5 to 15 kg 5.7 Late Toxicity: None observed 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure. It may cause secondary burns on long exposure. 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: 300°F (50°F) (C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water spray, dry chemical, foam or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 400°F (200°F) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available																													
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Johns-Manville Co. Greenwood Plaza Denver, Colo. 80211 2. Sun Oil Co. 1408 Walnut St. Philadelphia, Pa. 19103 3. Witco Chemical Corp. Poncor Division 277 Park Ave. New York, N.Y. 10017																													
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Manual CG 446-4) A-T-U-X-Y		10. SHIPPING INFORMATION 10.1 Grades or Purities: Each of the following is available in several grades: asphalt cement, rapid curing liquid asphalt, medium-curing liquid asphalt, slow curing liquid asphalt (road oil), emulsified asphalt, inverted asphaltic emulsion, oxidized (air blown) asphalt. 10.2 Storage Temperature: Elevated 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arrester																													
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible liquid 12.2 NAE Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>2</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>0</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>4</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>0</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table>		Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	1	Water Pollution		Human Toxicity	0	Aquatic Toxicity	1	Aesthetic Effect	4	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity (est.) 1.00 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: 70 dyne/cm = 0.07 N/m at 77 °C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Rating																														
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Self Reaction	0																														
12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0	(Continued on pages 4 and 5)																					
Category	Classification																														
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Reactivity (Yellow)	0																														
NOTES																															

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ARF

ASPHALT BLENDING STOCKS: ROOFERS FLUX

Common Synonyms Liquid asphalt Asphaltum Flaming oil Road oil Petroleum tailings Distilling oil		Oily liquid (generally heated) Dark brown to black Tar odor May float or sink in water. Rubbery solid is produced when cooled.																													
Stop discharge if possible Call fire department Avoid contact with liquid Isolate and remove discharged material Notify local health and pollution control agencies																															
Fire		Combustible Extinguish with water, dry chemical, foam, or carbon dioxide. Use expanded containers with water.																													
Exposure		CALL FOR MEDICAL AID LIQUID Will burn skin and eyes. Harmful if swallowed. Flush affected areas with plenty of water. If IN EYES: hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS: have victim drink water or milk. DO NOT INDUCE VOMITING.																													
Water Pollution		Effect of low concentrations on aquatic life is unknown. FOULING TO SHORELINE May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operators of nearby water intakes.																													
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Chemical and physical treatment		2 LABELS No hazard label required by Code of Federal Regulations																													
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Asphaltum oil Flux oil Petroleum tailings Residual oil Road oil 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not pertinent 3.4 IMCO/United Nations Numerical Designation: 1.2/1999 3.1/1999		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Brown to black 4.3 Odor: Tarry																													
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing, face and eye protection 5.2 Symptoms Following Exposure: Inhalation of vapors from semi-solid materials causes moderate irritation of nasal and upper respiratory tract passages. Aspiration causes slow onset and low degree of chemical pneumonitis with clinical symptoms of lower respiratory tract irritation. Ingestion produces irritation of gastrointestinal tract. 5.3 Treatment for Exposure: INHALATION OR ASPIRATION: treatment usually unnecessary. INGESTION: do NOT induce vomiting, do NOT lavage, administer 2-4 oz of olive oil and 1-2 oz of activated charcoal. EYES: wash with plenty of water. SKIN: wipe off material and wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2.1 LD ₅₀ 5 to 5 g/kg 5.7 Late Toxicity: None observed 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause irritation of eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smothering of the skin and first degree burns on short exposure; cause secondary burns on longer exposure. 5.10 Odor Threshold: Data not available																															
6 FIRE HAZARDS 6.1 Flash Point: 100-150°F (40-60°C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 400-700°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available																															
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent																															
8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available																															
9 SELECTED MANUFACTURERS 1. Johns Manville Co. Greenwood Plaza Denver, Colo. 80217 2. Sun Oil Co. 1605 Walnut St. Philadelphia, Pa. 19103 3. Witco Chemical Corp. Pioneer Division 277 Park Ave. New York, N.Y. 10017																															
10 SHIPPING INFORMATION 10.1 Grade or Purity: Data not available 10.2 Storage Temperature: Elevated 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (B) me arrester																															
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A 1-L		12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not Listed 12.2 HAAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td></td></tr><tr><td> Vapor Irritant</td><td>1</td></tr><tr><td> Liquid or Solid Irritant</td><td>2</td></tr><tr><td> Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td> Human Toxicity</td><td>0</td></tr><tr><td> Aquatic Toxicity</td><td>1</td></tr><tr><td> Aesthetic Effect</td><td>4</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td> Other Chemicals</td><td>0</td></tr><tr><td> Water</td><td>0</td></tr><tr><td> Self Reaction</td><td>0</td></tr></table>		Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	1	Water Pollution		Human Toxicity	0	Aquatic Toxicity	1	Aesthetic Effect	4	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0
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Continued on pages 5 and 6																															
NOTES																															

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ASR

ASPHALT BLENDING STOCKS STRAIGHT RUN RESIDUE

Common Synonyms: Petroleum residue Road binder Seal-coating material Residual asphalt Petroleum asphalt Petroleum pitch		Only liquid (generally heated) Black Tar odor May float or sink in water. Rubbery solid is produced when cooled
Avoid contact with liquid Stop discharge if possible Call fire department Isolate and remove discharged material Notify local health and pollution control agencies		
Fire	Combustible Extinguish with water, dry chemical, foam, or carbon dioxide. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID LIQUID Will burn skin and eyes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. FOULING TO SHORELINE May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Notify animal containment Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Carpeting medium, Petroleum asphalt, Petroleum pitch, Petroleum residue, Residual asphalt, Road binder, Seal-coating material. 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures. 3.3 Chemical Formula: Not pertinent. 3.4 IMCO/United Nations Numerical Designation: 32, 1999, 3.3, 1999.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Black. 4.3 Odor: Tarry.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing, eye and face protection. 5.2 Symptoms Following Exposure: Inhalation may cause moderate irritation of nose and throat. Skin contact may cause dermatitis. 5.3 Treatment for Exposure: Severe burns may result from contact with hot asphalt. If molten asphalt strikes the exposed skin, cool the skin immediately by quenching with cold water. A burn should be covered with a sterile dressing, and the patient should be taken immediately to a hospital. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade III, D, 5 to 15 g/kg. 5.7 Late Toxicity: None observed. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS 6.1 Flash Point: 300 - 600 F (150 - 315 C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 450 - 700 F (230 - 370 C) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. Johns-Manville Co. Greenwood Plaza Denver, Colo. 80211 2. Sun Oil Co. 1600 Walnut St. Philadelphia, Pa. 19103 3. Witco Chemical Corp. Pioneer Division 225 Park Ave. New York, N.Y. 10017	
		10. SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Elevated 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)	

11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-T-U		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: 50 to 225°F = 10 to 107°C = 299 to 340°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: Data not available 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																											
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not Listed 12.2 NAS Hazard Rating for Bulk Water Transportation <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td>1</td></tr><tr><td>Vapor Irritant (liquid or Solid Irritant)</td><td>2</td></tr><tr><td>Poisons</td><td></td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>0</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>4</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>0</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table>		Category	Rating	Fire	1	Health	1	Vapor Irritant (liquid or Solid Irritant)	2	Poisons		Water Pollution		Human Toxicity	0	Aquatic Toxicity	1	Aesthetic Effect	4	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0		
Category	Rating																												
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Aquatic Toxicity	1																												
Aesthetic Effect	4																												
Reactivity																													
Other Chemicals	0																												
Water	0																												
Self Reaction	0																												
12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0																				
Category	Classification																												
Health Hazard (Blue)	0																												
Flammability (Red)	1																												
Reactivity (Yellow)	0																												

Continued on pages 5 and 6

NOTES

REVISED 1978

ATZ

ATRAZINE

Common Synonyms: 2-Chloro-4-ethylamino-6-isopropylamino-s-triazine Atrax Herbicide		Solid crystals White Sinks in water
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear goggles and gloves. If contaminated by fire, extinguish with water spray. Use water spray to keep dust from spreading. Do not breathe dust. Do not get on skin.		
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED	
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Irritating to eyes, nose and throat May irritate to skin If in eyes, hold eyes open and flush with plenty of water. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes If on skin, contaminated clothing and shoes, flush with plenty of water. If in eyes, hold eyes open and flush with plenty of water. If swallowed, do not induce vomiting. If unconscious, have victim drink water. If swallowed and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Not a pollutant if used as directed. Not a pollutant if used as directed.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contamination. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Chloro-4-ethylamino-6-isopropylamino-S-triazine, Atrax herbicide 3.2 Coast Guard Compatibility Classification: To be developed. 3.3 Chemical Formula: C ₁₁ H ₁₄ N ₆ Cl 3.4 IMCO/United Nations Numerical Designation: 6.1 (609)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Data not available
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles, rubber gloves. 5.2 Symptoms Following Exposure: Irritates eyes and skin. If ingested, irritates mouth and stomach. 5.3 Treatment for Exposure: EYES: flush with copious amounts of water for 15 min. SKIN: wash with large amounts of water. INGESTION: no specific antidote; induce vomiting and give saline laxative and supportive therapy. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral rat LD ₅₀ = 3000 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns in short exposure and may cause second degree burns on long exposure. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable
 6.2 **Flammable Limits in Air:** Not flammable
 6.3 **Fire Extinguishing Agents:** Not pertinent
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
 6.5 **Special Hazards of Combustion Products:** Irritating hydrogen chloride and toxic oxides of nitrogen may be formed.
 6.6 **Behavior in Fire:** Not pertinent
 6.7 **Ignition Temperature:** Not pertinent
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 12.6 mg/l 48 hr rainbow trout TL₅₀ fresh water.
 8.2 **Waterfowl Toxicity:** > 2000 mg/kg LD₅₀.
 8.3 **Biological Oxygen Demand (BOD):** Data not available.
 8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

Ciba Geigy Corporation
 Agricultural Division
 P.O. Box 11422
 Greensboro, N.C. 27409

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:** No reaction
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

10 SHIPPING INFORMATION

- 10.1 **Grades or Purity:** Various grades 70-90%. Mixtures with sodium chlorate and sodium metaborate.
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 II

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not Listed
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 0 |
| Health | 0 |
| Vapor Irritant | 0 |
| Liquid or Solid Irritant | 2 |
| Poisons | 0 |
| Water Pollution | |
| Human Toxicity | |
| Aquatic Toxicity | 3 |
| Aesthetic Effect | 1 |
| Reactivity | |
| Other Chemicals | 1 |
| Water | 0 |
| Self Reaction | 0 |
- 12.3 **NIHA Hazard Classifications:** Not Listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid
 13.2 **Molecular Weight:** 214.6
 13.3 **Boiling Point at 1 atm:** Decomposes
 13.4 **Freezing Point:** 34°F = 1°C = 345°K
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** (solid) 1.2 at 20°C
 13.8 **Liquid Surface Tension:** Not pertinent
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 13.12 **Latent Heat of Vaporization:** Not pertinent
 13.13 **Heat of Combustion:** (solid) -9,400 Btu/lb = -5,500 cal/g = -230 x 10³ J/kg
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** Not pertinent
 13.16 **Heat of Polymerization:** Not pertinent

NOTES

(Continued on pages 5 and 6)

AZM

AZINPHOSMETHYL

Common Synonyms O, O Dimethyl S [(4-oxo-1,2,3-benzotriazin-3(4H)-ylidene) phosphorothioate] Gethion insecticide Gethion insecticide	Solid Brown Sinks in water
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear goggles and self-contained breathing apparatus. Stop work. Use water spray to knock down dust before and remove discharged material. Notify health and pollution control agencies.	
Fire	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED
 Exposure	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Move victim to fresh air. If eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS, DO NOT HAVE GASTRIC LAVAGE. Call for medical aid. Keep victim warm.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify health and wildlife agencies. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: O, O Dimethyl S [(4-oxo-1,2,3-benzotriazin-3(4H)-ylidene) phosphorothioate] Gethion insecticide; Gethion insecticide. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: C ₁₁ H ₁₂ N ₄ O ₂ PS ₂ . 3.4 IMCO/United Nations Numerical Designation: 6.1/1615.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Brown. 4.3 Odor: Data not available.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, protective goggles, rubber gloves. 5.2 Symptoms Following Exposure: Dust irritates eyes. Inhalation or ingestion causes sweating, constriction of pupils of eyes, asthmatic symptoms, cramps, weakness, convulsions, collapse. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, keep warm, call doctor. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. INGESTION: get medical attention at once, give water slurry of charcoal, do NOT give milk or alcohol. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.2 mg/m. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 4, oral rat LD ₅₀ = 1119.5 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Oxides of sulfur and phosphorus may be formed when in fire situation. 6.6 Behavior in Fire: Data not available. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.005 mg/l / 96 hr bluegill/TI m/fresh water. 8.2 Waterfowl Toxicity: 136 mg/kg LD ₅₀ . 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Baychem Corporation Chemagro Division Box 4913 Kansas City, Mo. 64120.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II	10. SHIPPING INFORMATION 10.1 Grade or Purity: Technical, 50% wettable powder, water emulsions. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous, Class B. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 317. 13.3 Boiling Point at 1 atm: Decomposes. 13.4 Freezing Point: 163°F = 73°C = 346°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.4 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: (est.) -8,600 Btu/lb = -4,800 cal/g = -200 X 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on pages 2 and 3)	

BRC

BARIUM CARBONATE

Common Synonyms		Solid crystals or powder	White	Odorless
		Sinks in water		
Health and Environmental Hazards: None known for this product.				
Fire	Not flammable			
Exposure	CALL FOR MEDICAL AID SOLID If swallowed, will cause nausea and vomiting. If SWALLOWED and it turns to CONSUMPTION, do not drink water. (note)			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline May be dangerous if it enters water intakes Slightly irritates health and wildlife (fishes) Slightly irritates to fresh water marine life			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Competibility Classification: Not applicable 3.3 Chemical Formula: BaCO ₃ 3.4 IMCO United Nations Numerical Designation: 6.1.1564		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Dust respirator				
5.2 Symptoms Following Exposure: (INGESTION ONLY): excessive salivation, vomiting, severe abdominal pain, and violent purging with watery and bloody stools, a slow and often irregular pulse and a transient elevation in arterial blood pressure, tinnitus, eddiness and vertigo, muscle twitchings progressing to convulsions and, or paralysis, dilated pupils with impaired accommodation, confusion and increasing somnolence, without coma, collapse and death from respiratory failure and cardiac arrest.				
5.3 Treatment for Exposure: Rapid oral administration of a soluble sulfate in water, such as magnesium or sodium sulfate (2 oz) alum (4 gm) or very dilute sulfuric acid (30 ml of a 10% solution diluted to 1 qt). These agents precipitate barium as the insoluble sulfate. (Gastric lavage or induced emesis. Seek medical attention.)				
5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent.				
5.5 Short-Term Inhalation Limits: Not pertinent				
5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 5 to 5 g/kg (rat, rat, guinea pig)				
5.7 Late Toxicity: None observed				
5.8 Vapor (Gas) Irritant Characteristics: Not pertinent				
5.9 Liquid or Solid Irritant Characteristics: None				
5.10 Ocular Threshold: Not pertinent				

6. FIRE HAZARDS

- 6.1 Flash Point: Not flammable
 6.2 Flammable Limits in Air: Not flammable
 6.3 Fire Extinguishing Agents: Not pertinent
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
 6.5 Special Hazards of Combustion Products: Not pertinent
 6.6 Behavior in Fire: Not pertinent
 6.7 Ignition Temperature: Not flammable
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: Not flammable

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
 8.2 Waterfowl Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD): None
 8.4 Food Chain Concentration Potential: Data not available

9. SELECTED MANUFACTURERS

- Chemical Products Corp.
Carterville, Georgia 30120
- IMCO Corp.
Inorganic Chemicals Div.
633 Third Ave.
New York, N.Y. 10017
- Sherwin Williams Co.
Sherwin Williams Chemicals Div.
P.O. Box 5638
Cleveland, Ohio 44101

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
 7.2 Reactivity with Common Materials: No reaction
 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
 7.5 Polymerization: Not pertinent
 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Reagent grade: 99.0%
 Ceramic grade: 98.1% Ceramic and
 chemical grade: 99.1% Glass grade:
 98.6% Electronic ceramic grade: 99.6%
 10.2 Storage Temperature: Data not available
 10.3 Inert Atmosphere: Data not available
 10.4 Venting: Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)
 11

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
 12.3 NFPA Hazard Classifications: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
 13.2 Molecular Weight: 197.14
 13.3 Boiling Point at 1 atm: Not pertinent
 13.4 Freezing Point: Not pertinent
 13.5 Critical Temperature: Not pertinent
 13.6 Critical Pressure: Not pertinent
 13.7 Specific Gravity: 4.3 at 20°C (solid)
 13.8 Liquid Surface Tension: Not pertinent
 13.9 Liquid-Water Interfacial Tension: Not pertinent
 13.10 Vapor (Gas) Specific Gravity: Not pertinent
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
 13.12 Latent Heat of Vaporization: Not pertinent
 13.13 Heat of Combustion: Not pertinent
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 4 and 5)

NOTES

BCR

BARIUM CHLORATE

Common Synonyms		Solid	White	Odorless
		Sinks and mixes with water		
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear goggles, self-contained breathing apparatus and other protective clothing. Call for department. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Not flammable May cause fire on contact with combustibles POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire Combustion fires from solid discharge products may cause explosion Flood discharge area with water Solid exposed containers will leak			
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Irritating to eyes, nose and throat Move victim to fresh air If in eyes, hold eyelids open and flush with plenty of water If breathing is difficult, give oxygen SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes Remove contaminated clothing and shoes Flush affected areas with plenty of water If IN EYES hold eyelids open and flush with plenty of water If SWALLOWED drink water to help wash down solids If SWALLOWED and feeling sick, unconscious or having convulsions, do not induce vomiting. Call for medical aid.			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and pollution control agencies Notify appropriate regulatory water agencies			
1. RESPONSE TO DISCHARGE See Response Methods handbook, CG 446-4. Issue warning - oxidizing material water contaminant Should be removed Chemical and physical treatment Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Barium chlorate monohydrate 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: Ba(ClO₃)₂ · H₂O 3.4 IMCO/United Nations Numerical Designation: 5.1 1425		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, dust respirator (U.S. Bureau of Mines approved), rubberized shoes and gloves, coveralls or other suitable outer clothing 5.2 Symptoms Following Exposure: Inhalation causes irritation of upper respiratory system. Contact with eyes or skin causes irritation. Ingestion causes abdominal pain, nausea and vomiting, diarrhea, pallor, blueness, shortness of breath, excessive salivation, convulsive tremors, slow, hard pulse, elevated blood pressure, unconsciousness. Hemorrhages may occur in the stomach, intestines and kidneys. Muscular paralysis may follow 5.3 Treatment for Exposure: Get medical attention. Alert doctor to possibility of barium poisoning, particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with copious quantities of water for at least 15 minutes. Get medical attention. SKIN: flush with water. INGESTION: induce vomiting and call a physician. Have victim drink aqueous 10% solution of magnesium or sodium sulfate for severe intoxication. Calcium or a magnesium salt may have to be given IV, with caution. Treatment otherwise is supportive and symptomatic. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m³ 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Barium poisoning 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable but see 7.2 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Data not available 6.5 Special Hazards of Combustion Products: Yields toxic fumes when involved in fire 6.6 Behavior in Fire: May cause an explosion when involved in a fire 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None											
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Can form explosive mixtures with combustible materials such as oil and wood; these can be ignited by friction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Barium and Chemicals, Inc. P.O. Box 218 Steubenville, Ohio 43981 2. Cerac, Inc. 13460 W. Silver Spring Road Menomonee Falls, Wis. 53051 3. Gallard-Schlesinger Chemical Mfg. Manufacturing Co. 584 Mineola Avenue Carle Place, N.Y. 11514											
		10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical Reagent 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open											
11 HAZARD ASSESSMENT CODE (See Hazard Assessment handbook, CG 446-3) NN		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 332 (monohydrate) 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: 77.7°C = 191.9°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 3.15 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 16.87 kcal/mole at 20°C = 0.84 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent											
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification*</th></tr><tr><td>Health Hazard (Blue)</td><td>0 - 1</td></tr><tr><td>Flammability (Red)</td><td>0 - 0</td></tr><tr><td>Reactivity (Yellow)</td><td>2 - 2</td></tr><tr><td></td><td>OXV - OXY</td></tr></table> *First column refers to entire situation		Category	Classification*	Health Hazard (Blue)	0 - 1	Flammability (Red)	0 - 0	Reactivity (Yellow)	2 - 2		OXV - OXY		
Category	Classification*												
Health Hazard (Blue)	0 - 1												
Flammability (Red)	0 - 0												
Reactivity (Yellow)	2 - 2												
	OXV - OXY												
<i>Continued on pages 5 and 6</i>													
NOTES													

Continued on pages 5 and 6

6. FIRE HAZARDS 6.1 Flash Point: Not flammable (see 7.2) 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Yields toxic gaseous oxides of nitrogen when involved in fire 6.6 Behavior in Fire: Mixtures with combustible materials are readily ignited and may burn fiercely. Containers may explode 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazards: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 900 ppm: 168 hr: stickle-back: average survival: fresh water 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Contact with combustible material may cause fire 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS J. T. Baker Chemical Co. Phillipsburg, N. J. 08865 Harmon and Chemicals, Inc. P. O. Box 275 Strubenville, Ohio 43082 Vestron Corp. Alta Products P. O. Box 154 Beverly, Mass. 01815								
11. HAZARD ASSESSMENT CODE (See H-1284 Assessment Handbook, C-1446-3) NS	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical Reagent 10.2 Storage Temperature: Ambient 10.3 inert Atmosphere: No requirement 10.4 Venting: Open								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 NAC Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>1</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	0	Reactivity (Yellow)	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 261.35 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: $100^\circ\text{F} = 39.2^\circ\text{C} = 303^\circ\text{K}$ 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.24 at 25°C (solids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: In Benzene = 20 cal/g $= 0.84 \times 10^3 \text{ J/g}$ 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	0								
Reactivity (Yellow)	1								

(continued on pages 7 and 8)

NOTES

BPC

BARIUM PERCHLORATE

Common Synonyms		Solid	White	Odorless
		Sinks and mixes with water		
AVOID CONTACT WITH GASES AND DUST. KEEP PEOPLE AWAY. Wear rubber boots that discharge no air. Do not use any pneumatic discharge method. No dust or health and pollution hazards.				
Fire	Not flammable. May explode on contact with combustibles. POISONOUS GASES MAY BE PRODUCED WHEN HEATED Containers may explode in fire. Combat fires from safe distance. Do not flood burns. Flood discharge area with water. Do not expose containers to water.			
Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Irritating to eyes, nose and throat. May cause throat and lung irritation. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, get oxygen. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. If on skin, wash with plenty of water. If in eyes, hold eyelids open and flush with plenty of water. If swallowed, do not induce vomiting. Get medical attention.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. No data on health and wildlife effects. No data on potential for bioaccumulation.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Issue warning: oxidizing material, water contaminant. Should be removed. Chemical and physical treatment. Disperse and flush.		2. LABEL OXIDIZER		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Barium perchlorate trihydrate 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: Ba(ClO ₄) ₂ · 3H ₂ O 3.4 IMCO/United Nations Numerical Designation: 4.1, 144		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, dust respirator, rubber gloves and shoes, suitable coveralls. 5.2 Symptoms Following Exposure: Inhalation or contact with eyes or skin causes irritation. Ingestion causes excessive salivation, vomiting, constipation, diarrhea, convulsive tremors, slow, hard pulse, and elevated blood pressure. Hemorrhages may occur in the stomach, intestines, and kidneys. Muscular paralysis may follow. 5.3 Treatment for Exposure: Get medical attention. Alert doctor to possibility of barium poisoning, particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with water for at least 15 min. SKIN: flush with water. INGESTION: oral administration of an aqueous 10% solution of magnesium or sodium sulfate, not severe intoxication. Calcium or a magnesium salt may have to be given IV, with caution; treatment otherwise is supportive and symptomatic. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Oral Toxicity: Barium poisoning. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.				

6 FIRE HAZARDS

- 6.1 Flash Point: Not flammable (but see 7.2)
- 6.2 Flammable Limits in Air: Not pertinent
- 6.3 Fire Extinguishing Agents: Not pertinent
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
- 6.5 Special Hazards of Combustion Products: Not pertinent
- 6.6 Behavior in Fire: Increases the intensity of fire. Containers may explode.
- 6.7 Ignition Temperature: Not pertinent
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterlow Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): None
- 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

- 1. Barium and Chemicals, Inc.
P.O. Box 218
Steubenville, Ohio 43952
- 2. Cerac, Inc.
13460 W. Silver Spring Rd.
Menomonee Falls, Wis. 53051
- 3. Gallard Schlenker Chemical Manufacturing Co.
584 Mircola Ave.
Carle Place, N.Y. 11514

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials: When mixed with combustible material or finely divided metals, can cause explosions
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grade or Purity: Technical, Reagent
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3.)
 NN

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Oxidizing material
- 12.2 NAS Haz: 3 Rating for Bulk Water Transportation: Not used
- 12.3 NFPA Hazard Classifications: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
- 13.2 Molecular Weight: 390.35
- 13.3 Boiling Point at 1 atm: Decomposes
- 13.4 Freezing Point:
441°F = 54°C = 778°K
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 3.2 at 20°C (solid)
- 13.8 Liquid Surface Tension: Not pertinent
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: Not pertinent
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: 9.25 x 10³ cal/g
= 0.2 x 10³ J/kg
- 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

NOTES

BPM

BARIUM PERMANGANATE

Common Synonyms	Solid Dark purple to black Odorless Sinks and mixes with water
AVOID CONTACT WITH SKIN AND EYES. KEEP FLOPPY AWAY. Wear gloves and eye protection when handling. Wash thoroughly with water if contact occurs. Do not ingest.	
Fire	Not flammable. May cause fire on contact with combustibles. Containers may explode in fire.
Exposure	CAUTION: DUST POISONOUS IF INHALED Irritating to eyes, nose and throat. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. Swallowing may cause severe irritation of the digestive tract. If swallowed, drink plenty of water. Do not induce vomiting.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Booklet Handbook, CG 446-7) Issue warning: oxidizing material, water contaminant. Should be removed. Chemical and physical treatment. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: Ba(MnO ₄) ₂ 3.4 IMCO/United Nations Numerical Designation: 5.1 1441	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Dark purple to black. 4.3 Odor: None.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, dust respirator, rubber gloves and shoes. 5.2 Symptoms Following Exposure: Irritation on contact with eyes or skin causes irritation. Ingestion causes abdominal pain, nausea, vomiting, pulse, shortness of breath. 5.3 Treatment for Exposure: Get medical attention. Alert doctor to possibility of barium poisoning, particularly if compound was swallowed. INHALATION: remove to fresh air. EYES: flush with copious amounts of water for 15 min. SKIN: wash with copious amounts of water. INGESTION: induce vomiting, give a 10% water solution of Epsom salt. 5.4 Toxicity by Inhalation (Threshold Limit Values): 0.5 mg/m. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Barium poisoning. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Can increase the intensity of fire. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazards: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 2.2 to 4.1 mg/L for Mn; 8 to 18 hr fish killed. *Type of water not specified. 8.2 Waterway Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: When mixed with combustible material, can ignite by friction or acids may be ignited; normally combustible. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Cerac, Inc. 1440 W. Silver Spring Rd. Meadowdale, W. Va. 26041 2. Ventron Corp. Alfa Products P.O. Box 159 Beverly, Mass. 01915
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 375. 13.3 Boiling Point at 1 atm: Decompose. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 4.7 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heat of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on pages 1 and 2)	

BPO

BARIUM PEROXIDE

Common Synonyms Barium dioxide Barium superoxide Barium baroxide	Solid Light gray to tan Odorless Sinks in water
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear rubber work shoes including pants. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Not flammable. May cause fire on contact with combustibles. Containers may explode in fire. Combat fires from safe distance or per listed location. Flood discharge area with water. Cool exposed containers with water.
 Exposure	CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Issue warning - oxidizing material. water contaminated. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Barium dioxide Barium superoxide Barium baroxide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: BaO 3.4 IMCO/United Nations Numerical Designation: N/A 1449	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Light grayish tan, grayish white 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: U.S. OSHA approved toxic dust respirator or liquid proof PVC gloves, chemical safety goggles, full cover clothing. 5.2 Symptoms Following Exposure: Irritation, cough, irritation in mouth, nose, eyes, throat, and skin. If contact with eyes or skin causes severe burns. Ingestion causes excessive salivation, vomiting, diarrhea, convulsions, tremors, numb, hard pulse, and elevated blood pressure. Severe burns may occur in the stomach, intestines, and esophagus. Muscular paralysis may follow. 5.3 Treatment for Exposure: Get medical attention. Alert doctor to possible toxicity of barium peroxide. Inhalation: If compound was swallowed, INHALATION: remove to fresh air. EYES: Flush with water for 15 min. SKIN: Flush with water. INGESTION: oral administration of a series of solutions of magnesium or sodium sulfate. In a severe intoxication, calcium or a magnesium salt may have to be given IV. In all cases, treatment of burning is symptomatic and symptomatic. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Barium poisoning 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent	

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable but may cause fire on contact with combustibles.
 6.2 **Flammable Limits in Air:** Not pertinent.
 6.3 **Fire Extinguishing Agents:** Flood with water, dry powder or a graphite powdered limestone.
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
 6.5 **Special Hazards of Combustion Products:** Not pertinent.
 6.6 **Behavior in Fire:** Can increase intensity of fire.
 6.7 **Ignition Temperature:** Not pertinent.
 6.8 **Electrical Hazard:** Not pertinent.
 6.9 **Burning Rate:** Not pertinent.

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available.
 8.2 **Waterway Toxicity:** Data not available.
 8.3 **Ecological Oxygen Demand (BOD):** None.
 8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

1. MC Corporation
 Industrial Chemicals Division
 600 Third Avenue
 New York, N.Y. 10017
 2. J. T. Baker Chemical Co.
 Philadelphia, N.J. 19106
 3. Barium and Chemicals, Inc.
 P. O. Box 248
 Mechanicsville, Ohio 43052

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Decomposes slowly.
 The reaction is not hazardous.
 7.2 **Reactivity with Common Materials:** Corrodes metal slowly. If mixed with combustible material or finely divided metal, can cause spontaneous combustion.
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Corrosives:** Not pertinent.
 7.5 **Polymerization:** Not pertinent.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** Technical 91-92% high purity reagent.
 10.2 **Storage Temperature:** Ambient.
 10.3 **Inert Atmosphere:** Not requirement.
 10.4 **Venting:** Pressure vacuum.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3.)
 II

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Oxidizing material.
 12.2 **HAS Hazard Rating for Bulk Water Transportation:** Not listed.
 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 3 |
| Flammability (Red) | 0 |
| Reactivity (Yellow) | 2 |

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid.
 13.2 **Molecular Weight:** 139.32
 13.3 **Boiling Point at 1 atm:** Decomposes.
 13.4 **Freezing Point:**
 $822.1 \pm 4.50^\circ\text{C} = 1511.8^\circ\text{F}$
 13.5 **Critical Temperature:** Not pertinent.
 13.6 **Critical Pressure:** Not pertinent.
 13.7 **Specific Gravity:** 4.6 at 15°C (solid).
 13.8 **Liquid Surface Tension:** Not pertinent.
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
 13.12 **Latent Heat of Vaporization:** Not pertinent.
 13.13 **Heat of Combustion:** Not pertinent.
 13.14 **Heat of Decomposition:** -9°BaO
 $-2044.7 \text{ cal/g} = -4.2 \text{ kcal/g} = -1.7 \text{ kJ/g}$
 13.15 **Heat of Solution:** Not pertinent.
 13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 3 and 4.)

NOTES

BZD

BENZALDEHYDE

Common Synonyms Oil of bitter almond Benzoyl aldehyde	Waxy liquid Colorless to pale yellow Bitter almond odor May float or sink in water
Stop discharge if possible. Keep people away. Avoid contact with liquid. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Combustible Extinguish with wet or dry chemical foam or carbon dioxide. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED: do not induce vomiting. Have victim drink water or milk and get to hospital as soon as possible. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do not induce except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant. Should be removed.	2 LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Benzoyl aldehyde Oil of bitter almond 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₇ H ₆ O 3.4 IMCO/United Nations Numerical Designation: 331900	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Like almonds
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical goggles and protective clothing. 5.2 Symptoms Following Exposure: Inhalation of concentrated vapor may irritate eyes, nose and throat. Liquid is irritating to the eyes. Prolonged contact with the skin may cause irritation. 5.3 Treatment for Exposure: SKIN EYE CONTACT: move victim to fresh air. Call physician immediately. Wash contaminated skin areas with water. Flush eyes with plenty of water for at least 15 min. INGESTION: induce vomiting. Call a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 5 to 5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.042 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 148 F (C) 168 F (C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Water spray, foam, carbon dioxide, or dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 378 F. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 3.8 in/min.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 80% 10 days 100% 5 days 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Entzsch, Dodge and Okott, Inc. Clifton, N. J. 07015 2. Stauffer Chemical Co. Specialty Chemical Division Edison, N. J. 08817 3. Tenneco Inc. Tenneco Chemicals Inc. 280 Park Ave. New York, N. Y. 10017								
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U X Y	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical grade 98.0% NF (CC) grade 98.0% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Inerted. 10.4 Venting: Data not available.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table data-bbox="999 1433 1243 1519"> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 106.12. 13.3 Boiling Point at 1 atm: 149 F = 170 C = 452 K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: 666 F = 352 C = 625 K. 13.6 Critical Pressure: 316 psia = 21.5 atm = 2.18 MN/m ² . 13.7 Specific Gravity: 1.046 at 20°C (liquids). 13.8 Liquid Surface Tension: 40.0 dynes/cm = 0.040 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 15.5 dynes/cm = 0.0155 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats (apor (Gas)): 1.1. 13.12 Latent Heat of Vaporization: 156 Btu/lb = 86.5 cal/g = 3.62 x 10 ³ J/kg. 13.13 Heat of Combustion: -13,730 Btu/lb = -7630 cal/g = -319 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	2								
Reactivity (Yellow)	0								
NOTES <i>(Continued on pages 5 and 6)</i>									

REVISED 1978

BNZ

BENZENE

Common Synonyms Benzol Benzole		Watery liquid	Colorless	Gasoline-like odor
Floats on water. Flammable, irritating vapor is produced. Freezing point is 42° F.				
Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Shut off gas flow and call fire department. Soap & large amounts. Soap and add use water. Do not use clean vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical foam or carbon dioxide. Water may be ineffective on fire. Confined vapors react with water.		
Exposure		CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, use oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability. Restrict access.		2. LABEL 		
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: Benzol Benzole		4.1 Physical State (as shipped): Liquid		
3.2 Coast Guard Compatibility Classification: Aromatic hydrocarbon		4.2 Color: Colorless		
3.3 Chemical Formula: C ₆ H ₆		4.3 Odor: Aromatic, rather pleasant aromatic odor, characteristic odor		
3.4 IMCO/United Nations Numerical Designation: 12.1114				
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Hydrocarbon vapor canister, supplied air or a hose mask, hydrocarbon insoluble rubber or plastic gloves, chemical goggles or face splash shield, hydrocarbon insoluble apron such as neoprene.				
5.2 Symptoms Following Exposure: Dizziness, excitation, pallor, followed by flushing, weakness, headache, breathlessness, chest constriction, coma and possible death.				
5.3 Treatment for Exposure: SKIN: Flush with water. Followed by soap and water. Remove contaminated clothing and wash skin. EYES: Flush with plenty of water until irritation subsides. INHALATION: Remove from exposure immediately. Call a physician. If breathing is irregular or stopped, start resuscitation, administer oxygen.				
5.4 Toxicity by Inhalation (Threshold Limit Value): 75 ppm				
5.5 Short-Term Inhalation Limits: 75 ppm for 30 min.				
5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 500-500 mg/kg				
5.7 Late Toxicity: Unknown				
5.8 Vapor (Gas) Irritant Characteristics: If present in high concentrations, vapors may cause irritation of eyes or respiratory system. The effect is temporary.				
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin.				
5.10 Odor Threshold: 4.65 ppm.				

6. FIRE HAZARDS		8. WATER POLLUTION	
6.1	Flash Point: 12°F (C)	8.1	Aquatic Toxicity: 5 ppm 4 hr in snow lethal; distilled water 20 ppm 24 hr sunfish 11 mg/lap water
6.2	Flammable Limits in Air: 1.1% - 9%	8.2	Waterfowl Toxicity: Data not available
6.3	Fire Extinguishing Agents: Dry chemical foam, or carbon dioxide	8.3	Biological Oxygen Demand (BOD): 12 lb/dh 10 days
6.4	Fire Extinguishing Agents Not to be Used: Water may be ineffective	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: Not pertinent	9. SELECTED MANUFACTURERS	
6.6	Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back	1	Commonwealth Oil Refining Co., Inc. Commonwealth Petrochemicals Co. Pensacola, Puerto Rico 00724
6.7	Ignition Temperature: 109°F	2	Phillips Petroleum Co. Phillips Puerto Rico Corp., Inc. Banco Popular Center Hato Rey, P.R. 00946
6.8	Electrical Hazard, Class I (Group D)	3	Shell Chemical Co. Petrochemicals Div. P.O. Box 2463 Houston, Texas 77001
6.9	Burning Rate: 6.0 m/min	10. SHIPPING INFORMATION	
7. CHEMICAL REACTIVITY		10.1	G - Degree of Purity
7.1	Reactivity with Water: No reaction		Industrial 99+%
7.2	Reactivity with Common Materials: No reaction		Thiophene, free 99+%
7.3	Stability During Transport: Stable		Nitration 99+%
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent		Industrial 99% 85+%
7.5	Polymerization: Not pertinent		Reagent 99+%
7.6	Inhibitor of Polymerization: Not pertinent	10.2	Storage Temperature: Ambient
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T-L-A-W		10.3	Inert Atmosphere: No requirement
12. HAZARD CLASSIFICATIONS		10.4	Venting: Pressure/vacuum
12.1	Code of Federal Regulations: Flammable liquid	13. PHYSICAL AND CHEMICAL PROPERTIES	
12.2	NAB Hazard Rating for Bril. Water Transportation:	13.1	Physical State at 15°C and 1 atm: Liquid
	Category Rating	13.2	Molecular Weight: 78.11
	Fire 3	13.3	Boiling Point at 1 atm: 176°F = 80.1°C = 333.3°K
	Health	13.4	Freezing Point: 42°F = 5.5°C = 278.7°K
	Vapor Irritant 1	13.5	Critical Temperature: 552.0°F = 288.9°C = 562.1°K
	Liquid or Solid Irritant 1	13.6	Critical Pressure: 710 psia = 48.3 atm = 4.89 MN/m ²
	Poisons 3	13.7	Specific Gravity: 0.879 at 20°C (liquid)
	Water Pollution	13.8	Liquid Surface Tension: 28.9 dynes/cm = 0.0249 N/m at 20°C
	Human Toxicity 1	13.9	Liquid-Water Interfacial Tension: 35.0 dynes/cm = 0.035 N/m at 20°C
	Aquatic Toxicity 3	13.10	Vapor (Gas) Specific Gravity: 2.7
	Aesthetic Effect 2	13.11	Ratio of Specific Heats of Vapor (Gas): 1.061
	Reactivity	13.12	Latent Heat of Vaporization: 169 Btu/lb = 94.1 cal/g = 3.94 x 10 ³ J/kg
	Other Chemicals 1	13.13	Heat of Combustion: -17,460 Btu/lb = -9698 cal/g = -406.0 x 10 ³ J/kg
	Water 0	13.14	Heat of Decomposition: Not pertinent
	Self-Reaction 0	13.15	Heat of Solution: Not pertinent
12.3	NFPA Hazard Classifications:	13.16	Heat of Polymerization: Not pertinent
	Category Classification	(Continued on pages 5 and 6)	
	Health Hazard (Blue) 2	NOTES	
	Flammability (Red) 3		
	Reactivity (Yellow) 0		

BHC

BENZENE HEXACHLORIDE

Common Synonyms 1,2,3,4,5,6-Hexachloro- cyclohexane Lindane BHC Camphene Tish	Solid: crystal or powder, or solution Solid: light to dark brown Musty odor Solid sinks in water. Solution generally floats on water.
Avoid contact with liquid and solid. Keep people away. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Call fire department. May upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agency.	
Fire	Solid not flammable, but usually dissolved in combustible liquid. POISONOUS GASES ARE PRODUCED WHEN SOLID IS HEATED OR WHEN SOLUTION BURNS. Wear goggles and self-contained breathing apparatus. Extinguish with foam, dry chemical, or carbon dioxide.
 Exposure	CALL FOR MEDICAL AID SOLID OR SOLUTION POISONOUS IF SWALLOWED Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED: do not vomit. CONSIDER have victim drink water if mild.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Memo's Handbook, CG 446-4) Issue warning: water contaminant poison. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: BHC Camphene 1,2,3,4,5,6-Hexachlorocyclohexane Lindane 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: C ₆ H ₆ Cl ₆ 3.4 IMCO United Nations Numerical Designation: 6.1 1615	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Light tan to dark brown 4.3 Odor: Characteristic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Data not available. 5.2 Symptoms Following Exposure: Hyperirritability and central nervous excitation: notably vomiting, restlessness, muscle cramps, ataxia, and clonic and tonic convulsions. Subsequent central nervous depression leading to respiratory failure. Occasional dermatitis and urticaria. 5.3 Treatment for Exposure: Gastric lavage and saline cathartics (not oil laxatives because they promote absorption). Sedatives: pentobarbital or phenobarbital in amounts adequate to control convulsions. Calcium gluconate intravenously may be used in conjunction with sedatives to control convulsions. Rest and quiet. Do NOT give epinephrine because ventricular fibrillation may result. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m. 5.5 Short-Term Inhalation Limits: Time not less than 30 min. 5.6 Toxicity by Ingestion: Gamma isomer (Lindane): Grade 3 LD ₅₀ 50 to 500 mg/kg (rat). Technical mixture: Grade 2 LD ₅₀ 0.5 to 5 g/kg. 5.7 Late Toxicity: Mutagen to human lymphocytes. 5.8 vapor (Gas) Irritant Characteristics: Moderately irritating. Personnel will not usually tolerate moderate or high concentrations. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic gases are generated when solid is heated or when solution burns. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not flammable.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.77 ppm: 96-hr. LC ₅₀ fish, fresh water. 0.18 ppm: 96-hr. LC ₅₀ fish, fresh water. 0.04 ppm: 10-hr. LC ₅₀ fish, 100% lethal salt water. 8.2 Waterfowl Toxicity: 2000 mg/kg. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: High.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Hooker Chemical Corp. Industrial Chemicals Div. Niagara Falls, N.Y. 14302								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) 11	10. SHIPPING INFORMATION 10.1 Grades or Purity: Fortified grade: 40-45% gamma isomer. Lindane: pure gamma isomer. 10.2 Storage Temperature: Data not available. 10.3 inert Atm. sphere: Data not available. 10.4 Venting: Data not available.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous liquid or solid, Class B. 12.2 NAG Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table data-bbox="966 1450 1209 1526"> <thead> <tr> <th>Category</th><th>Classification*</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2 2</td></tr> <tr> <td>Flammability (Red)</td><td>0 1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0 0</td></tr> </tbody> </table> *First column refers to non-fire situation.	Category	Classification*	Health Hazard (Blue)	2 2	Flammability (Red)	0 1	Reactivity (Yellow)	0 0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 290.83. 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.891 at 19°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification*								
Health Hazard (Blue)	2 2								
Flammability (Red)	0 1								
Reactivity (Yellow)	0 0								
NOTES									

Continued on pages 5 and 6.

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BPD

BENZENE PHOSPHORUS DICHLORIDE

Common Synonyms Phenylphosphorus dichloride		Liquid	Colorless	Unpleasant odor
Reacts violently with water. Poisonous visible vapor cloud is produced.				
Store in dry, cool place. Keep people away. Avoid contact with liquid and vapor. Wear eye protection. Discharge into sewer. Notify local health and pollution agencies.				
Fire	Fire data not available			
	CALL FOR MEDICAL AID GAS PRODUCED IN REACTION WITH WATER POISONOUS IF INHALED Irritating to eyes, nose and throat. If inhaled, move exposed person to fresh air. If breathing is stopped, give artificial respiration. If necessary, use mouth-to-mouth respiration. LIQUID Irritating to skin and eyes. Harmful if swallowed. If swallowed, do not induce vomiting. If in eyes, flush with water for at least 15 minutes. If on skin, flush with water. If swallowed, give large amounts of milk or water. Do NOT induce vomiting.			
Exposure				
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution agencies.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: corrosive. Restrict access. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Phenyl phosphorus dichloride Phenylphosphine dichloride Dichlorophenylphosphine 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₆ H ₅ PCl ₂ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Acid pungent		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, acid-type canister, mask, goggles and face shield, rubber gloves, protective clothing. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat, pulmonary edema may develop following severe exposures. Contact with skin or eyes causes severe burns. Ingestion causes severe burns of mouth and stomach. 5.3 Treatment for Exposure: Get medical attention following all exposures to this compound. INHALATION: remove to fresh air; if breathing has stopped, start mouth-to-mouth resuscitation. EYES: flush with water for at least 15 min; do not use oils or ointments. SKIN: flush with water, wash with soap and water. INGESTION: give large amounts of milk or water; do NOT induce vomiting; if vomiting does occur, give milk or beaten eggs at one-hour intervals. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: 218-10°C. May be lower because of presence of dissolved phosphorus 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Large amounts of water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic fumes include oxides of phosphorus and hydrogen chloride 6.6 Behavior in Fire: Containers may rupture; not liquid is spontaneously flammable because of presence of dissolved phosphorus 6.7 Ignition Temperature: 319°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously to form hydrogen chloride (hydrochloric acid) 7.2 Reactivity with Common Materials: Corrodes metal except 316 stainless steel, nickel or Hastelloy 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water; rinse with sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. PCR, Inc. P.O. Box 1466 Gainesville, Fla. 32602 2. Aldrich Chemical Co. 940 West St. Paul Ave. Milwaukee, Wis. 53233 3. Stauffer Chemical Co. Agricultural Chemical Division Westport, Conn. 06880
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A O	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 179.0 13.3 Boiling Point at 1 atm: 430°F = 221°C = 394°K 13.4 Freezing Point: -60°F = -51°C = 222°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.140 at 25°C (liquid) 13.8 Liquid Surface Tension: (test) 25°C, dyne/cm = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (test) 1-X 200 Btu/lb = -4,500 cal/g = -190 X 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -72 Btu/lb = -40 cal/g = -1.7 X 10³ J/kg 13.16 Heat of Polymerization: Not pertinent
(Continued on pages 5 and 6)	
NOTES	

BPT

BENZENE PHOSPHORUS THIODICHLORIDE

Common Synonyms Benzenetriphosphonyl chloride Phenylphosphonothioic dichloride Phenylphosphine thiodichloride	Liquid Colorless Unpleasant odor Sinks and reacts in water. Poisonous visible vapor cloud is produced.
See also: 1. 2. 3. 4. 5. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16. 17. 18. 19. 20. 21. 22. 23. 24. 25. 26. 27. 28. 29. 30. 31. 32. 33. 34. 35. 36. 37. 38. 39. 40. 41. 42. 43. 44. 45. 46. 47. 48. 49. 50. 51. 52. 53. 54. 55. 56. 57. 58. 59. 60. 61. 62. 63. 64. 65. 66. 67. 68. 69. 70. 71. 72. 73. 74. 75. 76. 77. 78. 79. 80. 81. 82. 83. 84. 85. 86. 87. 88. 89. 90. 91. 92. 93. 94. 95. 96. 97. 98. 99. 100.	Fire data not available
 Exposure	CALL FOR MEDICAL AID VAPOR PRODUCED IN REACTION WITH WATER POISONOUS IF INHALED Irritating to eyes, nose and throat Move to fresh air If breathing has stopped, administer artificial respiration If breathing not too far gone, give oxygen LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing Flush affected area with plenty of water IF EYES ARE EXPOSED , hold eyes open and flush with water for at least 15 minutes IF SWALLOWED , do not induce vomiting. Give water or milk
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local authorities if spilled in water Notify police if it enters water
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - Corrosive Restrict access Disperse and flush	2. LABEL  CORROSIVE
3 CHEMICAL DESIGNATIONS 3.1 Synonyms : Benzenetriphosphonyl chloride Phenylphosphonothioic dichloride Phenylphosphine thiodichloride 3.2 Coast Guard Compatibility Classification : Not listed 3.3 Chemical Formula : $C_6H_5PSCl_2$ 3.4 IMCO/United Nations Numerical Designation : Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped) : Liquid 4.2 Color : Colorless to light yellow 4.3 Odor : Acid pungent
5 HEALTH HAZARDS 5.1 Personal Protective Equipment : Self-contained breathing apparatus, acid type, canister mask, goggles and face shield, rubber gloves, protective clothing 5.2 Symptoms Following Exposure : Inhalation of vapor irritates nose and throat; pulmonary edema may result. Contact with eyes or skin causes severe irritation. Ingestion causes severe irritation of mouth and stomach. 5.3 Treatment for Exposure : Get medical attention following all exposures to this compound. INHALATION : remove to fresh air. EYES : flush with water for at least 15 min. do not use oil or ointments. SKIN : flush with water, wash with soap and water. INGESTION : give large amounts of water or milk, induce vomiting, give milk, eggs or olive oil. 5.4 Toxicity by Inhalation (Threshold Limit Value) : Data not available 5.5 Short-Term Inhalation Limits : Data not available 5.6 Toxicity by Ingestion : Data not available 5.7 Late Toxicity : Data not available 5.8 Vapor (Gas) Irritant Characteristics : Data not available 5.9 Liquid or Solid Irritant Characteristics : Data not available 5.10 Odor Threshold : Data not available	

6. FIRE HAZARDS 6.1 Flesh Point : 252°F (100°C) 6.2 Flammable Limits in Air : Not pertinent 6.3 Fire Extinguishing Agents : Water 6.4 Fire Extinguishing Agents Not to be Used : Not pertinent 6.5 Special Hazards of Combustion Products : Toxic fumes include oxides of phosphorus and sulfur and hydrogen chloride 6.6 Behavior in Fire : Containers may rupture 6.7 Ignition Temperature : 338°F 6.8 Electrical Hazard : Data not available 6.9 Burning Rate : Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity : Data not available 8.2 Waterfowl Toxicity : Data not available 8.3 Biological Oxygen Demand (BOD) : Data not available 8.4 Food Chain Concentration Potential : None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water : Forms hydrogen chloride fumes (hydrochloric acid). The reaction is slow unless water is hot. 7.2 Reactivity with Common Materials : Corrodes metal slowly. 7.3 Stability During Transport : Stable 7.4 Neutralizing Agents for Acids and Caustics : Flush with water, rinse with sodium bicarbonate or lime solution. 7.5 Polymerization : Not pertinent 7.6 Inhibitor of Polymerization : Not pertinent	9. SELECTED MANUFACTURERS 1. Aldrich Chemical Co. 240 West St. Paul Ave. Milwaukee, Wis. 53233 2. PCR, Inc. P. O. Box 1466 Gainesville, Fla. 32602 3. Stauffer Chemical Co. Agricultural Chemical Division Westport, Conn. 06880
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A O	10 SHIPPING INFORMATION 10.1 Grades or Purity : Commercial 10.2 Storage Temperature : Ambient 10.3 Inert Atmosphere : No requirement 10.4 Venting : Pressure vacuum
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations : Corrosive 12.2 NAS Hazard Rating for Bulk Water Transportation : Not listed 12.3 NFPA Hazard Classifications : Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm : Liquid 13.2 Molecular Weight : 211 13.3 Boiling Point at 1 atm : 270°C = 518°F 13.4 Freezing Point : -112°F = -24.0°C = 249.2 K 13.5 Critical Temperature : Not pertinent 13.6 Critical Pressure : Not pertinent 13.7 Specific Gravity : 1.378 at 20°C (liquid) 13.8 Liquid Surface Tension : (est.) 25 dyne/cm = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension : Not pertinent 13.10 Vapor (Gas) Specific Gravity : Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas) : Not pertinent 13.12 Latent Heat of Vaporization : Not pertinent 13.13 Heat of Combustion : (est.) -10,000 Btu/lb = -4,184 kJ/kg 13.14 Heat of Decomposition : Not pertinent 13.15 Heat of Solution : (est.) -9 Btu/lb = -5 cal/g = -0.2 X 10 ³ J/kg 13.16 Heat of Polymerization : Not pertinent
NOTES (Continued on pages 2 and 3)	

BZA

BENZOIC ACID

Common Synonyms Benzenecarboxylic acid Carboxybenzene	Solid crystals or powder White Faint pleasant odor Sinks in water
Avoid contact with skin and face. Keep people away from vapors. Always use in a well-ventilated area. If exposed, wash eyes and face with plenty of water. If inhaled, move to fresh air. If ingested, do not induce vomiting. Seek medical attention.	
Fire	Combustible Vapor may explode if ignited in an enclosed area. Dust may form explosive mixture with air. Extinguish with water spray. Do not use chemical extinguishers.
Exposure	CAUTION FOR MEDICAL AID DUST Irritating to nose and throat if inhaled. Move to fresh air. SOLID Irritating to skin and eyes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Disperse and flush.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms Benzenecarboxylic acid Carboxybenzene Diacrylic acid 3.2 Coast Guard Compatibility Classification Not applicable 3.3 Chemical Formula: <chem>c1ccccc1C(=O)O</chem> 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Faint, pleasant, slight aromatic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Bureau of Mines dust respirator when melted material present; use eye protection and organic respirator for fumes. 5.2 Symptoms Following Exposure: Dust may be irritating to nose and eyes. At elevated temperatures fumes may cause irritation of eyes, respiratory system, and skin. 5.3 Treatment for Exposure: Remove patient to fresh air. EYE CONTACT: Flush eyes with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 g/kg. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Minimal hazard. If applied on clothing and allowed to remain may cause smarting and reddening of the skin. Dust may irritate the nose and eyes. 5.10 Odor Threshold: Not pertinent.	

6. FIRE HAZARDS 6.1 Flash Point: 240°F (116°C) 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Dry powder, chemical foam, water fog, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: None. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Vapor from molten benzoic acid may form explosive mixture with air. Concentrated dust may form explosive mixture. 6.7 Ignition Temperature: 1163°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 200 ppm 7 hr. reddish lethal, fresh water 400 ppm 4 hr. sunfish lethal, fresh water 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 165% 5 days. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Monsanto Co. Monsanto Industrial Chemicals Co. 100 North Lindbergh Blvd. St. Louis, Mo. 63166 2. Northwest Industries Inc. Velsco Chemical Corp. 341 E. Ohio St. Chicago, Ill. 60611 3. Tenneco Chemicals Inc. Tenneco Intermediates Div. 5 Turner Place Piscataway, N.J. 08854
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) H	10. SHIPPING INFORMATION 10.1 Grades or Purity: USP FCC grade 99.5% - 100.5% 10.2 Storage Temperature: Data not available. 10.3 Inert Atmosphere: Data not available. 10.4 Venting: Data not available.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 HFFA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 122.12. 13.3 Boiling Point at 1 atm: 480.5°F = 249.2°C = 522.4°K 13.4 Freezing Point: 252.1°F = 122.3°C = 395.5°K 13.5 Critical Temperature: 594°F = 479°C = 752°K 13.6 Critical Pressure: 640 psia = 43 atm = 4.6 MN/m ² 13.7 Specific Gravity: 1.316 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on pages 3 and 4)	

BZN

BENZONITRILE

Common Synonyms Phenylcyanide Cyanobenzene Benzoic acid nitrile		Liquid	Colorless	Almond-like odor
May float or sink in water				
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. NO FUMES OR GASES FROM LIQUID OR VAPOR. NO TOXIC EFFECTS FROM LIQUID OR VAPOR. NO TOXIC EFFECTS FROM LIQUID OR VAPOR.				
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Weak explosives when heated, but not detonates. Liquefies with heat. Burns with a blue flame. Water may be used to extinguish fire. AVOID CONTACT WITH LIQUID AND VAPOR.			
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, difficult breathing or loss of consciousness. If inhaled, get fresh air immediately with plenty of water. If inhaled, get fresh air immediately with plenty of water. If inhaled, get fresh air immediately with plenty of water. LIQUID Irritating to skin and eyes. If swallowed will cause headache, nausea, vomiting or loss of consciousness. If swallowed, get fresh air immediately with plenty of water. If swallowed, get fresh air immediately			

(Continued on page 41)

6. FIRE HAZARDS Material is combustible but burns with difficulty. 6.1 Flash Point: 16° F (C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Toxic hydrogen cyanide and oxides of nitrogen may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Difficult to burn	8. WATER POLLUTION 8.1 Aquatic Toxicity: 5 ppm/24 hr. rainbow trout/no effect, fresh water 135 ppm/96 hr. fathead minnow, 11% soft fresh water 78 ppm/96 hr. fathead minnow, 11% hard fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 60% (theoretical) 18 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Will attack some plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Velsicol Chemical Corp. 341 E. Ohio Street Chicago, Ill. 60611 2. Eastman Organic Chemicals Rochester, N.Y. 14650 3. Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T X	10. SHIPPING INFORMATION 10.1 Grades or Purity: Pure 99+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Ventilated (no draft) 10.4 Venting: Open (flame arresters)
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 105.12 13.3 Boiling Point at 1 atm: 176°F = 191°C = 462°K 13.4 Freezing Point: 9°F = -12.8°C = 289°K 13.5 Critical Temperature: 799.2°F = 426.2°C = 699.4°K 13.6 Critical Pressure: 611 psia = 41.6 atm = 4.22 MN/m ² 13.7 Specific Gravity: 1.01 at 25°C (liquid) 13.8 Liquid Surface Tension: 34.7 dyne/cm = 0.0347 N/m at 25°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: 3.6 13.11 Ratio of Specific Heats of Vapor (Gas): 1.09 13.12 Latent Heat of Vaporization: 1577 Btu/lb = 367 cal/g = 1.67 x 10 ³ J/g 13.13 Heat of Combustion: -15,100 Btu/lb = -3400 cal/g = -351 x 10 ³ J/g 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
5. HEALTH HAZARDS (Cont'd) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

(Continued on page 42)

BZP

BENZOPHENONE

Common Synonyms Benzoyl benzene Diphenyl ketone Diphenyl methanone Alpha-oxodiphenylmethane Alpha-oxodione		Liquid or solid	White	Flowers odor
May float or sink in water				
Not flammable, combustible, or toxic Not a severe irritant Not a severe skin sensitizer Not a severe eye irritant				
Fire		Combustible Flammable liquid and vapor May burn to a black smoke		
Exposure		ALL OR MOSTLY VAPOR LIQUID OR SOLID Irritating to skin and eyes. If swallowed will cause nausea, or vomiting. If inhaled, irritation of the respiratory tract. If in eyes, flush with water for at least 15 min. If on skin, wash with soap and water. If swallowed, do not induce vomiting unless instructed by a physician. If swallowed, do not induce vomiting unless instructed by a physician.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Not a severe water pollutant.		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-4. Issue warning - water contaminant Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Benzobenzene Diphenyl ketone, Diphenyl methanone alpha-Oxodiphenylmethane alpha-Oxodione 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₁₃ H ₁₀ O 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid or solid 4.2 Color: White 4.3 Odor: Characteristic		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Ingestion causes gastrointestinal disturbances. Contact causes eye irritation and, if prolonged, irritation of skin. 5.3 Treatment for Exposure: INHALATION: remove to fresh air. INGESTION: get medical attention. EYES: flush with water for at least 15 min. get medical attention if irritation persists. SKIN: flush with water, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion, Grade 1 acute oral rat LD ₅₀ : 10,000 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS (Material is combustible) 6.1 Flash Point: Data not available. 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Will attack some plastics. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Eastman Organic Chemicals, Rochester, N.Y. 14600. 2. Aldrich Chemical Co., 540 W. Saint Paul Ave., Milwaukee, Wis. 53204. 3. Guller & Schlegel Chemical Mfg. Co., 544 Milwaukee Avenue, Carle Place, N.Y. 11514.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) A T N O H	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99+. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not recommended. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 182. 13.3 Boiling Point at 1 atm: 281.9°C = 535.5°F = 575.7°K. 13.4 Freezing Point: 118.2°F = 47.9°C = 321.1°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.085 at 50°C (liquid). 13.8 Liquid Surface Tension: 42 dynes/cm = 0.042 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 25.8 Btu/lb = 70.0 cal/g = 293 J/g. 13.13 Heat of Combustion: -15,400 Btu/lb = -3550 cal/g = -358 kJ/g. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

(Continued on pages 1 and 2)

BZC

BENZOYL CHLORIDE

Common Synonyms Benzencarbonyl chloride	Water liquid Color less to slightly brown Sinks and reacts slowly with water producing a poisonous gas.
Avoid contact with liquid and vapor. Wear goggles and with retained breathing apparatus. Keep people away. Evacuate area in case of large discharge. Stop discharge if possible. Call fire department. To avoid fire from discharged material. Notify local health and pollution control agencies.	
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED Wear goggles and with retained breathing apparatus. DO NOT USE WATER Extinguish with foam dry chemical or carbon dioxide.
Exposure	CALL FOR MEDICAL AID LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyes wide open and flush with plenty of water. If SWALLOWED, do not induce vomiting. DO NOT INDUCE VOMITING . If SKIN ALREADY IRRITATED, DO NOT USE WATER.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and water pollution agencies. Notify operators of nearby water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Evacuate area in case of large discharge. Call fire department. Chemical and physical control.	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Benzencarbonyl chloride 3.2 Coast Guard Compatibility Classification: No applicability 3.3 Chemical Formula: C ₆ H ₅ COCl 3.4 IMCO United Nations Numerical Designation: 2.3	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless, may become slightly brownish on standing 4.3 Odor: Pungent, characteristic
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Full protective clothing, including full face respirator for acid gases and organic vapors (yellow GMS canisters), close fitting goggles, nonslip rubber gloves, plastic apron, face shield. 5.2 Symptoms Following Exposure: INHALATION: may irritate eyes, nose and throat. INGESTION: causes acute discomfort. SKIN: causes irritation and burning. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, administer oxygen with patient in sitting position. INGESTION: give water, call physician at once, give milk. EYES: flush with water for 15 min., get medical attention. SKIN: wash with plenty of soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on direct contact and is very irritating to the eyes. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS

- 6.1 **Flash Point:** 102°F (39°C)
6.2 **Flammable Limits in Air:** 2-14%
6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, dry chemical, water fog.
6.4 **Fire Extinguishing Agents Not to be Used:** Water spray. Do not allow water to enter containers.
6.5 **Special Hazards of Combustion Products:** Highly poisonous phosgene gas may be formed in fire.
6.6 **Behavior in Fire:** At high temperatures, the compound may react violently with water to steam.
6.7 **Ignition Temperature:** 550°F
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** Data not available.

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 200 ppm 7-day goldfish lethal, fresh water; 500 ppm 14-day goldfish lethal, fresh water.
8.2 **Waterfowl Toxicity:** Data not available.
8.3 **Biological Oxygen Demand (BOD):** 168% 5 days.
8.4 **Food Chain Concentration Potential:** None.

9 SELECTED MANUFACTURERS

- Northwest Industries, Inc.
Velsicol Chemical Corp.
4411 Ohio St.
Chicago, Ill. 60641
- Occidental Petroleum Corp.
Hooker Chemical Corp.
Industrial Chemical Division
Naperville, Ill. 60563
- Stauffer Chemical Co.
Specialty Chemicals Division
Green Farms Rd.
Westport, Conn. 06881

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Slow reaction with water to produce hydrochloric acid fumes. Reaction much faster with steam.
7.2 **Reactivity with Common Materials:** Slow corrosion of metals, but no immediate hazard.
7.3 **Stability During Transport:** Not pertinent.
7.4 **Neutralizing Agents for Acids and Caustics:** Soda ash and water, lime.
7.5 **Polymerization:** Does not occur.
7.6 **Inhibitor of Polymerization:** Not pertinent.

10 SHIPPING INFORMATION

- 10.1 **Grades or Purity:** 99+%, special grade.
10.2 **Storage Temperature:** Store in cool, dry area.
10.3 **Inert Atmosphere:** Data not available.
10.4 **Ventings:** Pressure Safety.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 444-3)
XXXO

12 HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Corrosive material.
12.2 **HAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 1 |
| Health | |
| Vapor Irritant | 4 |
| Liquid or Solid Irritant | 4 |
| Poisons | 2 |
| Water Pollution | |
| Human Toxics | 2 |
| Aquatic Toxics | 2 |
| Acute Effect | 2 |
| Reactivity | |
| Other Chemicals | 1 |
| Water | 4 |
| Self Reaction | 0 |
- 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 2 |
| Reactivity (Yellow) | 1 |
| | W |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 140.57
13.3 **Boiling Point at 1 atm:** 197.3°C = 470.3°F
13.4 **Freezing Point:** 109.1°C = 228.4°F
13.5 **Critical Temperature:** Not pertinent.
13.6 **Critical Pressure:** Not pertinent.
13.7 **Specific Gravity:** 1.211 at 25°C (liquid)
13.8 **Liquid Surface Tension:** 36.3 dynes/cm = 0.00363 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
13.11 **Ratio of Specific heats of Vapor (Gas):** Not pertinent.
13.12 **Latent Heat of Vaporization:** Data not available.
13.13 **Heat of Combustion:** -10,030 Btu/lb = -5500 cal/g = -23,220 J/g
13.14 **Heat of Decomposition:** Not pertinent.
13.15 **Heat of Solution:** Not pertinent.
13.16 **Heat of Polymerization:** Not pertinent.

NOTES

REVISED 1978

BAL

BENZYL ALCOHOL

Common Synonyms Benzylcarbinol Benzylcarbinol Alpha-hydroxytoluene Phenylmethanol Phenylmethyl alcohol		Liquid Colorless Mild, pleasant odor May float or sink in water
AVOID CONTACT LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear gloves over bathing suit if clothing gets wet. Notify fire department. Notify and remove animals, birds, fish, etc. Notify and remove plants, trees, etc.		
Fire		Combustible Extinction with dry chemical, carbon dioxide, water. Water may cause frothing. Low flashpoint, low boiling point.
Exposure		CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, coughing, or difficult breathing. If in eyes, flush with water. If in nose, wipe with moist cloth. If breathing apparatus is used, use only fresh air. If breathing apparatus is used, use only fresh air. LIQUID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. MAY BE READILY ABSORBED THROUGH THE SKIN Remove contaminated clothing. Flush skin with water. If in eyes, flush with water. If swallowed, do not induce vomiting. Notify physician. IF SWALLOWED, DO NOT INDUCE VOMITING. IF SWALLOWED, DO NOT INDUCE VOMITING. IF SWALLOWED, DO NOT INDUCE VOMITING.
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intake.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3) Issue warning - water contaminant. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Benzylcarbinol, Alpha-hydroxytoluene, Phenylmethanol, Phenylmethyl alcohol. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: C ₇ H ₈ O. 3.4 IMCO/United Nations Numerical Designation: No listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Mild, pleasant.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, chemical safety goggles. 5.2 Symptoms Following Exposure: Inhalation: Vapor may cause irritation of upper respiratory tract. Prolonged or excessive inhalation may result in headache, nausea, vomiting and diarrhea. In severe cases, respiratory stimulation followed by respiratory and muscular paralysis, convulsions, narcosis and death may result. Ingestion may produce severe irritation of the gastrointestinal tract, followed by nausea, vomiting, cramps and diarrhea. Tissue ulceration may result. Contact with eyes causes local irritation. Material can be absorbed through skin with anesthetic or irritant effect. 5.3 Treatment for Exposure: INHALATION: Remove victim from contaminated atmosphere, call physician immediately. INGESTION: Induce vomiting and contact a physician. EYES: Flush with plenty of water for 15 min. and contact a physician. SKIN: Flush with water, wash with soap and water. Obtain medical attention in case of irritation or central nervous system depression. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral rat LD ₅₀ = 1,230 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: < 5 ppm.		

6. FIRE HAZARDS 6.1 Flash Point: 229°F (0°C) 219°F (0°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: 317°F 6.8 Electrical Properties: Data not available 6.9 Burning Rate: 1.74 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 160 ppm, 48 hr. daphnia magna, 11 m. * * water type not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 155% 5 days 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Will attack some plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Velucol Chemical Corp. 3411 Ohio St. Chicago, Ill. 60611 2. Stauffer Chemical Company Specialty Chemical Division Meadow Road Edison, N.J. 08817 3. Givaudan Corporation 125 Delawanna Avenue Clifton, N.J. 07014								
	10. SHIPPING INFORMATION 10.1 Grades & Purity: NE Photographic, Technical Textile 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Open								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P T X	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 108.14 13.3 Boiling Point at 1 atm: 401°F = 205°C = 478°K 13.4 Freezing Point: 4°F = -15.5°C = 257°K 13.5 Critical Temperature: 747°F = 403°C = 676°K 13.6 Critical Pressure: 661 psi = 45.0 atm = 4.57 MN/m² 13.7 Specific Gravity: 1.050 at 15.5°C (liquid) 13.8 Liquid Surface Tension: 39.0 dynes/cm = 0.390 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 3.73 13.11 Ratio of Specific Heats of Vapor (Gas): 1.070 13.12 Latent Heat of Vaporization: 197 Btu/lb = 107 cal/g = 4.48 x 10³ J/kg 13.13 Heat of Combustion: -14,850 Btu/lb = -8,260 cal/g = -345 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0	(Continued on pages 7 and 8) NOTES
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	1								
Reactivity (Yellow)	0								

BZM

BENZYLAMINE

Common Synonyms Alpha-aminotoluene Phenylmethylamine	Liquid Colorless to light yellow Strong ammonia odor Floats and mixes with water
Avoid contact with skin and eyes. Keep away from heat and open flame. Do not breathe vapors. Do not get in eyes, on clothing, or on skin. If in eyes, flush with water for 15 min. If on skin, wash with soap and water. If swallowed, do not induce vomiting. Call a physician.	
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and suit. Do not breathe vapors. Do not get in eyes, on clothing, or on skin. If in eyes, flush with water for 15 min. If on skin, wash with soap and water. If swallowed, do not induce vomiting. Call a physician.
Exposure	CAUTION FOR MEDICAL USE VAPOR Irritating to eyes, nose and throat If inhaled will cause dizziness, headache, or difficult breathing LIQUID Will burn skin and eyes Harmful if Swallowed HAZARD STATEMENT H314 Causes severe skin burns and eye irritation H332 Irritating to respiratory system ENVIRONMENTAL STATEMENT P201 + P202 Hazardous. Do not handle without appropriate supervision. P273 Release to the environment without permission. ENVIRONMENTAL PRECAUTION Do not release into the environment.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE (See Resource Materials Handbook, CG 446-4) Issue warning - air contaminant, water contaminant Restrict access Disperse and flush	2. LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: alpha-Aminotoluene Phenylmethylamine 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₇ H ₉ NH ₂ 3.4 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light yellow 4.3 Odor: Strong ammonia
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation of vapor causes irritation of the mucous membranes of the nose and throat and lung irritation with respiratory distress and cough. Headache, nausea, faintness, and anxiety can occur. Exposure to vapor produces eye irritation with lacrimation, conjunctivitis, and corneal edema resulting in halos around lights. Direct local contact with liquid is known to produce severe and sometimes permanent eye damage and skin burns. Vapors may also produce primary skin irritation and dermatitis. 5.3 Treatment for Exposure: INHALATION: remove victim from exposure, if breathing is difficult administer oxygen. If breathing has stopped, begin artificial respiration. EYES or SKIN: wash with copious amounts of water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: 168°F (76°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Alcohol, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Toxic nitrogen oxides may form in a fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazards: Data not available 6.9 Burning Rate: 4.13 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: 10 ppm 48 hr D ₅₀ (mga) 11 m fresh water 8.2 Waterborne Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: In presence of moisture may weakly corrode some metals. Liquid will attack some plastics. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Miles Laboratories, Inc. Summer Division Elkhart, Ind. 46514 2. The Ames Laboratories, Inc. 200 Roca Lane Milford, Conn. 06460 3. Eastman Organic Chemicals Rochester, N. Y. 14650
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P-Q	10 SHIPPING INFORMATION 10.1 Grade or Purity: Commercial, 95.5% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Ventilated (natural) 10.4 Venting: Open flame arresters
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 107.16 13.3 Boiling Point at 1 atm: 162.1°F = 162.5°C = 435.7°K 13.4 Freezing Point: (approx) -51°F = -45°C = 227°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.95 at 20°C (liquid) 13.8 Liquid Surface Tension: 19.5 dynes/cm = 0.0195 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 3.70 13.11 Ratio of Specific Heats of Vapor (Gas): (not listed) 13.12 Latent Heat of Vaporization: (cal/g) 164 Btu/lb = 91 cal/g = 3.8 x 10 ³ J/kg 13.13 Heat of Combustion: -16,260 Btu/lb = -9,040 cal/g = -378 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -43 Btu/lb = -24 cal/g = -1.0 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent
NOTES	

(Continued on pages 2 and 3)

BBR

BENZYL BROMIDE

Common Synonyms alpha-Bromotoluene alpha-Bromotoluene Bromotoluene, alpha		Liquid Colorless to yellow Sharp irritating odor Sinks in water
Fire Combustible Irritating gases are produced when heated Harmful if swallowed		
Exposure LIQUID Irritative to skin and eyes. Harmful if swallowed		
Water Pollution HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Toxic warning: extreme Restrict access Should be removed Chemical and physical treatment	2 LABEL 	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: alpha-Bromotoluene alpha-Bromotoluene Bromotoluene, alpha 3.2 Coast Guard Competibility Classification: Not listed 3.3 Chemical Formula: C ₇ H ₇ Br 3.4 IMCO/United Nations Numerical Designation: 1.111	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to yellow 4.3 Odor: Very sharp pungent, lacrymatory	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles, rubber gloves, protective clothing 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat; severe exposure may cause pulmonary edema. Vapors cause severe eye irritation, lacrimation, burns eyes. Nausea, chest constriction. Ingestion causes irritation of mouth and stomach. 5.3 Treatment for exposure: INHALATION: remove to fresh air. EYES: irrigate with copious amounts of water for 15 min. SKIN: flush with water; wash with soap and water. INGESTION: do NOT induce vomiting; give large amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS 6.1 Flash Point: 72°F (22°C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating hydrogen bromide gas may be formed 6.6 Behavior in Fire: Burns vapor that is a poor fuel for gas 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Index: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: 0.05 mg/l - 48 hr marine fish, no irritant response, salt water 1.1 mg/l - 48 hr marine fish, violent irritant activity, salt water * Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts slowly to generate hydrogen bromide (hydrobromic acid) 7.2 Reactivity with Common Materials: Decomposes rapidly in the presence of all common metals except nickel and lead liberating heat and hydrogen bromide 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Rinse with sodium bicarbonate or long solution 7.5 Polymerization: Polymerizes with evolution of heat and hydrogen bromide when in contact with all common metals except nickel and lead 7.6 Inhibitor of Polymerization: None used	9 SELECTED MANUFACTURERS 1. White Chemical Corporation East 22nd Street P. O. Box 275 Bayonne, N. J. 07002 2. Eastman Kodak Co. Eastman Organic Chemicals Rochester, N. Y. 14650 3. Adich Chemical Co. 940 West St. Paul Avenue Milwaukee, Wis. 53233								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-2) A O N Y	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Pressure vessel								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 171.0 13.3 Boiling Point at 1 atm: 150°F = 65.5°C = 271°K 13.4 Freezing Point: 24.0°F = -5.0°C = 268°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.441 at 22°C (liquid) 13.8 Liquid Surface Tension: 32.3 dynes/cm = 0.0323 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 10.5 dynes/cm = 0.0105 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: 4.9 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available 13.12 Latent Heat of Vaporization: 120 Btu/lb = 64.4 cal/g = 270 X 10 ³ J/kg 13.13 Heat of Combustion: 10210 Btu/lb = 4.600 cal/g = 200 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	2								
Reactivity (Yellow)	0								
NOTES 6. 100% pure, 100%									

BBP

BENZYL n-BUTYL PHTHALATE

Common Synonyms Benzyl butyl phthalate Phthalic acid, benzyl n-butyl ester		Liquid	Colorless	Slight odor
Sinks in water				
Fire		Combustible Irritating gases may be produced when heated		
Exposure		LIQUID Irritating to skin and eyes		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4 Not applicable (chemical and physical hazard not present)		2. LABELS Not required (not required by U.S. Federal Regulations)		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: benzyl butyl phthalate Phthalic acid, benzyl n-butyl ester 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: C ₁₆ H ₂₂ O ₄ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Slight, pleasant		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Protective gloves and goggles				
5.2 Symptoms Following Exposure: Prolonged contact with liquid causes irritation to skin, eyes, and nose				
5.3 Treatment for Exposure: If in eyes, flush with water for 15 min. SKIN: Wash with soap and water				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limit: Data not available				
5.6 Toxicity by Ingestion: Grade I irritant (LD ₅₀ 1.3 g/kg)				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Vapors are irritating to eyes and throat				
5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard; practically harmless to skin				
5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not available 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, foam 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Irritating vapors of unburned chemical may form in fires 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Montecarlo 800 North Lindbergh Blvd St. Louis, Missouri 63116 2. Public and Baker, Inc. 2001 Northern Drive Farmingdale, New York 11735																																				
	10. SHIPPING INFORMATION 10.1 Grades or Purities: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Open																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.4 NA	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 222.27 13.3 Boiling Point at 1 atm: 260°C = 500°F = 643°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.05 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: -14,550 Btu/lb = -5,090 cal/g = -21.3 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>0</td></tr><tr><td>Health</td><td>0</td></tr><tr><td>Vapor Irritant</td><td>0</td></tr><tr><td>Liquid or Solid Irritant</td><td>0</td></tr><tr><td>Poisons</td><td>0</td></tr><tr><td>Water Pollution</td><td>0</td></tr><tr><td>Human Toxicity</td><td>0</td></tr><tr><td>Aquatic Toxicity</td><td>0</td></tr><tr><td>Acute Effect</td><td>0</td></tr><tr><td>Reactivity</td><td>0</td></tr><tr><td>Other Chemicals</td><td>0</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self-Reactive</td><td>0</td></tr></tbody></table> 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (H2)</td><td>0</td></tr><tr><td>Flammability (F2)</td><td>0</td></tr><tr><td>Reactivity (R2)</td><td>0</td></tr></tbody></table>	Category	Rating	Fire	0	Health	0	Vapor Irritant	0	Liquid or Solid Irritant	0	Poisons	0	Water Pollution	0	Human Toxicity	0	Aquatic Toxicity	0	Acute Effect	0	Reactivity	0	Other Chemicals	0	Water	0	Self-Reactive	0	Category	Classification	Health Hazard (H2)	0	Flammability (F2)	0	Reactivity (R2)	0	
Category	Rating																																				
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Health Hazard (H2)	0																																				
Flammability (F2)	0																																				
Reactivity (R2)	0																																				
NOTES (Continued on page 1 and 2)																																					

BCL

BENZYL CHLORIDE

Common Synonyms alpha-Chlorobenzene omega-Chlorobenzene		Waters liquid Sinks in water	Colorless to yellow Sharp irritating odor
Fire Combustible Irritating gases are produced when heated			
Exposure LIQUID Will burn skin and eyes If swallowed will cause nausea and vomiting			
Water Pollution HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Appendix CC 445-4) For a warning: Informative Retention: Informative Absorption: Informative Control and physical treatment		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: alpha-Chlorobenzene omega-Chlorobenzene (Chlorobenzene, alpha) 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C₆H₅Cl 3.4 IMCO/United Nations Numerical Designation: 1.103		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Pungent, irritating	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety goggles or face shield; self-contained breathing apparatus; positive pressure hose mask; air line mask; industrial carrier type gas mask; or chemical cartridge respirator; rubber gloves; protective clothing 5.2 Symptoms Following Exposure: Inhalation causes severe irritation of upper respiratory tract with coughing, burning of the throat, headache, dizziness, and weakness; lung damage and pulmonary edema may occur after severe exposure; chronic irritation of the upper respiratory tract may result after prolonged and repeated exposure to vapors. Immediate and severe eye irritation may result from contact with the liquid or vapors; prolonged or permanent eye damage may result. Vapors irritate skin and liquid may cause severe burns. Ingestion may cause immediate and severe burns of the mouth, throat, and gastro-intestinal tract; nausea, vomiting, cramps, and diarrhea may follow; gastrointestinal damage and systemic effects may result. 5.3 Treatment for Exposure: INHALATION: Remove from contaminated atmosphere. Breathing has ceased, start mouth-to-mouth respiration, oxygen if available. Should be administered only by an experienced person when authorized by a physician. Keep patient warm and comfortable with a physician immediately. EYES: Immediately flush with large quantities of running water for a minimum of 15 min. Hold eyelids apart during irrigation to insure flushing of the entire surface of the eye and help with water. Do not attempt to neutralize with chemicals; apply moist medical attention as soon as possible. SKIN: Remove contaminated clothing and shoes. Continue washing with water. Do not attempt to neutralize with chemicals; apply moist medical attention if irritation persists. INGESTION: Give large amounts of water. Do NOT induce vomiting.			

6 FIRE HAZARDS 6.1 Flash Point: 115°F (40.5°C) 6.2 Flammable Limits in Air: 1.1% - 11.1% 6.3 Fire Extinguishing Agents: Water and chemical, foam and carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride gas may be formed 6.6 Behavior in Fire: Forms superheated vapors and irritating gas 6.7 Ignition Temperature: 1,100°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 4.2 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: 0.05 mg/l - marine fish, no effect response with water 0.1 mg/l - marine fish, sudden irritant activity with water *Time period not specified 8.2 Waterford Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Liquid produces hydrochloric acid liberating hydrogen chloride (hydrogen acid) 7.2 Reactivity with Common Materials: Decomposes rapidly in the presence of all common metals with the exception of nickel and lead; liberates hydrogen and hydrogen chloride 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Corrosives: React with sodium bicarbonate or lime solution 7.5 Polymerization: Polymerizes with evolution of heat and hydrogen chloride when in contact with all common metals except nickel and lead 7.6 Inhibitor of Polymerization: Triethylamine, propylene oxide, or sodium carbonate	9 SELECTED MANUFACTURERS Master Chemical Company Specialty Chemical Division Westport, Connecticut Allied Chemical Corporation 341 East Ohio Street Chicago, Illinois Monsanto Company Monsanto Industrial Chemicals 800 North Lindbergh Boulevard St. Louis, Missouri																																				
10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.5% or higher; stabilizers may be added 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not recommended 10.4 Sealing: Pressure vacuum																																					
11. HAZARD ASSESSMENT CODE See Table 1, Assessment Appendix CC 445-7 C O V X	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 126.6 13.3 Boiling Point at 1 atm: 154.9°F = 68.2°C = 341.4°K 13.4 Freezing Point: -33.4°F = -35.2°C = 238.0°K 13.5 Critical Temperature: 482.2°F = 250°C = 523°K 13.6 Critical Pressure: 16.1 MPa = 161.3 atm = 232.5 MN/m² 13.7 Specific Gravity: 1.10 at 25°C (liquid) 13.8 Liquid Surface Tension: 37.5 dyne/cm = 0.0375 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 12.1 dyne/cm = 0.0121 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: 4.16 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0649 13.12 Latent Heat of Vaporization: 13.1 Btu/lb = 70 cal/g = 2.9 x 10⁵ J/kg 13.13 Heat of Combustion: -12,610 Btu/lb = -6,700 cal/g = -280 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulation: Corrosive 12.2 HAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td></td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>2</td></tr><tr><td>Liquid or Solid Irritant</td><td>2</td></tr><tr><td>Poisons</td><td>2</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>2</td></tr><tr><td>Aquatic Toxicity</td><td>4</td></tr><tr><td>Marine Effect</td><td>4</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Water</td><td>2</td></tr><tr><td>Self Reaction</td><td>1</td></tr></table> 12.3 MFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>1</td></tr></table>	Category	Rating	Fire		Health		Vapor Irritant	2	Liquid or Solid Irritant	2	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	4	Marine Effect	4	Reactivity		Other Chemicals	1	Water	2	Self Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	1	
Category	Rating																																				
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Water Pollution																																					
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Marine Effect	4																																				
Reactivity																																					
Other Chemicals	1																																				
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Self Reaction	1																																				
Category	Classification																																				
Health Hazard (Blue)	2																																				
Flammability (Red)	2																																				
Reactivity (Yellow)	1																																				
5 HEALTH HAZARDS (Cont'd.) 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm 5.5 Short-Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral LD₅₀ = 1,231 mg/kg 5.7 Lethal Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very corrosive to the eyes 5.10 Odor Threshold: 0.02 ppm																																					

BCF

BENZYL CHLOROFORMATE

Common Synonyms Carbobenzoxy chloride Chloroformic acid, benzyl ester Benzylcarbonyl chloride Benzyl chloroformate	Liquid Colorless Sharp, irritating odor Sinks in water. Reacts with water.
Call for department Avoid contact with liquid. Keep as low as possible. Stop discharge if possible. Isolate and remove from area if possible. Notify all other employees in the area.	
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE Containers may explode in fire. Water chemically reacts with contents and may cause explosion. Extinguish with dry chemical or carbon dioxide.
Exposure	All forms of acid LIQUID Irritating to skin and eyes Harmful if swallowed Runny eyes and redness of eyes Discharge of pus with pain in water If INEYES flush with copious amounts of water If SWALLOWED give oral EMERGENCY first aid with water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify all other employees in the area.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning: corrosive Restrict access Should be removed Chemical and physical treatment	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Carbobenzoxy chloride Chloroformic acid, benzyl ester Benzylcarbonyl chloride Benzyl chloroformate 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₆ H ₅ CH ₂ OCOCl 3.4 IMCO/United Nations Numerical Designation: 8.1719	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Irritating sharp penetrating
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self contained breathing apparatus or hood type canister mask goggles or face shield, rubber gloves, protective clothing. 5.2 Symptoms Following Exposure: Inhalation causes mucous membrane irritation. Eyes are irritated by excessive exposure to vapor. Liquid causes severe irritation of eyes and irritates skin. Ingestion causes irritation of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: Remove from exposure support respiration call physician. EYES: Irrigate with copious amounts of water for 15 min. SKIN: flush with large quantities of water wash with soap and water. INGESTION: give large amounts of water, do NOT induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 LD 50 to 800 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure. 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS

- 6.1 **Flash Point:** 176°F (80°C) 227°F (110°C)
 Vigorous decomposition occurs at these temperatures, thus these values are anomalous due to the effect of the decomposition products (benzyl chloride and CO).
 6.2 **Flammable Limits in Air:** Not pertinent
 6.3 **Fire Extinguishing Agents:** Dry chemical foam and carbon dioxide
 6.4 **Fire Extinguishing Agents Not to be Used:** Data not available
 6.5 **Special Hazards of Combustion Products:** Toxic phosgene, hydrogen chloride, and benzyl chloride vapors may form.
 6.6 **Behavior in Fire:** Containers may explode.
 6.7 **Ignition Temperature:** Data not available
 6.8 **Electrical Hazard:** Data not available
 6.9 **Burning Rate:** 4.0 mm/min

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Forms hydrogen chloride (hydrochloric acid). The reaction is not very vigorous in cold water.
 7.2 **Reactivity with Common Materials:** Slow corrosion of metal.
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or lime solution.
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterfowl Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

- 1 Chemetron Corporation
 Organic Chemicals Division
 393 Seventh Avenue
 New York, N.Y. 10001
 2 Aldrich Chemical Co.
 940 West St. Paul Avenue
 Milwaukee, Wis. 53233
 3 PC R, Inc.
 P.O. Box 1466
 Gainesville, Fla. 32602

10 SHIPPING INFORMATION

- 10.1 **Grade or Purity:** 97+ %
 10.2 **Storage Temperature:** Ambient, in cool place
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-5)
 A O X-Y

12 HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Corrosive
 12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	3
Self Reaction	3

- 12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid
 13.2 **Molecular Weight:** 170.6
 13.3 **Boiling Point at 1 atm (decomposes):** 306°F = 152°C = 425°K
 13.4 **Freezing Point:** Not pertinent
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 1.22 at 20°C (liquid)
 13.8 **Liquid Surface Tension:** (est) 25 dynes/cm = 0.025 N/m at 20°C
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 13.12 **Latent Heat of Vaporization:** (est) 90 Btu/lb = 50 cal/g = 2.1 x 10⁵ J/kg
 13.13 **Heat of Combustion:** (est) -10,000 Btu/lb = -5,700 cal/g = -240 x 10³ J/kg
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** Not pertinent
 13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BZO

BENZYL DIMETHYLOCTADECYLAMMONIUM CHLORIDE

Common Synonyms Stearyl dimethylbenzylammonium chloride Tallow benzyl dimethylammonium chloride Benzyl dimethyl laurylammonium chloride	Solid or thick liquid White Mild odor Sinks and mixes with water
Stop discharge if possible. Keep people away. Avoid contact with liquid and solid. Isolate and remove as far as practical. Notify local health and pollution control agencies.	
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with water.
Exposure	CALL FOR MEDICAL AID LIQUID OR SOLID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected area with plenty of water. If IN EYES, hold eyes open and flush with plenty of water. If SWALLOWED, do not induce vomiting. Have victim drink water. If SWALLOWED, but victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not drink. Accept victim water. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operators of water works.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 445-4) Issue warning - water contaminant. Disperse and flush.	2. LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Benzyl dimethylstearylamm. onium chloride, Dimethylbenzyl octadecyl ammonium chloride, Dimethyloctadecylbenzyl- ammonium chloride, Octadecyl dimethylbenzyl ammonium chloride 3.2 Coast Guard Compatibility Classification: Not listed <i>(Continued on page 4)</i>	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or viscous liquid 4.2 Color: White 4.3 Odor: Mild
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Ingestion causes gastrointestinal disturbances. Contact with chemical irritates eyes and skin and may damage eyes. 5.3 Treatment for Exposure: INGESTION: do NOT induce vomiting; give large quantities of fluid and call physician immediately. EYES: flush with plenty of water for at least 15 min.; call a physician. SKIN: remove contaminated clothing; flush skin with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, oral rat LD ₅₀ = 4,000 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen and hydrochloric acid fumes may form in fires. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aquatic Toxicity: 5 ppm/48 hr. (australorbis snails/80% km/fresh water) 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Fine Organics Inc. 205 Main Street Lodi, N. J. 07644 2. Lonza Inc. Lay Lawn, N. J. 07410 3. Ashland Chemical Company P. O. Box 2219 Columbus, Ohio 43216
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) SS	10. SHIPPING INFORMATION 10.1 Grades or Purity: Pure 95+%, 24-26% solution in water. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 411. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes at 120°C). 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: > 1.1 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent. <i>(Continued on pages 5 and 6)</i>
3 CHEMICAL DESIGNATIONS (Cont'd) 3.3 Chemical Formula: (C ₁₈ H ₃₇)(C ₁₈ H ₃₇)(C ₁₈ H ₃₇)NCl 3.4 IMCO/United Nations Numerical Designation: Not listed.	

BMA

BENZYLTRIMETHYLAMMONIUM CHLORIDE

Common Synonyms BTMAC Trimethylbenzylammonium chloride		Liquid Light yellow Mild almond odor May float or sink in water
Stop discharge if possible. Keep people away. Avoid contact with liquid. Evacuate and remove discharged material. Notify local health and pollution control agencies.		
Fire		Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or water. Water may be ineffective in fire.
Exposure		CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Flush with water for 15 minutes. IF SWALLOWED: Give victim 1-2 glasses of water. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: Do not induce vomiting. Keep victim warm.
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operator of nearby water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning - water contaminant. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: BTMAC Trimethylbenzylammonium chloride 3.2 Coast Guard Competibility Classification: Not listed 3.3 Chemical Formula: $C_6H_5CH_2N(CH_3)_3Cl$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light yellow 4.3 Odor: Mild almond
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles and rubber gloves. 5.2 Symptoms Following Exposure: Ingestion causes gastrointestinal disturbances. Contact with liquid irritates eyes and may irritate skin. 5.3 Treatment for Exposure: INGESTION: Give large amount of water. Get medical attention. EYES: Flush with water for at least 15 minutes. If irritation continues, get medical attention. SKIN: Flush well with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 50-900 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not pertinent
 6.2 **Flammable Limits in Air:** Not pertinent
 6.3 **Fire Extinguishing Agents:** Not pertinent
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
 6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen and hydrochloric acid fumes may form in fire.
 6.6 **Behavior in Fire:**
 6.7 **Ignition Temperature:** Not pertinent
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Not pertinent

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available.
 8.2 **Waterfowl Toxicity:** Data not available.
 8.3 **Biological Oxygen Demand (BOD):** Data not available.
 8.4 **Food Chain Concentration Potential:** None.

9 SELECTED MANUFACTURERS

1. Tanalox Chemical Company
 Page and Schuster Avenues
 Lyndhurst, N. J. 07071
 2. Yu. Chemical Co.
 P. O. Box 70
 Chester, N. C. 29706
 3. Ashland Chemical Company
 P. O. Box 2219
 Columbus, Ohio 43216

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction.
 7.2 **Reactivity with Common Materials:**
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
 7.5 **Polymerization:** Not pertinent.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

10. SHIPPING INFORMATION

- 10.1 **Grades or Purity:** 50% (60% solution in water).
 10.2 **Storage Temperature:** Ambient.
 10.3 **Inert Atmosphere:** No requirement.
 10.4 **Venting:** Open.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)
 A P

12 HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed.
 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.
 12.3 **NFPA Hazard Classifications:** Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid.
 13.2 **Molecular Weight:** 172 (solute).
 13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes).
 13.4 **Freezing Point:** Not pertinent.
 13.5 **Critical Temperature:** Not pertinent.
 13.6 **Critical Pressure:** Not pertinent.
 13.7 **Specific Gravity:** 1.07 at 20°C (liquid).
 13.8 **Liquid Surface Tension:** Data not available.
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
 13.12 **Latent Heat of Vaporization:** Not pertinent.
 13.13 **Heat of Combustion:** Not pertinent.
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** Not pertinent.
 13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 5 and 6)

NOTES

BIC

BERYLLIUM CHLORIDE

Common Synonyms		Solid	White to green	Sharp odor
		Sinks and mixes violently with water		
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear dust respirator and rubber-vented gloves, including gloves when the hands are soiled. Isolate area from unshielded material. Notify local health and pollution control agencies.				
Fire		Not flammable Irritating gases may be produced when heated. Wear goggles and mask. Do not use water on fires. DO NOT USE WATER ON ADJACENT FIRES.		
Exposure		CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing, difficult breathing, or loss of consciousness. If inhaled, immediately flush with plenty of water. If breathing has stopped, artificial respiration. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Will burn skin and eyes. If swallowed will cause nausea, coughing, or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, flush with water for at least 15 min. If irritation persists, get medical attention. If SWALLOWED and victim is conscious, flush with water. If SWALLOWED and victim is unconscious or having convulsions, do nothing except keep victim warm.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and pollution control agencies.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison corrosive Restrict access Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: BeCl ₂ 3.4 IMCO/United Nations Numerical Designation: 6.1 (1566)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White to green 4.3 Odor: Sharp, acrid		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Respirators, protection gloves, freshly laundered clothing, chemical safety goggles 5.2 Symptoms Following Exposure: Inhalation causes pneumonitis, nasopharyngitis, tracheitis, dyspnea, chronic cough. Ingestion causes irritation of mouth and stomach. Contact with dust causes conjunctival inflammation of eyes and irritation of skin. Any dramatic, unexplained weight loss should be considered as a possible first indication of beryllium disease. 5.3 Treatment for Exposure: INHALATION: chest x-ray should be taken immediately for evidence of pneumonitis. EYES: flush with water for at least 15 min.; if irritation persists, get medical attention. SKIN: cuts or puncture wounds in which beryllium may be embedded under the skin should be thoroughly cleansed immediately by a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.002 mg./m ³ (as beryllium) 5.5 Short-Term Inhalation Limits: 0.025 mg./m ³ less than 30 min. 5.6 Toxicity by Ingestion: Grade 3 oral: LD ₅₀ = 86 mg./kg. 5.7 Late Toxicity: Reproduces a chronic systemic disease that primarily affects the lung but also can involve other organs such as lymph nodes, liver, bones, and kidneys. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS

- 6.1 Flash Point: Not flammable.
 6.2 Flammable Limits in Air: Not flammable.
 6.3 Fire Extinguishing Agents: Not pertinent.
 6.4 Fire Extinguishing Agents Not to be Used: Do not use water on adjacent fires.
 6.5 Special Hazards of Combustion Products: Toxic and irritating beryllium oxide fumes and hydrogen chloride may form in fires.
 6.6 Behavior in Fire:
 6.7 Ignition Temperature: Not pertinent.
 6.8 Electrical Hazard: Not pertinent.
 6.9 Burning Rate: Not pertinent.

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Reacts vigorously with evolution of heat. Forms beryllium oxide and hydrochloric acid solution.
 7.2 Reactivity with Common Materials: Corrodes most metals in presence of moisture. Flammable and explosive hydrogen gas may collect in enclosed spaces.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: 0.15 ppm* /96 hr./fathead minnow, TL_m/soft fresh water.
 15 ppm* /96 hr./fathead minnow, TL_m/hard fresh water.
 *as beryllium.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): None.

(Continued on page 4)

9. SELECTED MANUFACTURERS

1. Kaweco Berico Industries, Inc.
 Hazleton, Pa. 18201.
 2. Varlacoid Chemical Co.
 666 South Front St.
 Elizabeth, N.J. 07202.
 3. Research Organic/Inorganic Chemical Corp.
 11686 Sheldon.
 Sun Valley, Calif. 91352.

10. SHIPPING INFORMATION

- 10.1 Grade or Purity: Commercial 99+%.
 10.2 Storage Temperature: Ambient.
 10.3 Inert Atmosphere: No requirement.
 10.4 Venting: Open.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 RR

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Poisonous solid, Class B.
 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed.
 12.3 NFPA Hazard Classifications: Not listed.

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid.
 13.2 Molecular Weight: 79.9.
 13.3 Boiling Point at 1 atm: (sublimes) 988°F = 520°C = 793°K.
 13.4 Freezing Point: 824°F = 440°C = 713°K.
 13.5 Critical Temperature: Not pertinent.
 13.6 Critical Pressure: Not pertinent.
 13.7 Specific Gravity: 1.90 at 25°C (solid).
 13.8 Liquid Surface Tension: Not pertinent.
 13.9 Liquid-Water Interfacial Tension: Not pertinent.
 13.10 Vapor (Gas) Specific Gravity: Not pertinent.
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.
 13.12 Latent Heat of Vaporization: Not pertinent.
 13.13 Heat of Combustion: Not pertinent.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: -1,000 Btu/lb = -457 cal/g = -213 × 10³ J/kg.
 13.16 Heat of Polymerization: Not pertinent.

(Continued on pages 5 and 6)

8. WATER POLLUTION (Cont'd.)

- 8.4 Food Chain Concentration Potential: Bioconcentration of 100 fold can occur under constant exposure. Not significant in spill conditions.

BEF

BERYLLIUM FLUORIDE

Common Synonyms		Solid	White	Odorless
Sinks and mixes with water				
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wash hands thoroughly with soap and water after handling. Do not eat, drink, or use tobacco while handling. Do not breathe dust.				
Fire	Not flammable			
	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED. IF SWALLOWED OR IF SKIN IS EXPOSED Will burn eyes. May cause severe irritation and burns. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Will burn eyes. May cause severe irritation and burns. If inhaled, get medical attention immediately. If swallowed, get medical attention immediately. If skin is exposed, get medical attention immediately. Do not breathe dust.			
Exposure				
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Do not discharge into water.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-1)		2. LABEL		
Issue warning: poison, water contaminant. Restrict access. Should be removed. Chemical and physical treatment.				
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: No common synonyms.		4.1 Physical State (as shipped): Solid		
3.2 Coast Guard Compatibility Classification: Not listed.		4.2 Color: White		
3.3 Chemical Formula: BeF ₂		4.3 Odor: None		
3.4 IMCC/United Nations Numerical Designation: 6.1.1560				
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Respiratory protection, gloves, goggles.				
5.2 Symptoms Following Exposure: Any dramatic weight loss should be considered as possible first indication of beryllium disease. Inhalation causes irritation of nose, throat, and lungs; severe pneumonitis and/or pulmonary edema. Ingestion causes fatigue, weakness, loss of appetite. Contact with eyes causes severe irritation and burns. Contact with skin causes dermatitis and non-healing ulcers.				
5.3 Treatment for Exposure: INHALATION: move to fresh air; chest x-ray should be taken immediately to detect pneumonitis; if exposure has been severe, INGESTION: induce vomiting; get medical attention. EYES: flush with water for at least 15 min; get medical attention. SKIN: flush with water; get medical attention if skin has been broken.				
5.4 Toxicity by Inhalation (Threshold Limit Value): 0.002 mg/m ³ (as beryllium)				
5.5 Short-Term Inhalation Limits: 0.025 mg/m ³ less than 30 min				
5.6 Toxicity by Ingestion: Grade 3, oral LD ₅₀ = 100 mg/kg (mouse)				
5.7 Late Toxicity: Berylliosis of lungs may occur from 3 months to 15 years after exposure. Chronic systemic diseases of the liver, spleen, lymph nodes, bone, kidney, and other organs may also occur.				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS

- 6.1 Flash Point: Not flammable
- 6.2 Flammable Limits in Air: Not flammable
- 6.3 Fire Extinguishing Agents: Not pertinent
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
- 6.5 Special Hazards of Combustion Products: Toxic and irritating vapor of unburned material may form in fire
- 6.6 Behavior in Fire:
- 6.7 Ignition Temperature: Not pertinent
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity:
0.15 ppm*/96 hr fathead minnow, 11 m
fresh (soft) water;
15 ppm*/96 hr fathead minnow, 11 m
fresh (hard) water
*As beryllium
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): None
- 8.4 Food Chain Concentration Potential: Bioconcentration of 100 fold under constant exposure only. Not significant under spill conditions.

9. SELECTED MANUFACTURERS

1. Kaweski Beryllio Industries, Inc.
P.O. Box 429
Hazleton, Pa. 18201
2. Brush Wellman, Inc.
South River Road
Elmore, Ohio 43416
3. Gallard Schlessinger Chemical Mfg. Co.
564 Mineola Ave.
Carle Place, N.Y. 11514

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials:
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Purified 99.9%
Chemically pure 99.9%
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 444-3)
SS

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Poisonous solid, Class B
- 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
- 13.2 Molecular Weight: 47
- 13.3 Boiling Point at 1 atm: Not pertinent (sublimes at 800°C)
- 13.4 Freezing Point: Not pertinent
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.99 at 20°C (solid)
- 13.8 Liquid Surface Tension: Not pertinent
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (G_{as}): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: Not pertinent
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: 180 Btu/lb
= 98 cal/g = 41 × 10³ J/kg
- 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 4 and 5)

NOTES

BEM

BERYLLIUM METALLIC

Common Synonyms		Solid	Silver color	Odorless
		Sinks in water		
AVOID CONTACT WITH SOLID AND DUST. KEEP OFF FLOOR AND ON Wear dust respirator and rubber or scotch gloves. In hot gloves Stop discharge if possible Call fire department Isolate and remove discharged material Notify local health and pollution control agencies				
Fire		Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Dust cloud may explode if ignited in an enclosed area Wear goggles and self-contained breathing apparatus Extinguish with dry graphite powder or other non-powder DO NOT USE WATER ON FIRE		
		CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing If on eyes, hold eyes open and flush with plenty of water If breathing has stopped, use artificial respiration If breathing is difficult, use oxygen SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Remove contaminated clothing and shoes If food, offer first aid with plenty of water IF IN EYES, hold eyes open and flush with plenty of water If SWALLOWED and victim is CONSCIOUS, use victim drink water or milk and have victim induce vomiting If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm		
Exposure				
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not a health contaminant Not a pollutant for surface water bodies		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: person, water, contain, inant Restrict access Should be removed Chemical and physical treatment		2 LABELS No hazard label required in Code 1 Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: Be 3.4 IMCO/United Nations Numerical Designation: 4.1 156		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Bu. Mines approved respirator, clean work clothes, daily gloves, eye protection 5.2 Symptoms Following Exposure: Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Dust is extremely toxic when inhaled. Symptoms include coughing, shortness of breath, and acute or chronic lung disease. There is no record of illness from ingestion of beryllium. Contact with dust causes conjunctival inflammation of eyes and dermatitis. 5.3 Treatment for Exposure, INHALATION: acute disease may require hospitalization with administration of oxygen. chest x-ray should be taken immediately. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. all cuts, scratches or other injuries should receive prompt medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.002 mg/m 5.5 Short-Term Inhalation Limits: 0.025 mg/m, 5 min 5.6 Toxicity by Ingestion: Grade 3 LD50 500 mg/kg 5.7 Late Toxicity: Beryllium disease may occur in lungs, lymph nodes, liver, spleen, kidneys, and other organs. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Graphite, soda or any other inert dry powder 6.4 Fire Extinguishing Agents Not to be Used: Water 6.5 Special Hazards of Combustion Products: Combustion yields beryllium oxide fume which is toxic if inhaled 6.6 Behavior in Fire: Powder may form explosive mixture with air 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Varfac and Chemical Co. 666 South Front St. Elizabeth, N.J. 07202 2. Gullard-Schlesinger Chemical Mfg. Co. 884 Mineola Avenue Carle Place, N.Y. 11814 3. Pfaltz and Bauer, Inc. 126-04 Northern Blvd. Flushing, N.Y. 11368								
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Grade XX 99.96+ Grade X 99.5+ Nuclear grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 9.01 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.85 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -25,000 Btu/lb = -15,560 cal/g = -652 X 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification*</th></tr><tr><td>Health Hazard (Blue)</td><td>4</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>1</td></tr></table> * Applies to dust or powder	Category	Classification*	Health Hazard (Blue)	4	Flammability (Red)	1	Reactivity (Yellow)	1	
Category	Classification*								
Health Hazard (Blue)	4								
Flammability (Red)	1								
Reactivity (Yellow)	1								
Continued on pages 5 and 6 NOTES									

BERYLLIUM NITRATE

Common Synonyms Beryllium nitrate trihydrate		Solid	White	Odorless
Sinks and mixes with water				
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear full respirator and rubber suit, gloves, and shoe covers. Stop discharging if possible. Isolate and contain discharge immediately. Notify local health and fire departments.				
Fire	Not flammable. Will increase the intensity of a fire. POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Flush with water.			
	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing. If eyes are affected, flush open and flush with plenty of water. If breathing is affected, give artificial respiration. If breathing is difficult, give oxygen.			
Exposure	SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED If swallowed will cause nausea, vomiting or loss of consciousness. If eyes are affected, flush open and flush with plenty of water. If in eyes, flush with plenty of water. If SWALLOWED, give water immediately. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not give anything by mouth.			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and fire departments.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: POISON, Water contaminant. Restrict access. Should be removed. Chemical and physical treatment.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Beryllium nitrate trihydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{Be}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: 6.1 1566		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Respiratory protection, gloves, freshly laundered clothing, chemical safety goggles. 5.2 Symptoms Following Exposure: Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Inhalation causes pneumonitis, nasopharyngitis, tracheobronchitis, dyspnea, chronic cough. Ingested on causes anorexia, fatigue, weakness, malaise. Contact with eyes causes conjunctival inflammation. Contact with skin causes dermatitis and non-healing ulcers. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, take chest x-ray immediately, check for pneumonia. INGESTION: induce vomiting, get medical attention. EYES: flush with water for at least 15 min., get medical attention. SKIN: cuts or puncture wounds in which beryllium may be embedded under the skin should be thoroughly cleaned immediately by a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.002 mg/m ³ as beryllium. 5.5 Short-Term Inhalation Limits: 0.025 mg/m ³ for less than 40 min. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: May cause chronic, systemic disease of the lung as well as other organs such as liver, spleen, lymph nodes, bone and kidneys. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS	7 CHEMICAL REACTIVITY	8 WATER POLLUTION
6.1 Flash Point: Not combustible 6.2 Flammable Limits in Air: Not combustible 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating beryllium oxide and oxides of nitrogen may form in fire 6.6 Behavior in Fire: May increase intensity of fire when in contact with combustible material 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	7.1 Reactivity with Water: Reacts to form weak solution of nitric acid; the reaction is not hazardous 7.2 Reactivity with Common Materials: In presence of moisture will damage wood and corrode most metals 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	8.1 Aquatic Toxicity: 0.15 ppm/96 hr fathead minnow, 11 m. soft water 20 ppm/96 hr fathead minnow, 11 m. hard water *as beryllium 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Bioconcentration of 100 fold can occur under constant exposure. Not significant in spill conditions
9 SELECTED MANUFACTURERS	10. SHIPPING INFORMATION	11 HAZARD ASSESSMENT CODE
1. Kawaoka-Berko Industries, Inc. Harleton, Pa. 18201 2. Varfac and Chemical Co. 666 South Front St. Elizabeth, N. J. 07202 3. Gallard-Schlesinger Chemical Mfg. Co. 584 Mincola Avenue Cark Place, N. Y. 11814	10.1 Grades or Purity: Purified 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not requirement 10.4 Venting: Open	(See Hazard Assessment Handbook, CG 444-3) SS
12 HAZARD CLASSIFICATIONS	13 PHYSICAL AND CHEMICAL PROPERTIES	14 HAZARD CLASSIFICATIONS
12.1 Code of Federal Regulations: Poisonous solid, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 201.1 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.46 at 20°C (solids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent	15 HAZARD CLASSIFICATIONS

BE0

BERYLLIUM OXIDE

Common Synonyms Beryllia Beryllite	Solid White Odorless Sinks in water
AVOID CONTACT WITH SOLIDS AND DUST. KEEF PEOPLE AWAY. Wear Dust Respirator and Protective Clothing in all operations. Not to be discharged if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and soft contact lenses in fire situations
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED If inhaled will cause coughing and difficult breathing. If inhaled, stop work immediately, get fresh air, and seek medical attention. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed, do not induce vomiting. Drink water and seek medical attention. If swallowed, do not induce vomiting. Drink water and seek medical attention. If swallowed, do not induce vomiting. Drink water and seek medical attention.
Water Pollution	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-1) Issue warning: poison water contamination. Restrict access. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Beryllia, Beryllite 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical formula: BeO 3.4 IMCO/United Nations Numerical Designation: 6.1.1.566	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Respiratory protection, gloves, freshly laundered clothing, chemical safety goggles. 5.2 Symptoms Following Exposure: Any dramatic, unexplained weight loss should be considered as possible first indication of beryllium disease. Other symptoms include anorexia, fatigue, weakness, malaise. Inhalation causes pneumonia, nasopharyngitis, tracheobronchitis, dyspnea, chronic cough. Contact with dust causes conjunctival inflammation of eyes and irritation of skin. 5.3 Treatment for Exposure: INHALATION: Take chest x-ray immediately, check for pneumonia. INGESTION: Induce vomiting, get medical attention. EYES: Flush with water for at least 15 min. SKIN: Get medical attention. SKIN: Get medical attention. SKIN: Get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.002 mg/m ³ as beryllium. 5.5 Short-Term Inhalation Limits: 0.025 mg/m ³ less than 30 min. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Beryllium disease may occur in lymph nodes, liver, spleen, kidneys, as well as lungs. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic, beryllium oxide fume may form in fire. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: Bioconcentration of 100-fold can occur under constant exposure. Not significant in pH conditions.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Varfac and Chemical Co. 666 South Front St. Elizabeth, N.J. 07202 2. Gallard-Schlesinger Chemical Mfg. Co. 584 Mineola Avenue Carle Place, N.Y. 11514 3. Ventron Corporation P.O. Box 159 Beverly, Mass. 01915
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-3) II	10. SHIPPING INFORMATION 10.1 Grades or Purities: Technical, Nuclear 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous solid, Class B. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 25. 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 3.0 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES (See notes on pages 3 and 4)	

BES

BERYLLIUM SULFATE

Common Synonyms Beryllium sulfate tetrahydrate		Solid	White	Odorless
		Sinks and mixes with water		
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY Wear eye protection, gloves, and a respirator when handling solid and dust. Avoid contact with skin and eyes. Avoid contact with clothing. Avoid contact with food and drink. Avoid contact with children and pets.				
Fire		Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Wear eye protection, gloves, and a respirator when handling solid and dust.		
		CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing. If skin is exposed will cause irritation or difficulty breathing. If swallowed will cause irritation or difficulty breathing. SOLID Irritating to skin and eyes Harmful if swallowed Wear eye protection, gloves, and a respirator when handling solid and dust. Avoid contact with skin and eyes. Avoid contact with clothing. Avoid contact with food and drink. Avoid contact with children and pets.		
Exposure		If swallowed If swallowed will cause irritation or difficulty breathing. 		

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic beryllium oxide and sulfuric acid fumes may form in fire 6.6 Behavior in Fire 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 11 ppm 96 hr fathead minnow 11 m hard fresh water 0.2 ppm 96 hr fat cad minnow 11 m soft fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Bioconcentration of 100-fold can occur under constant exposure. Not significant in spill conditions
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Brush Wellman Inc. Lima, Ohio 43426 2. Kaweco Beryll Industries, Inc. Hartleton, Pa. 15201 3. Varfacoid Chemical Co. 666 South Front St. Elizabeth, N. J. 07202
	10 SHIPPING INFORMATION 10.1 Grades or Purity: High purity Analytical grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NN	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 171.14 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.71 at 15°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -13 kcal/mole = -54.4 kJ/mole 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous solid, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

BOC

BISMUTH OXYCHLORIDE

Common Synonyms Basic bismuth chloride Basic bismuth chloride Bismuthyl chloride Bismuth subchloride		Solid	White	Colorless
		Sinks in water		
Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Not flammable Irritating gases may be produced when heated Wear goggles and self-contained breathing apparatus		
Exposure		CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat Harmful if inhaled If in eyes: Hold eyelids open and flush with copious amounts of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED: and victim is CONSCIOUS: Have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING TROUBLE SWALLOWING: do nothing except keep person warm.		
Water Pollution:		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife agencies. Notify operators of water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Basic bismuth chloride Bismuth chloride oxide, Bismuth subchloride, Bismuthyl chloride, Pearl white 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: BOCl ₂ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, protective gloves, dust mask. 5.2 Symptoms Following Exposure: Contact with dust causes irritation and can cause skin rashes. 5.3 Treatment for Exposure: EYES: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3 (Dose 2) - see page 14. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 5.1 Flash Point: Not flammable 5.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride gas may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 The Mearl Corp. 41 East 42nd St. New York, N.Y. 10017 2 Mallock Chemical Works 223 Westside Ave. P.O. Box 384 Jersey City, N.J. 07310 3 Whittaker Corporation Rona Pearl Company Division East 21st Street Bayonne, N.J. 07002
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Dry powder (99.9% aqueous concentrates may contain solid in fine alcohol or castor oil) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3.) II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 260.4 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 7.7 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	

NOTES

6 FIRE HAZARDS 6.1 Flash Point: 250°F (121°C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Data not available 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Dow Chemical Co. Midland, Michigan 48620 2 General Electric Co. O'Plains, N.Y. Pittsfield, Mass. 01201 3 Shell Chemical Co. Polycres Div. P.O. Box 243 Houston, Texas 77001
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial high purity 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Data not available 10.4 Venting: Data not available
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 445.3 11	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Solid 13.2 Molecular Weight: 226.25 13.3 Boiling Point at 1 atm.: Not pertinent 13.4 Freezing Point: 133°F and 57°C = 240 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.42 at 25°C and 1 atm. 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

NOTES

BDE

BISPHENOL A DIGLYCIDYL ETHER

Common Synonyms 4,4'-isopropylidenediphenol; epichlorohydrin resin Bisphenol A - epichlorohydrin condensate 2,2-Bis(p-hydroxyphenyl) propane, diglycidyl ether	Liquid Yellowish brown Sinks in water
Storage and Handling: Keep in original container, tightly closed. Avoid contact with liquid. Do not inhale vapors or dust. Notify local health and pollution control agencies.	
Fire	Combustible Extinguish with water or chemicals suitable for liquid.
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Wash affected areas with plenty of water. If IN EYES, hold open and flush with plenty of water. If SWALLOWED, do not induce vomiting. Give of first drink of water or milk. If SWALLOWED, get medical attention for possible HAVING CONSEQUENCES. Do not induce vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Should be removed. Chemical and physical treatment.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 4,4'-isopropylidenediphenol; epichlorohydrin resin; Bisphenol A; epichlorohydrin condensate; 2,2-Bis(p-hydroxyphenyl)propane; diglycidyl ether. 3.2 Coast Guard Competibility Classification: Not listed. 3.3 Chemical Formula: C ₁₅ H ₁₆ O ₂ . 3.4 IMCO/United Nations Numerical Designation: Not listed.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Amber. 4.3 Odor: Data not available.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, goggles, protective clothing and protective creams. Good personal hygiene is necessary, with instruction of personnel and adequate cleanliness facilities. 5.2 Symptoms Following Exposure: Contact with liquid irritates eyes. Prolonged or repeated contact with skin causes irritation and dermatitis. 5.3 Treatment for Exposure: EYES: Flush with water for at least 15 min. SKIN: Remove chemical with water or waterless skin cleaner. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade I LD ₅₀ = 5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on, clothing and allowed to remain, may cause smearing and reddening of skin. 5.10 Odor Threshold: Odorless.	

6. FIRE HAZARDS 6.1 Flash Point: 175°F (80°C). 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Foal Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Shell Chemical Co. 1 Shell Plaza Houston, Texas 77002.																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-2) A X	10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAF Hazard Rating for Bulk Water Transportation: <table data-bbox="922 1430 1161 1703"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td></td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>0</td></tr> <tr><td>Liquid or Solid Irritant</td><td>1</td></tr> <tr><td>Poisons</td><td>1</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>1</td></tr> <tr><td>Aquatic Toxicity</td><td>0</td></tr> <tr><td>Aesthetic Effect</td><td>0</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>2</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed.	Category	Rating	Fire		Health		Vapor Irritant	0	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	0	Aesthetic Effect	0	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 140. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.16 at 20°C (liquid). 13.8 Liquid Surface Tension: Data not available. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Data not available. 13.13 Heat of Combustion: (est.) = 14,900 Btu/lb = 4,100 cal/g = 140 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Data not available.
Category	Rating																												
Fire																													
Health																													
Vapor Irritant	0																												
Liquid or Solid Irritant	1																												
Poisons	1																												
Water Pollution																													
Human Toxicity	1																												
Aquatic Toxicity	0																												
Aesthetic Effect	0																												
Reactivity																													
Other Chemicals	2																												
Water	0																												
Self Reaction	1																												
NOTES (Continued on pages 5 and 6)																													

BCP

BOILER COMPOUND, LIQUID

Common Synonyms	Liquid Colorless to brown Odorless to mild odor Sinks and mixes with water
Hazardous Properties	Acute toxicity: LD₅₀ (oral, rat) = 1.5 g/kg Subacute toxicity: LD₅₀ (oral, rat) = 1.5 g/kg Subchronic toxicity: LD₅₀ (oral, rat) = 1.5 g/kg Chronic toxicity: LD₅₀ (oral, rat) = 1.5 g/kg
Fire	Not flammable Flammable gas may be produced on contact with metals.
Exposure	LIQUID Will burn skin and eyes Harmful if swallowed R 22/23/24/25 S 2/3/4/5/6/7/8/9/10/11/12/13/14/15/16/17/18/19/20/21/22/23/24/25/26/27/28/29/30/31/32/33/34/35/36/37/38/39/40/41/42/43/44/45/46/47/48/49/50/51/52/53/54/55/56/57/58/59/60/61/62/63/64/65/66/67/68/69/70/71/72/73/74/75/76/77/78/79/80/81/82/83/84/85/86/87/88/89/90/91/92/93/94/95/96/97/98/99/100
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Summary Handbook, CG 446-1)	2. LABEL 
3. CHEMICAL DESIGNATIONS	4. OBSERVABLE CHARACTERISTICS
3.1 Synonyms: Alkylar liquid alkaline detergent 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: Not pertinent 3.4 IMCO/United Nations Numerical Designation: Not listed	4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to brown 4.3 Odor: Mild to mild
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves, protective clothing 5.2 Symptoms Following Exposure: Contact of liquid with eyes causes severe caustic burns. Also causes caustic burns of skin if not washed off immediately. Ingestion causes caustic burns of mouth and stomach. 5.3 Treatment for Exposure: Basic treatment is identical with that for caustic soda or caustic potash solutions. EYES: flush with water for at least 15 min., call a doctor. SKIN: flush with water, wash with soap and water. INGESTION: give large amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 mg/m 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Not pertinent 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent	

6. FIRE HAZARDS	8. WATER POLLUTION
6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: May burn container 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8.1 Acute Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY	9. SELECTED MANUFACTURERS
7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Attacks aluminum and zinc, the reaction may form flammable hydrogen gas. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	1. BASF Wyandotte Corp. Chemical Specialties Division Wyandotte, Mich. 48192 2. Nalco Chemical Co. 400 N. Michigan Ave. Chicago, Ill. 60601 3. Oak Water Services 3555 Fiberglas Road Kansas City, Kan. 64118
11. HAZARD ASSESSMENT CODE (See HAZARD ASSESSMENT Handbook, CG 446-3)	10. SHIPPING INFORMATION
12. HAZARD CLASSIFICATIONS	10.1 Grades or Purity: Various commercial grades, some of which contain chelating and complexing agents for metals 10.2 Storage Temperature: Ambient, preferably 40-100 F 10.3 Inert Atmosphere: No requirement 10.4 Venting: Once
13. PHYSICAL AND CHEMICAL PROPERTIES	NOTES
13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: >220°C = >424°F = 2.277E 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.45 at 20°C (liquids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	(continued on pages 1 and 2)

BAC

BORIC ACID

Common Synonyms Orthoboric acid Boric acid		Solid	White	Odorless
		Sinks and mixes with water		
See Section 5.1 for information on the physical and chemical properties of boric acid. The following information is provided for the purpose of identifying the material and is not intended to be used for identification purposes.				
Fire	Not flammable			
Exposure	CALL FOR MEDICAL AID. SOLID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Respiratory irritation may occur if inhaled. Eye irritation may occur if contact with eyes. IF IN EYES: Flush eyes with water for at least 15 minutes. IF SWALLOWED: Do not induce vomiting. Drink water. IF ON SKIN: Wash with water. IF ON CLOTHING: Remove clothing and wash with water. IF ON EYES: Flush eyes with water for at least 15 minutes. IF SWALLOWED: Do not induce vomiting. Drink water. IF ON SKIN: Wash with water.			
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. No known adverse effects on humans. No known adverse effects on the environment.			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-1. Issue warning: water contaminant. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Boric acid, Orthoboric acid. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: H_3BO_3 . 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: White. 4.3 Odor: None.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical goggles. 5.2 Symptoms Following Exposure: Although no adverse effect has been reported from the use of boric acid dust, it is absorbed through mucous membranes. Ingestion of 1 gram or more may irritate gastrointestinal tract and affect central nervous system. Contact with dust or aqueous solutions may irritate eyes. No known effects have been recognized but unknown effects should be avoided. Dust and solutions are absorbed through burns and open wounds but not through unbroken skin. 5.3 Treatment for Exposure: INHALATION: Remove from contaminated atmosphere. INGESTION: Obtain medical attention as soon as possible. If the patient is conscious, induce vomiting by giving warm salty water (2 tablespoons of table salt to a pint of water or warm soap suds). If this measure is unsuccessful, vomiting may be induced by tickling the back of the patient's throat with a finger. Vomiting should be encouraged about three times or until the vomitus is clear. Additional water may be given to wash out the stomach. EYES: Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the irrigation to ensure flushing of the entire surface of the eye. Flush with water when medical attention is available. Continue the irrigation for at least 15 minutes. If the physician cannot locate the SKIN, immediately flush affected area with water. Remove contaminated clothing under the shower. Continue washing with water. Do not attempt to treat skin with chemical agents. Obtain medical attention as soon as possible. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m ³ as TSP, 0.1 mg/m ³ as respirable. 5.5 Short-Term Inhalation Limits: Data not available.				

Continued on page 4

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	7 WATER POLLUTION 7.1 Aquatic Toxicity: 1000 ppm 24 hr. mortality to fish. 11 mg. fresh water 7.2 Waterway Toxicity: Data not available 7.3 Biological Oxygen Demand (BOD): None 7.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Kerr-McGee Chemical Corp. Kerr-McGee Bldg. Oklahoma City, OK 73102 E. S. Lucas and Chemical Co. 3075 Wilshire Blvd. Los Angeles, Calif. 90010 Stauffer Chemical Co. Industrial Chemical Div. Westport, Conn. 06880
	10. SHIPPING INFORMATION 10.1 Grades or Purities: Radio 99.99% Technical 99.95% N.F. 99.95% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-1 00-II	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 61.83 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.87 g./ml. (solid) 13.8 Liq. Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -11.7 kcal./mole -11.7 kcal/g. x 1000 = 11,700 cal/g. 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 MAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
5 HEALTH HAZARDS (Cont'd) 5.6 Toxicity by Ingestion: LD50 2.5 g/kg body weight 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: None	

(continued on page 4)

BTB

BORON TRIBROMIDE

Common Synonyms	Liquid	Colorless	Sharp odor
Reacts violently with water Poisonous vapor is produced			
Avoid contact with liquid in large quantities. Avoid contact with skin. Avoid contact with eyes. Avoid contact with clothing. Avoid contact with food and drink. Avoid contact with children.			
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Wear mask and self-contained breathing apparatus. DO NOT USE WATER ON ABOVE FIRES.		
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If in eyes: Flush eyes with plenty of water. If in clothing: Flush with plenty of water. If in food: Flush with plenty of water. LIQUID Will burn skin and eyes If swallowed will cause nausea and vomiting If in eyes: Flush eyes with plenty of water. If in clothing: Flush with plenty of water. If in food: Flush with plenty of water. If SWALLOWED: Give large amounts of water. If in eyes: Flush with plenty of water. If in clothing: Flush with plenty of water. If in food: Flush with plenty of water.		
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health department. Notify police for leaks or spills.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-6) Issue warning: corrosive, air contaminant Restrict access Disperse and flush with care		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Competibility Classification: Not listed 3.3 Chemical Formula: BBr ₃ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sharp, irritating	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety glasses or face mask, rubber gloves, and respiratory protection 5.2 Symptoms Following Exposure: Inhalation causes severe irritation of mucous membranes. Ingestion causes burns of mouth and stomach. Contact with eyes or skin causes severe burns. 5.3 Treatment for Exposure: Get medical attention for all exposures to this chemical. INHALATION: Remove from exposure, support respiration. INGESTION: Give large amounts of water. EYES: Flush with water for at least 15 min. SKIN: Wash thoroughly with water. Launder clothing before reuse. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Do not use water or foam on adjacent fires. 6.5 Special Hazards of Combustion Products: Toxic fumes of the chemical or hydrogen bromide may form in fires. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently to form hydrobromic acid solution and fumes. 7.2 Reactivity with Common Materials: Strongly attacks metals and wood. Flammable hydrogen gas may collect in enclosed spaces. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Eagle-Picher Industries, Inc. Miami Research Laboratories Miami, Okla. 74354 2 Gallard-Schlesinger Chemical Mfg. Co. 584 Mineola Avenue Cattle Place, N.Y. 11514 3 Vertron Corporation P.O. Box 159 Beverly, Mass. 01915
	10. SHIPPING INFORMATION 10.1 Grades or Purities: Epitaxial 99.999+%, Pure 99.99+%, Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Padded 10.4 Venting: Pressure/vacuum
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A O	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 250.5 13.3 Boiling Point at 1 atm: 196°F = 91°C = 364°K 13.4 Freezing Point: -51°F = -46°C = 227°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.645 at 20°C (liquid) 13.8 Liquid Surface Tension: 29.1 dynes/cm = 0.0291 N/m at 22°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 8.64 13.11 Ratio of Specific Heats of Vapor (Gas): 1.140 13.12 Latent Heat of Vaporization: 52 Btu/lb = 29 cal/g = 1.2×10^5 J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
(Continued on pages 5 and 6)	
NOTES	

BRT

BORON TRICHLORIDE

Common Synonyms		Liquid	Colorless	Irritating odor
		Reacts violently with water. Irritating visible vapor cloud is produced. Boiling point is 54°F.		
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP FROM FIRE. Wear goggles with indirect ventilation and face shield. Do not breathe vapors. Do not get liquid on skin or clothing. If on skin, wash with plenty of water. If on clothing, remove clothing and wash skin. If in eyes, hold closed, pour and flush with plenty of water. If swallowed, do not induce vomiting. If victim is unconscious, have victim drink water or milk. DO NOT INDUCE VOMITING.				
Fire		Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Do not expose container to fire.		
 Exposure		CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. May irritate lungs. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing. If on face, flush affected areas with plenty of water. If IN EYES, hold closed, pour and flush with plenty of water. If SWALLOWED, do not induce vomiting. If victim is UNCONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not to be discharged into water. Not to be poured down the drain.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: corrosive air contaminant. Restrict access. Evacuate area. Disperse and flush.		2. LABEL  CORROSIVE		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Boron trichloride. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: BCl ₃ . 3.4 IMCO/United Nations Numerical Designation: 2.1741.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Acid and irritating.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical goggles, rubber protective clothing and gloves, self-contained breathing apparatus. 5.2 Symptoms Following Exposure: Inhalation causes edema and severe irritation of the upper respiratory system. Contact with liquid causes acid burns of eyes and severe burns of skin. Ingestion causes severe burns of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, give oxygen or apply artificial respiration. Keep arm, call a doctor at once, observe for pulmonary edema. EYES: wash with plenty of water for 15 min., consult an eye specialist. SKIN: wash off with plenty of water. INGESTION: do NOT induce vomiting, give large amount of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, LD ₅₀ 0.5 to 5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Decomposes in moist air, releasing hydrochloric acid and decomposition products: hydrochloric acid 1 ppm.				

6. FIRE HAZARDS

6.1 **Flash Point** Not flammable
6.2 **Flammable Limits in Air** Not flammable
6.3 **Fire Extinguishing Agents** Not pertinent
6.4 **Fire Extinguishing Agents Not to be Used** Not pertinent
6.5 **Special Hazards of Combustion Products** Not pertinent
6.6 **Behavior in Fire** Toxic fumes of hydrogen chloride are given off upon contact with water applied to adjacent fires
6.7 **Ignition Temperature** Not pertinent
6.8 **Electrical Hazard** Not pertinent
6.9 **Burning Rate** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Reacts vigorously to liberate heat and forms hydrogen chloride fumes (hydrochloric acid) and boric acid
7.2 **Reactivity with Common Materials:** Vigorously attacks elastomers and packing materials. Viton, Teflon, Saran or silastic elastomers and natural and synthetic rubbers are not recommended for service. Lead and graphite impregnated asbestos are to be avoided. In the presence of moisture, highly corrosive to most metals
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with sodium bicarbonate or solution
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** None
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Kerr-McGee Chemical Corp.
Kerr-McGee Building
Oklahoma City, Oklahoma 73101
2. Matheson Gas Products Co.
East Rutherford, New Jersey 07073
3. Union Carbide Corp.
Linde Division
270 Park Avenue
New York, New York 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purities:** C.P. (99.9+%)
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure/vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
A C-O

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Corrosive
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	3
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	4
Water	4
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas
13.2 **Molecular Weight:** 117.2
13.3 **Boiling Point at 1 atm:** 54.3°F = 12.4°C = 285.6°K
13.4 **Freezing Point:** -161°F = -197°C = 166°K
13.5 **Critical Temperature:** 352°F = 178°C = 451°K
13.6 **Critical Pressure:** 566 psia = 38.7 atm = 3.90 MPa/m²
13.7 **Specific Gravity:** 1.35 at 11°C (liquid)
13.8 **Liquid Surface Tension:** 15.7 dynes/cm = 0.0167 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 4
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1470
13.12 **Latent Heat of Vaporization:** 68.8 Btu/lb = 38.2 cal/g = 1.60 × 10³ J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** -13,000 Btu/lb = -7,200 cal/g = -300 × 10³ J/kg
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 4 and 5)

NOTES

BRX

BROMINE

Common Synonyms	Watery liquid Reddish-brown Sharp irritating odor Sinks in water. Irritating brown vapor is produced.
AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away from goggles, self-contained breathing apparatus and other very effective including rescue breathing apparatus. No breathing apparatus should be used in the vicinity.	
Fire	Not flammable May cause fire or contact with combustibles POISONOUS GASES ARE PRODUCED IN FIRE If exposed, get persons with water - wear goggles, self-contained breathing apparatus and rubber protective clothing and goggles.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled, will cause coughing, difficult breathing, or loss of consciousness Move to fresh air If breathing has stopped, give artificial respiration. Do NOT mouth-to-mouth If breathing is difficult, give oxygen LIQUID Will burn skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED, do not induce vomiting. Have victim drink water or milk.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Notify health and welfare officials Notify operator of nearby water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning - poison air contaminant Restrict access Isolate area Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Halogen 3.3 Chemical Formula: Br ₂ 3.4 IMCO/United Nations Numerical Designation: 80/1744	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Dark red-red brown 4.3 Odor: Sharp harsh penetrating
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety goggles, face shield, self-contained air line, canister mask, rubber suit 5.2 Symptoms Following Exposure: SKIN: contact with liquid or vapor may cause acne and slow healing ulcers. INHALATION: induces severe irritation of the respiratory passages and pulmonary edema. Prob. Lethal oral dose (for an adult) is 1 ml. A brief exposure to 1000 ppm may be fatal. 5.3 Treatment for Exposure: SKIN AND EYES: wash well with water and sodium bicarbonate solution. RESPIRATORY SYSTEM: if there is obstruction to breathing establish airway by pulling tongue forward, inserting an airway tube or doing a tracheostomy, begin artificial respiration. If difficulty in breathing is a result of pulmonary edema, treatment should be carried out with the patient in the sitting position. Administration of oxygen is most important. INGESTION: do not induce vomiting. Have victim drink water and milk. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 ppm 5.5 Short-Term Inhalation Limits: 0.4 ppm for 30 min 5.6 Toxicity by Ingestion: Not pertinent 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Causes severe eye or throat irritations which can cause eye or lung injury. Cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact. Very injurious to the eyes. 5.10 Odor Threshold: 3.5 ppm	

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable
6.2 **Flammable Limits in Air:** Not flammable
6.3 **Fire Extinguishing Agents:** Use water spray to cool exposed containers and to wash away spills.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
6.5 **Special Hazards of Combustion Products:** Toxic and irritating gases are generated when heated or in fires.
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** Not flammable
6.8 **Electrical Hazard:** Not pertinent
6.9 **Burning Rate:** Not flammable

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 10 ppm 10 hr cladophora killed fresh water
10 ppm * fish irritant salt water
* Time period not specified
8.2 **Waterway Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Not pertinent
8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Arkansas Chemicals Inc.
El Dorado, Arkansas 71730
2. Bromet Co.
Magnolia, Arkansas 71753
3. Dow Chemical Co.
Midland, Michigan 48640

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** Reacts violently with aluminum. May cause fire in contact with wood, cotton, straw, iron, steel, stainless steel and copper are corroded by bromine and are especially subject to attack by wet bromine. Of the plastics, only those which are highly fluorinated resist bromine attack.
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

10 SHIPPING INFORMATION

- 10.1 **Grades or Purities:** Commercial technical
10.2 **Storage Temperature:** Cool but above 20°F to prevent freezing
10.3 **Inert Atmosphere:** Data not available
10.4 **Venting:** Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 444-2)
A-P-X

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 159.81
13.3 **Boiling Point at 1 atm:** 138°F = 58.8°C = 332°K
13.4 **Freezing Point:** 19°F = -7.2°C = 266°K
13.5 **Critical Temperature:** Not pertinent
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 3.12 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 41 dynes/cm = 0.41 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Data not available
13.10 **Vapor (Gas) Specific Gravity:** < 5 at 20°C
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.3
13.12 **Latent Heat of Vaporization:** 80.6 Btu/lb = 44 N/m² g = 1.88 x 10⁶ J/kg
13.13 **Heat of Combustion:** Not pertinent
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Corrosive material
12.2 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 0 |
| Health | |
| Vapor Irritant | 4 |
| Liquid or Solid Irritant | 4 |
| Poisons | 4 |
| Water Pollution | |
| Human Toxics | 4 |
| Aquatic Toxics | 3 |
| Aesthetic Effect | 3 |
| Reactivity | |
| Other Chemicals | 4 |
| Water | 1 |
| Self Reaction | 0 |
- 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 4 |
| Flammability (Red) | 0 |
| Reactivity (Yellow) | 0 |

NOTES

(Continued on pages 5 and 6)

BPF

BROMINE PENTAFLUORIDE

Common Synonym:		Liquefied gas	Colorless	Irritating odor
Reacts violently with water Poisonous vapor is produced				
Store in airtight container. Keep people away. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Not flammable May cause fire on contact with combustibles Will increase the intensity of a fire POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire Wear goggles and self-contained breathing apparatus DO NOT USE WATER OR FOAM ON FIRE		
Exposure		CAUTION FOR MEDICAL AID: VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If eyes, nose and throat are irritated with persistent water If breathing has stopped, give artificial respiration If breathing is difficult, give oxygen LIQUID Will burn skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water If IN EYES, hold eyelids open and flush with plenty of water If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and pollution control agencies Notify appropriate federal water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-1) Issue warning: corrosive air contaminant Restrict access Evacuate area Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: BrF ₅ 3.4 IMCO/United Nations Numerical Designation: 8.1745		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied gas 4.2 Color: Colorless 4.3 Odor: Highly irritating		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus and suit and gloves 5.2 Symptoms Following Exposure: Chemical is highly corrosive and toxic. Inhalation causes severe burns of mucous membrane. Ingestion causes severe burns of mouth. Contact with eyes or skin causes severe burns. 5.3 Treatment for Exposure: Get medical attention IMMEDIATELY for any exposure to this chemical, even if no adverse effects are evident. INHALATION: remove victim from area, apply artificial respiration if breathing has ceased. INGESTION: give large amount of water. EYES: wash with copious amounts of water for 15 min. SKIN: wash with large amounts of water and follow with lime water; remove contaminated clothing. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS Chemical is strong oxidizer and may cause fire in contact with organic materials such as wood, cotton or straw. 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Do not use water or foam on adjacent fires 6.5 Special Hazards of Combustion Products: Toxic and irritating fumes of hydrogen fluoride and bromine may form in fires 6.6 Behavior in Fire: Containers may burst when exposed to heat of fire 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently with water, evolves hydrogen fluoride, an extremely irritating and corrosive gas. 7.2 Reactivity with Common Materials: Reacts violently with many metals and materials of construction such as wood, glass, some plastics. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Union Carbide Corp. Linde Division 270 Park Avenue New York, N.Y. 10017 2. Gallard Schlesinger Chemical Mfg. Co. 584 Mineola Avenue Carle Place, N.Y. 11514 3. Plantz and Bauer, Inc. 126-04 Northern Blvd. Flushing, N.Y. 11368								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A O Z	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 98.0+ Pure 99.9% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Padded 10.4 Venting: Safety relief								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizer 12.2 IAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>4</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>3</td></tr> </table> W 000	Category	Classification	Health Hazard (Blue)	4	Flammability (Red)	0	Reactivity (Yellow)	3	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 174.9 13.3 Boiling Point at 1 atm: 106°F = 41°C = 314 K 13.4 Freezing Point: -76°F = -60°C = 213 K 13.5 Critical Temperature: 327°F = 165°C = 439 K 13.6 Critical Pressure: Data not available 13.7 Specific Gravity: 2.48 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 6.03 13.11 Ratio of Specific Heats of Vapor (Gas): 1.059 at 25°C 13.12 Latent Heat of Vaporization: 76.8 Btu/lb = 42.7 cal/g = 179 J/g 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	4								
Flammability (Red)	0								
Reactivity (Yellow)	3								
NOTES (Continued on page 4 and 5)									

BTF

BROMINE TRIFLUORIDE

Common Synonyms	Liquid Colorless Extremely irritating odor Reacts violently with water. Poisonous gas is produced on contact with water. Freezing point is 28° F.
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Notify the following people: City or department Fire department Local health department Notify the following people: Notify the following people: Notify the following people:	
Fire	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Wear goggles and gloves when fighting fire. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.
Exposure	CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. May cause throat irritation. If in eyes, flush with plenty of water. If on skin, flush with plenty of water. If inhaled, get fresh air and breathe deeply. LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED: do not induce vomiting. Do not eat or drink. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify the local health department. Notify the local water supply authority.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Issue warning: corrosive, air contaminant. Restrict access. Evacuate area. Disperse and flush.	2. LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: BrF ₃ . 3.4 IMCO/United Nations Numerical Designation: 5.1746.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless to gray-yellow. 4.3 Odor: Extremely irritating.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, complete protective clothing, safety glasses, face shield. 5.2 Symptoms Following Exposure: Inhalation causes severe irritation of upper respiratory system. Contact with liquid or vapor causes severe burns of eyes and can cause ulcers and blindness. Contact with skin causes severe burns. Ingestion causes severe burns of mucous membranes. 5.3 Treatment for Exposure: Get immediate medical attention for all exposures. INHALATION: remove from exposure, support respiration. EYES: irrigate with copious amounts of water for at least 15 min. SKIN: wash with large amounts of water for at least 15 min, then rinse with sodium bicarbonate or lime solution. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 ppm (suggested). 5.5 Short-Term Inhalation Limits: 50 ppm, 30 min; 100 ppm, 3 min. 5.6 Toxicity by Ingestion: Data not available. 5.7 Lethal Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable but may cause fire on contact with combustibles. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water, foam. 6.5 Special Hazards of Combustion Products: Data not available. 6.6 Behavior in Fire: Forms very toxic and irritating fume. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously to generate toxic hydrogen fluoride gas (hydrofluoric acid). 7.2 Reactivity with Common Materials: Will cause severe corrosion of common metals and glass. May cause fire in contact with organic materials such as wood, cotton or straw. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with sodium bicarbonate or lime solution. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Matheson Gas Products Co. East Rutherford, N. J. 07073. 2. Union Carbide Corp. Linde Division 270 Park Avenue New York, N. Y. 10017. 3. Air Products and Chemicals, Inc. Specialty Gas Department P. O. Box 538 Allentown, Pa. 18105.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-3) A O	10. SHIPPING INFORMATION 10.1 Grades or Purity: 98+%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure vacuum.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizer. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 136.9. 13.3 Boiling Point at 1 atm: 28.4°F = 125.8°C = 399.0°K. 13.4 Freezing Point: 47.8°F = 8.8°C = 282.0°K. 13.5 Critical Temperature: (est) 162.1°F = 127°C = 400°K. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.81 at 20°C (liquid). 13.8 Liquid Surface Tension: 26.3 dynes/cm = 0.0363 N/m at 27°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 4.7. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1425. 13.12 Latent Heat of Vaporization: 130 Btu/lb = 74 cal/g = 3.1 X 10 ³ J/kg. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on page 2 and 3)	

BBZ

BROMOBENZENE

Common Synonyms Monobromobenzene Phenyl bromide Bromobenzol		Liquid	Colorless	Pleasant odor
		Sinks in water		
SAFETY DATA SHEET Section 1: Identification Section 2: Hazard Identification Section 3: Composition/Information on Ingredients Section 4: First Aid Measures Section 5: Fire Fighting Section 6: Accidental Release Measures Section 7: Handling and Storage Section 8: Exposure Controls/Personal Protection Section 9: Physical and Chemical Properties Section 10: Stability and Reactivity Section 11: Toxicological Information Section 12: Ecological Information Section 13: Disposal Considerations Section 14: Transport Information Section 15: Regulatory Information Section 16: Other Information				
Fire		Combustible Extinguish with water, foam, dry chemical, or carbon dioxide. Do not use alcohol. Can explode when heated or with		
Exposure		Colorless liquid LIQUID Irritating to skin and eyes. Harmful if swallowed. K ₁₀₀ = 1.5 (skin irritation) K ₁₀₁ = 1.5 (eye irritation) K ₁₀₂ = 1.5 (respiratory irritation) K ₁₀₃ = 1.5 (inhalation irritation) K ₁₀₄ = 1.5 (ingestion irritation) K ₁₀₅ = 1.5 (skin corrosion) K ₁₀₆ = 1.5 (eye corrosion) K ₁₀₇ = 1.5 (respiratory corrosion) K ₁₀₈ = 1.5 (inhalation corrosion) K ₁₀₉ = 1.5 (ingestion corrosion) K ₁₁₀ = 1.5 (skin sensitization) K ₁₁₁ = 1.5 (eye sensitization) K ₁₁₂ = 1.5 (respiratory sensitization) K ₁₁₃ = 1.5 (inhalation sensitization) K ₁₁₄ = 1.5 (ingestion sensitization)		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not recommended for use in water. Not recommended for use in wastewater.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Monobromobenzene Phenyl bromide Bromobenzol 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₆ H ₅ Br 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pleasant		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves and apron 5.2 Symptoms Following Exposure: Contact with liquid causes irritation of eyes and mild irritation of skin. Ingestion causes mild irritation of mouth and stomach 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: induce vomiting, consult a doctor 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS		8. WATER POLLUTION	
6.1	Flash Point: 124°F (40°C)	8.1	Aquatic Toxicity: Data not available
6.2	Flammable Limits in Air: Not pertinent	8.2	Waterfowl Toxicity: Data not available
6.3	Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide	8.3	Biological Oxygen Demand (BOD): Data not available
6.4	Fire Extinguishing Agents Not to be Used: Not pertinent	8.4	Food Chain Concentration Potential: Data not available
6.5	Special Hazards of Combustion Products: Irritating hydrogen bromide and other gases may be produced in fire		
6.6	Behavior in Fire: Not pertinent		
6.7	Ignition Temperature: 1,049°F		
6.8	Electrical Hazard: Data not available		
6.9	Burning Rate: 1.8 mm/min		
7. CHEMICAL REACTIVITY		9. SELECTED MANUFACTURERS	
7.1	Reactivity with Water: No reaction	1	Dow Chemical Co. Midland, Mich. 48640
7.2	Reactivity with Common Materials: No reaction	2	Great Lakes Chemical Corp. P. O. Box 2200 West Lafayette, Ind. 47906
7.3	Stability During Transport: Stable	3	Michigan Chemical Corp. 351 East Ohio Street Chicago, Ill. 60611
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent		
7.5	Polymerization: Not pertinent		
7.6	Inhibitor of Polymerization: Not pertinent		
		10. SHIPPING INFORMATION	
		10.1	Grades or Purity: Commercial
		10.2	Storage Temperature: Ambient
		10.3	Inert Atmosphere: No requirement
		10.4	Venting: Open (flame arrester)
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) XXX		13. PHYSICAL AND CHEMICAL PROPERTIES	
12. HAZARD CLASSIFICATION		13.1	Physical State at 15°C and 1 atm: Liquid
12.1	Code of Federal Regulations: Combustible Liquid	13.2	Molecular Weight: 157
12.2	NAB Hazard Rating for Bulk Water Transportation: Not listed	13.3	Boiling Point at 1 atm: 113°F = 156°C = 429°K
12.3	NFPA Hazard Classifications:	13.4	Freezing Point: -23.1°F = -30.6°C = 242.6°K
	Category Classification	13.5	Critical Temperature: 747°F = 397°C = 670°K
	Health Hazard (Blue) 2	13.6	Critical Pressure: 655 psia = 44.6 atm = 4.52 MN/m ²
	Flammability (Red) 2	13.7	Specific Gravity: 1.49 at 25°C (liquid)
	Reactivity (Yellow) 0	13.8	Liquid Surface Tension: 36 dynes/cm = 0.016 N/m at 20°C
		13.9	Liquid-Water Interfacial Tension: (est.) 30 dynes/cm = 0.030 N/m at 20°C
		13.10	Vapor (Gas) Specific Gravity: 5.4
		13.11	Ratio of Specific Heats of Vapor (Gas): 1.0931
		13.12	Latent Heat of Vaporization: 104 Btu/lb = 58 cal/g = 2.4 × 10 ³ J/kg
		13.13	Heat of Combustion: 8,510 Btu/lb = 4,740 cal/g = 198 × 10 ³ J/kg
		13.14	Heat of Decomposition: Not pertinent
		13.15	Heat of Solution: Not pertinent
		13.16	Heat of Polymerization: Not pertinent
		(Continued on pages 4 and 5)	
NOTES			

BRU

BRUCINE

Common Synonyms 1011 Dimethoxytryptamine (+) Brucine dihydrate		Solid	White	Odorless
Sinks in water				
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear dust respirator and rubber gloves. Do not breathe dust. Do not ingest or swallow. Do not get on skin or clothes. Do not get in eyes, nose or mouth. Do not get in eyes, nose or mouth.				
Fire		Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Water-soluble. Vaporizes. Toxic. Irritant. Corrosive. Extinguish with dry chemical or water.		
		CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Irritating to eyes, nose and throat. If in eyes, flush with water. If on skin, wash with soap and water. If swallowed, do not induce vomiting. If unconscious, have someone drink water. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED If swallowed will cause nausea and vomiting. If on skin, wash with soap and water. If in eyes, flush with water. If on skin, wash with soap and water. If swallowed, do not induce vomiting. If unconscious, have someone drink water. If swallowed, do not induce vomiting. If unconscious, have someone drink water.		
Exposure				
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not recommended for use in water. Not recommended for use in water.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison water contaminant. Restrict access. Should be removed. Chemical and physical treatment.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 31 Synonyms: Brucine dihydrate 1011 Dimethoxytryptamine 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: $C_{17}H_{14}N_2O_4$ ($C_{17}H_{14}N_2O_4 \cdot 2H_2O$) 34 IMCO/United Nations Numerical Designation: 611570		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: White 43 Odor: None		
5. HEALTH HAZARDS 51 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves. 52 Symptoms Following Exposure: Chemical irritant if inhaled, swallowed, or absorbed through skin. Inhalation produces intense bitter taste. Ingestion causes nausea, vomiting, restlessness, excitement, twitching, and (rarely) convulsions. Contact with dust irritates eyes. 53 Treatment for Exposure: INHALATION: remove victim from exposure. INGESTION: induce vomiting, get medical attention at once. EYES: flush with water for 15 min. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Grade 4, oral rat LD ₅₀ = 1 mg/kg. 57 Lethal Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Data not available. 59 Liquid or Solid Irritant Characteristics: Data not available. 510 Odor Threshold: Odorless.				

6 FIRE HAZARDS

- 61 **Flash Point:** Not pertinent (combustible solid)
 62 **Flammable Limits in Air:** Not pertinent
 63 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide
 64 **Fire Extinguishing Agents not to be Used:**
 65 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fires.
 66 **Behavior in Fire:**
 67 **Ignition Temperature:** Not pertinent
 68 **Electrical Hazard:** Not pertinent
 69 **Burning Rate:** Not pertinent

8 WATER POLLUTION

- 81 **Aquatic Toxicity:** Data not available
 82 **Waterfowl Toxicity:** Data not available
 83 **Biological Oxygen Demand (BOD):** Data not available
 84 **Food Chain Concentration Potential:** Possible bioaccumulation problem for the duration of 1 week

9. SELECTED MANUFACTURERS

1. Gallard Schlesinger Chemical Mfg. Co.
 584 Mincola Ave.
 Carle Place, N.Y. 11514
 2. Aldrich Chemical Co.
 940 W. Saint Paul Ave.
 Milwaukee, Wis. 53233
 3. Norve Laboratories, Inc.
 2038 Alameda Padre Serra
 Santa Barbara, Calif. 93103

7. CHEMICAL REACTIVITY

- 71 **Reactivity with Water:** No reaction
 72 **Reactivity with Common Materials:**
 73 **Stability During Transport:** Stable
 74 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 75 **Polymerization:** Not pertinent
 76 **Inhibitor of Polymerization:** Not pertinent

10 SHIPPING INFORMATION

- 101 **Grade or Purity:** Pure
 102 **Storage Temperature:** Ambient
 103 **Inert Atmosphere:** No requirement
 104 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 II

13. PHYSICAL AND CHEMICAL PROPERTIES

- 131 **Physical State at 15°C and 1 atm:** Solid
 132 **Molecular Weight:** 304.4
 133 **Boiling Point at 1 atm:** Not pertinent (decomposes)
 134 **Freezing Point:** 152°F = 174°C = 451°K
 135 **Critical Temperature:** Not pertinent
 136 **Critical Pressure:** Not pertinent
 137 **Specific Gravity:** > 1 at 20°C (solid)
 138 **Liquid Surface Tension:** Not pertinent
 139 **Liquid-Water Interfacial Tension:** Not pertinent
 1310 **Vapor (Gas) Specific Gravity:** Not pertinent
 1311 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 1312 **Latent Heat of Vaporization:** Not pertinent
 1313 **Heat of Combustion:** -13,400 Btu/lb
 = -7,440 cal/g = -311 X 10³ J/kg
 1314 **Heat of Decomposition:** Not pertinent
 1315 **Heat of Solution:** Not pertinent
 1316 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

BDI

BUTADIENE, INHIBITED

Common Synonyms Diene Viable diene 1,3-Butadiene	Liquefied compressed gas Colorless Gasoline-like odor Floats and boils on water. Flammable visible vapor cloud is produced.
Avoid contact with liquid and any key, or the away from a fire. If contact with liquid occurs, wash immediately with water. If contact with gas occurs, move to fresh air. If inhaled, get fresh air. If swallowed, do not induce vomiting. If on skin, wash with soap and water. If in eyes, flush with water for 15 minutes. If inhaled, get fresh air. If in eyes, flush with water for 15 minutes. If on skin, wash with soap and water. If in eyes, flush with water for 15 minutes.	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, gloves, and safety shoes. Avoid contact with skin and eyes. Do not breathe vapor. Do not get liquid or vapor on skin or clothing. Do not get liquid or vapor in eyes. Do not get liquid or vapor on clothing. Do not get liquid or vapor on skin or clothing.
Fire	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. May be harmful if inhaled. LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. Do not use solvents to clean skin. Do not use solvents to clean skin.
Exposure	Not harmful to aquatic life. May be dangerous if it enters water intakes. Not a pollutant of surface water.
Water Pollution	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Toxic warning: High flammability. Evaluate area.	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Butadiene 1,3-Butadiene Butene Diene Vinylbutadiene 3.2 Coast Guard Compatibility Classification: Orlfin 3.3 Chemical Formula: C_4H_6 3.4 IMCO United Nations Numerical Designation: 2010	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Gas 4.2 Color: Colorless 4.3 Odor: Mild aromatic
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety goggles, respirator, and gloves. If in contact with liquid, wear gloves. If in contact with gas, wear a respirator. If in contact with liquid, wear gloves. If in contact with gas, wear a respirator. 5.2 Symptoms Following Exposure: Nausea, headache, dizziness, and irritation of the eyes, nose, and throat. 5.3 Treatment for Exposure: Remove from exposure immediately. If a physician is available, INHALATION: If breathing is irregular or stopped, start resuscitation; administer oxygen. SKIN CONTACT: Remove contaminated clothing and wash affected skin area. EYE CONTACT: Flush with water for 15 minutes. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes a stinging irritation of the eyes, nose, and throat at high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. Irritation to skin and a mild skin rash may occur on contact and reddening of the skin because of irritation. 5.10 Odor Threshold: 4 mg/m ³	

6 FIRE HAZARDS 6.1 Flash Point: -40°F (-40°C) 6.2 Flammable Limits in Air: 2.0 - 12.5 6.3 Fire Extinguishing Agents: Stop flow of gas. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Vapor heavier than air and may travel a considerable distance to source of ignition and flash back. Containers may explode due to ductile polymerization. 6.7 Ignition Temperature: 750°F 6.8 Electrical Hazard: Class I, Group B 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Not pertinent. 8.2 Waterway Toxicity: Not pertinent. 8.3 Biological Oxygen Demand (BOD): Not pertinent. 8.4 Food Chain Concentration Potential: Not pertinent.																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Explosive decomposition when contaminated with peroxides formed by reaction with air. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Stable when inhibitors present. 7.6 Inhibitor of Polymerization: eth. Butylated hydroxytoluene	9. SELECTED MANUFACTURERS 1. Nacex Butene Products Co. Port Neches, Texas 77659 2. Petro-Tex Chemical Corp. Houston, Texas 77017 3. Phillips Petroleum Co. Bartlesville, Oklahoma 74004																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) ABCDEFG	10 SHIPPING INFORMATION 10.1 Grades or Purities: Research grade 99.95% min. Special purity 99.95% min. Rubber grade 99.95% min. Commercial 99% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Safety relief.																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>4</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>3</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td></td> </tr> <tr> <td>Poisons</td> <td></td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>0</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>0</td> </tr> <tr> <td>Aesthetic Effects</td> <td>0</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Explosive Chemicals</td> <td>2</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self-Reaction</td> <td>3</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	3	Liquid or Solid Irritant		Poisons		Water Pollution		Human Toxicity	0	Aquatic Toxicity	0	Aesthetic Effects	0	Reactivity		Explosive Chemicals	2	Water	0	Self-Reaction	3	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	4	Reactivity (Yellow)	2	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas. 13.2 Molecular Weight: 54.10 13.3 Boiling Point at 1 atm: 24.1°C = -4.4°C = 245.5°K 13.4 Freezing Point: -162.1°C = -103.8°F = 161.1°K 13.5 Critical Temperature: 36.1°C = 95°F = 329°K 13.6 Critical Pressure: 628 psia = 42.6 atm = 4.32 MPa 13.7 Specific Gravity: 0.62 at 20°C (vs. water) 13.8 Liquid Surface Tension: 19.4 dynes/cm at 20°C 13.9 Liquid-Water Interfacial Tension: 18.7 dynes/cm at 20°C 13.10 Vapor (Gas) Specific Gravity: 1.86 at 20°C 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1 13.12 Latent Heat of Vaporization: 130 Btu/lb = 100 cal/g = 4.19 kJ/kg 13.13 Heat of Combustion: -15,000 Btu/lb = -3,500 cal/g = -442 kJ/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: -549 Btu/lb = -128 kJ/kg
Category	Rating																																				
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NOTES (Continued on pages 5 and 6)																																					

BUT

BUTANE

Common Synonyms as Butane	Liquefied compressed gas Colorless Gasoline-like odor Floats and boils on water Flammable, visible vapor cloud is formed
Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Vapor is flammable
Exposure	VAPOR If inhaled, will cause dizziness or difficult breathing Not irritating to eyes, nose or throat LIQUID Will cause frostbite
Water Pollution	Not harmful to aquatic life May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 434.4. Fire warning: High flammability Major hazard: Flammable	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: n-Butane 3.2 Coast Guard Compatibility Classification: Paraffin 3.3 Chemical Formula: C_4H_{10} 3.4 IMCO United Nations Numerical Designation: 2015	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Compressed gas 4.2 Color: Colorless 4.3 Odor: Gasoline-like
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Not required when handling properly and in proper place 5.2 Symptoms Following Exposure: High concentration of vapor may cause dizziness or difficulty breathing 5.3 Treatment for Exposure: ORAL AND ASPIRATION: Not recommended. INHALATION: Fresh air. If severe, vapor may cause dizziness or difficulty breathing. Apply artificial respiration. If unconscious, place in recovery position. If in contact with eyes, flush with water. If on skin, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: Data is available 5.6 Toxicity by Ingestion: Not pertinent 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless. No data available on liquid and solid irritant qualities from human or animal testing. 5.10 Odor Threshold: 100 ppm	

6 FIRE HAZARDS 6.1 Flash Point: -100°F (-73.3) 6.2 Flammable Limits in Air: 1.8 - 8.4 6.3 Fire Extinguishing Agents: See paragraph 6.4 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: No pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 510°F 6.8 Electrical Hazard: Class I (Group D) 6.9 Burning Rate: 7 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterway Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Neches Butane Products, Co. Port Neches, Texas 77654 2. Petro-Tech Chemical Corp. Houston, Texas 77007 3. Phillips Petroleum Co. Bartlesville, Oklahoma 74604																																				
11 HAZARD ASSESSMENT CODE See Hazard Assessment Codebook, CG 434.3 ABCDEFG	10 SHIPPING INFORMATION 10.1 Grades or Purity: Research 99.95% Pure 99.4% Technical 97.6% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Safety relief																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="958 1454 1197 1716"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>4</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>0</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>0</td></tr> <tr> <td> Poisons</td><td>0</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>0</td></tr> <tr> <td> Aquatic Toxicity</td><td>0</td></tr> <tr> <td> Verbal Effect</td><td>0</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>0</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self-Reactive</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="958 1738 1197 1825"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td></td></tr> <tr> <td>Flammability (Red)</td><td>4</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	0	Liquid or Solid Irritant	0	Poisons	0	Water Pollution		Human Toxicity	0	Aquatic Toxicity	0	Verbal Effect	0	Reactivity		Other Chemicals	0	Water	0	Self-Reactive	0	Category	Classification	Health Hazard (Blue)		Flammability (Red)	4	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Gas 13.2 Molecular Weight: 58.12 13.3 Boiling Point at 1 atm.: -0.5°C (32°F) 13.4 Freezing Point: -138.3°C (-207°F) 13.5 Critical Temperature: 152.1°C (305.8°F) 13.6 Critical Pressure: 37.7 atm (37.7 bar) 13.7 Specific Gravity: 0.002 (at 15°C) 13.8 Liquid Surface Tension: 2.7 dyne/cm (at 15°C) 13.9 Liquid-Water Interfacial Tension: 2.7 dyne/cm (at 15°C) 13.10 Vapor (Gas) Specific Gravity: 2.0 13.11 Ratio of Specific Heats of Vapor (Gas): 1.07 13.12 Latent Heat of Vaporization: 376 Btu/lb (1090 kJ/kg) 13.13 Heat of Combustion: 49.5 Btu/lb (1150 kJ/kg) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
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REVISED 1976

BDO

1,4-BUTANEDIOL

Common Synonyms 1,4-Dihydroxybutane Tetramethylene glycol		Thick liquid Colorless Odorless Sinks and mixes with water. Freezing point is 68°F.
Fire		Combustible Flammable in air. Ignites at 110°C (230°F). Water may become flammable.
Exposure		HAZARDOUS TO HEALTH LIQUID OR SOLID Irritating to skin or eyes. Harmful if swallowed. Skin affected more with heating. Flammable. UNWASHED HANDS MAY CONTAMINATE FOOD OR DRINK.
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not biodegradable and persistent in the environment. Not a priority pollutant.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-1. Dispense and Flush.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,4-Dihydroxybutane Tetramethylene glycol 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: HOCH ₂ CH ₂ CH ₂ CH ₂ OH 3.4 IMCO United Nations Numerical Designation: 1.1.1.1.1		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Odorless
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Eye protection 5.2 Symptoms Following Exposure: Ingestion of large amounts needed to produce any symptoms. 5.3 Treatment for Exposure: SKIN OR EYES: Wash off immediately with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 2.1 Data not available. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: None. 5.9 Liquid or Solid Irritant Characteristics: None. 5.10 Odor Threshold: Not pertinent.		

6. FIRE HAZARDS 6.1 Flash Point: -25°F (-32°C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Alcohol resistant chemical or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water and foam may cause a fire. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterway Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not pertinent. 7.2 Reactivity with Common Materials: Not pertinent. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS GAF Corporation Chemical Division 1000 GAF Building Charlotte, N.C. 28202
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3. A P Q		10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent grade 99% Anhydrous grade 99.5% 10.2 Storage Temperature: 70°-100°F 10.3 Inert Atmosphere: Data not available. 10.4 Venting: Data not available.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 92.1 13.3 Boiling Point at 1 atm: 117.7°C (244°F) 13.4 Freezing Point: -12.9°C (9°F) 13.5 Critical Temperature: 304.1°C (579°F) 13.6 Critical Pressure: 33.8 atm (3435 kPa) 13.7 Specific Gravity: 1.11 at 20°C (68°F) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: 10.1 kJ/mol (2.4 kcal/mol) 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES		

BUD

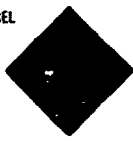
1,4-BUTENEDIOL

Common Synonyms 2-Buten-1,4-diol 1,4-Dihydroxy-2-butene	Thick liquid Light yellow Odorless Sinks and mixes with water. Freezing point is 45°F.
Supplies Not applicable.	Supplies Not applicable.
Fire	Combustible Extinguish with water, foam, carbon dioxide, or other dry agent. Water may be effective.
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, do not induce vomiting. Have medical attention.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. No data for acute or chronic toxicity.
1. RESPONSE TO DISCHARGE Use appropriate methods (NFPA 704, 442, 443). Dispense and flush.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: cis-2-Butene-1,4-diol 1,4-Dihydroxy-2-butene 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: HOCH ₂ CH=CHCH ₂ OH 3.4 IMCO United Nations Numerical Designation: 1.4.1997	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Pale yellow 4.3 Odor: Odorless
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Eye protection. 5.2 Symptoms Following Exposure: Data not available. 5.3 Treatment for Exposure: SEE OR EYE CONTACT: Flush with water. A small amount of liquid may be swallowed. Do not induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 2.1 (2.0 to 2.9). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Minimum 5.0 (2.0 to 2.9). 5.10 Odor Threshold: Not pertinent.	

6. FIRE HAZARDS 6.1 Flash Point: 26°F (0°C) 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Foam or water may cause burning. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterway Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Bases: Not pertinent. 7.5 Polymerization: Stable. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Celanese Corporation Chemical Division California, Kentucky 42029
11. HAZARD ASSESSMENT CODE See Hazard Assessment Code (NFPA 704, 442, 443). A P O	10. SHIPPING INFORMATION 10.1 Grades or Purity: Not applicable. 10.2 Storage Temperature: Above 45°F. 10.3 Inert Atmosphere: Inerted. 10.4 Viscosity: Data not available.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAA Hazard Rating for Both Water Transport: Not listed. 12.3 NFPA Hazard Classification: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 90.1. 13.3 Boiling Point at 1 atm: 253°F (123°C) @ 1 atm. 13.4 Freezing Point: 45°F (7°C) @ 1 atm. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.07 at 25°C (liquid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

BCN

n-BUTYL ACETATE

Common Synonyms: Acetic Acid n-Butyl Ester Butyl acetate Butyl ethanoate	Appearance: Watery liquid Color: Colorless Odor: Pleasant fruity odor Other: Floats on water. Flammable emitting vapor is produced.
Stop discharge if possible. Keep people away. Wash thoroughly with soap and water. Avoid breathing vapors. No smoking or open flames. Do not eat or drink. Do not get in eyes. Do not get on skin or clothing.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Do not use with flame, heat, or sparks. Do not use near open flames. Do not use near hot surfaces.
Exposure	CALL FOR MEDICAL AID VAPOR: Irritating to eyes, nose and throat. If inhaled will cause nausea, dizziness, headache or difficult breathing. May irritate skin. If inhaled, move to fresh air immediately. LIQUID: Irritating to skin and eyes. Harmful if swallowed. If swallowed, do not induce vomiting. If in eyes, flush with plenty of water. If on skin, wash with plenty of water. If swallowed, drink plenty of water. If swallowed, do not induce vomiting. If on skin, wash with plenty of water. If swallowed, drink plenty of water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. No known health or pollution effects. No known effects on aquatic life.
1 RESPONSE TO DISCHARGE See Response Methods Manual, CG 444-4 For handling instructions. Minimum quantities.	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetic Acid n-Butyl Ester, Butyl acetate, Butyl ethanoate. 3.2 Coast Guard Compatibility Classification: 1. 3.3 Chemical Formula: CH ₃ COOC ₄ H ₉ 3.4 IMCO United Nations Numerical Designation: 1.1	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Pleasant, fruity, acetone-like.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Avoid skin contact with chemical. Use gloves, goggles, and mask. 5.2 Symptoms Following Exposure: SKIN: Irritation, redness, itching. EYES: Irritation, redness, tearing. INHALATION: Headache, dizziness, nausea, difficulty breathing. 5.3 Treatment for Exposure: EYES: Flush with plenty of water. INHALATION: Move to fresh air. If breathing is difficult, give oxygen. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm. 5.5 Short-Term Inhalation Limits: 100 ppm. 5.6 Toxicity by Ingestion: Irritation to the stomach. 5.7 Lethal Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is irritating to the eyes, nose, and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard if inhaled, ingested, and absorbed. 5.10 Odor Threshold: None.	

6 FIRE HAZARDS 6.1 Flash Point: 99°F (37°C) 6.2 Flammable Limits in Air: 2.5% - 12.5% 6.3 Fire Extinguishing Agents: Alcohol, chemical carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water, steam, dry chemical, foam, and halon. 6.5 Special Hazards of Combustion Products: None. 6.6 Behavior in Fire: Non-persistent. 6.7 Ignition Temperature: 500°F (260°C) 6.8 Electrical Hazard: Class I, Group 1. 6.9 Burning Rate: 4.4 ft/min.	8 WATER POLLUTION 8.1 Aquatic Toxicity: 44 ppm (4.4% in 11% water). 8.2 Waterfowl Toxicity: 1.1% in water. 8.3 Biological Oxygen Demand (BOD): 0.1% in 11% water. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: None. 7.2 Reactivity with Common Materials: None. 7.3 Stability During Transport: None. 7.4 Neutralizing Agents for Acids and Caustics: None. 7.5 Polymerization: None. 7.6 Inhibitor of Polymerization: None.	9 SELECTED MANUFACTURERS C. I. Parfums, Inc. 100 West 11th St. New York, N.Y. 10011 E. I. du Pont de Nemours & Co. 100 West 11th St. New York, N.Y. 10011 E. I. du Pont de Nemours & Co. 100 West 11th St. New York, N.Y. 10011																																				
11 HAZARD ASSESSMENT CODE See Manual of Hazardous Materials, CG 444-4 A 11	10 SHIPPING INFORMATION 10.1 Grades or Purity: 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 2.0, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.9, 3.0, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 4.0, 4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.8, 4.9, 5.0, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7, 5.8, 5.9, 6.0, 6.1, 6.2, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 7.0, 7.1, 7.2, 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 8.0, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.7, 8.8, 8.9, 9.0, 9.1, 9.2, 9.3, 9.4, 9.5, 9.6, 9.7, 9.8, 9.9, 10.0. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: None. 10.4 Venting: Open flame and heat.																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poison</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td>1</td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Acute Effect</td> <td>1</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> <tr> <td>Other Chemical</td> <td>1</td> </tr> <tr> <td>Water</td> <td>1</td> </tr> <tr> <td>Self Reaction</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>1</td> </tr> </tbody> </table>	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poison	1	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	1	Acute Effect	1	Reactivity	1	Other Chemical	1	Water	1	Self Reaction	1	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 116.16. 13.3 Boiling Point at 1 atm: 126.1°C (259.0°F). 13.4 Freezing Point: -108.1°C (-162.6°F). 13.5 Critical Temperature: 281.1°C (538.0°F). 13.6 Critical Pressure: 48.0 atm (690.0 psi). 13.7 Specific Gravity: 0.88 (at 15°C). 13.8 Liquid Surface Tension: 24.5 dynes/cm (0.0145 N/m) at 25°C. 13.9 Liquid-Water Interfacial Tension: 17.0 dynes/cm (0.012 N/m) at 25°C. 13.10 Vapor (Gas) Specific Gravity: None. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1. 13.12 Latent Heat of Vaporization: 38.0 kJ/mol. 13.13 Heat of Combustion: -22.0 kJ/mol. 13.14 Heat of Decomposition: None. 13.15 Heat of Solution: None. 13.16 Heat of Polymerization: None.
Category	Rating																																				
Fire	1																																				
Health	1																																				
Vapor Irritant	1																																				
Liquid or Solid Irritant	1																																				
Poison	1																																				
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Category	Classification																																				
Health Hazard (Blue)	1																																				
Flammability (Red)	2																																				
Reactivity (Yellow)	1																																				
NOTES 1. This material is highly flammable.																																					

REVISED 1978

6 FIRE HAZARDS

6.1 Flash Point:

6.2 Flammable Limits in Air:

6.3 Fire Extinguishing Agents:

6.4 Fire Extinguishing Agents Not to be Used:

6.5 Special Hazards of Combustion Products:

6.6 Behavior in Fire:

6.7 Ignition Temperature:

6.8 Electrical Hazard:

6.9 Burning Rate:

8 WATER POLLUTION

8.1 Aquatic Toxicity:

8.2 Waterfowl Toxicity:

8.3 Biological Oxygen Demand (BOD):

8.4 Food Chain Concentration Potential:

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water:

7.2 Reactivity with Common Materials:

7.3 Stability During Transport:

7.4 Neutralizing Agents for Acids and Caustics:

7.5 Polymerization:

7.6 Inhibitor of Polymerization:

9 SELECTED MANUFACTURERS

10 SHIPPING INFORMATION

10.1 Grades or Purity:

10.2 Storage Temperature:

10.3 Inert Atmosphere:

10.4 Venting:

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Manual for details

A T I

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm:

13.2 Molecular Weight:

13.3 Boiling Point at 1 atm:

13.4 Freezing Point:

13.5 Critical Temperature:

13.6 Critical Pressure:

13.7 Specific Gravity:

13.8 Liquid Surface Tension:

13.9 Liquid-Water Interfacial Tension:

13.10 Vapor (Gas) Specific Gravity:

13.11 Ratio of Specific Heats of Vapor (Gas):

13.12 Latent Heat of Vaporization:

13.13 Heat of Combustion:

13.14 Heat of Decomposition:

13.15 Heat of Solidation:

13.16 Heat of Polymerization:

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:

12.2 HAS Hazard Rating for Bulk Water Transportation:

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BAI

iso-BUTYL ACRYLATE

Common Synonyms: Isobutyl Acrylate isobutyl methacrylate Waxy liquid Colorless Sharp fragrant odor Floats on water. Irritating vapor is produced.		6 FIRE HAZARDS 6.1 Flash Point: 141°F (61°C) 6.2 Flammable Limits in Air: 1.1-10.0% 6.3 Fire Extinguishing Agents: Dry chemical, foam, water (not damped) 6.4 Fire Extinguishing Agents Not to be Used: None known 6.5 Special Hazards of Combustion Products: None known 6.6 Behavior in Fire: None known 6.7 Ignition Temperature: 141°F (61°C) 6.8 Electrical Hazard: None known 6.9 Burning Rate: None known	
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: None known 7.2 Reactivity with Common Materials: None known 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: None known 7.5 Polymerization: Will polymerize when heated or in presence of certain catalysts 7.6 Inhibitor of Polymerization: Methyl ethyl butyl peroxide, benzoyl peroxide, hydroquinone, etc.		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available	
9 SELECTED MANUFACTURERS Colson Corp. Crescent Chemical Co., Inc. J. T. Baker Co. Nacac Chemical Co. Rohm and Haas Co. Independent Methyl Methacrylate Producers Union Carbide Corp. Chemical and Plastics Division N. E. A. Co. New York, N. Y.		10 SHIPPING INFORMATION 10.1 Grades or Purities: 99.5% min. 10.2 Storage Temperature: 5-10°C 10.3 Inert Atmosphere: None known 10.4 Venting: If container is pressurized	
11 HAZARD ASSESSMENT CODE See Table 1 of Assessment Code, 1973, 1974, 1975, 1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 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2794, 2795, 2796, 2797, 2798, 2799, 2800, 2801, 2802, 2803, 2804, 2805, 2806, 2807, 2808, 2809, 2810, 2811, 2812, 2813, 2814, 2815, 2816, 2817, 2818, 2819, 2820, 2821, 2822, 2823, 2824, 2825, 2826, 2827, 2828, 2829, 2830, 2831, 2832, 2833, 2834, 2835, 2836, 2837, 2838, 2839, 2840, 2841, 2842, 2843, 2844, 2845, 2846, 2847, 2848, 2849, 2850, 2851, 2852, 2853, 2854, 2855, 2856, 2857, 2858, 2859, 2860, 2861, 2862, 2863, 2864, 2865, 2866, 2867, 2868, 2869, 2870, 2871, 2872, 2873, 2874, 2875, 2876, 2877, 2878, 2879, 2880, 2881, 2882, 2883, 2884, 2885, 2886, 2887, 2888, 2889, 2890, 2891, 2892, 2893, 2894, 2895, 2896, 2897, 2898, 2899, 2900, 2901, 2902, 2903, 2904, 2905, 2906, 2907, 2908, 2909, 2910, 2911, 2912, 2913, 2914, 2915, 2916, 2917, 2918, 2919, 2920, 2921, 2922, 2923, 2924, 2925, 2926, 2927, 2928, 2929, 2930, 2931, 2932, 2933, 2934, 2935, 2936, 2937, 2938, 2939, 2940, 2941, 2942, 2943, 2944, 2945, 2946, 2947, 2948, 2949, 2950, 2951, 2952, 2953, 2954, 2955, 2956, 2957, 2958, 2959, 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BTC

n-BUTYL ACRYLATE

Common Synonyms Butyl acrylate n-Butyl 2-propenoate Acrylic acid, n-butyl ester		Watery liquid	Colorless	Sharp, fragrant odor
		Floats on water		
Stop discharge if possible Call fire department Avoid contact with liquid Isolate and remove contaminated material Notify local health and pollution control agencies				
Fire		Combustible Containers may explode in fire Extinguish with dry chemical, foam, or water Exposed containers with water		
Exposure		CALL FOR MEDICAL AID LIQUID Irritant to skin and eyes Harmful if swallowed Remove contaminated clothing, shoes Flush affected areas with plenty of water IF IN EYES: Wash with plenty of water IF SWALLOWED: Do not induce vomiting. Have victim drink water IF SWALLOWED and not pregnant: DO NOT INDUCE VOMITING. CONSULT A PHYSICIAN. Things to expect from water		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intake Notify local health and pollution control agencies Notify local fire department		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3) Mechanical containment Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acrylic acid n-butyl ester Butyl acrylate Butyl propenoate 3.2 Coast Guard Compatibility Classification Acrylate 3.3 Chemical Formula $\text{C}_8\text{H}_{10}\text{O}_2$ 3.4 MCO/United Nations Numerical Designation Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped) Liquid 4.2 Color Colorless 4.3 Odor Characteristic of acrylics		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, rubber gloves, acid goggles 5.2 Symptoms Following Exposure: Vapor is irritating when breathed at high concentrations. Contact with liquid causes irritation of skin and burning of eyes 5.3 Treatment for Exposure: INHALATION: remove to fresh air, administer artificial respiration or oxygen if indicated, call a physician. SKIN AND EYES: wash with plenty of water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: 100 ppm (4 hr) 5.6 Toxicity by Ingestion: Not available 5.7 Late Toxicity: Not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present at high concentrations. The effect is temporary 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS

6.1 Flash Point: 118°F (43°C)
 6.2 Flammable Limits in Air: 1.4% - 9.4%
 6.3 Fire Extinguishing Agents: Dry chemical, foam or carbon dioxide
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
 6.5 Special Hazards of Combustion Products: Not pertinent
 6.6 Behavior in Fire: Not pertinent
 6.7 Ignition Temperature: 534°F
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: 4.7 mm/min

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
 7.2 Reactivity with Common Materials: No reaction
 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
 7.5 Polymerization: Will polymerize on application of heat; uncontrolled bulk polymerization can be explosive
 7.6 Inhibitor of Polymerization: Methyl ether of hydroquinone
 15-100 ppm. Store in contact with air

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
 8.2 Waterfowl Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD): Data not available
 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1. Celanese Corp.
 Celanese Chemical Co. Division
 245 Park Ave.
 New York, N.Y. 10017
 2. Rohm and Haas Co.
 Independence Mall West
 Philadelphia, Pa. 19108
 3. Union Carbide Corp.
 Chemicals and Plastics Div.
 270 Park Ave.
 New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 Grades or Purity: 99+%
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Pressure venting

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 A-T U-Z

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Combustible Liquid
 12.2 HAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Combustion	2
Water	0
Self Reaction	1

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 126.17
 13.3 Boiling Point at 1 atm: 299°F = 148.9°C = 422.9 K
 13.4 Freezing Point: -53°F = -64°C = 209 K
 13.5 Critical Temperature: 621°F = 327°C = 600 K
 13.6 Critical Pressure: 426 psia = 2.9 atm = 2.9 MPa
 13.7 Specific Gravity: 0.899 at 20°C (liquid)
 13.8 Liquid Surface Tension: (estimated) 20 dynes/cm = 0.020 N/m at 20°C
 13.9 Liquid-Water Interfacial Tension: (estimated) 100 dynes/cm = 0.060 N/m at 20°C
 13.10 Vapor (Gas) Specific Gravity: Not pertinent
 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0
 13.12 Latent Heat of Vaporization: 120 Btu/lb = 66.4 cal/g = 2.78 x 10⁵ J/kg
 13.13 Heat of Combustion: -13,860 Btu/lb = -7700 cal/g = -3224 x 10³ J/kg
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: -25.9 Btu/lb = -144 cal/g = -6.0 x 10³ J/kg

(continued, page 500)

NOTES

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BAN

n-BUTYL ALCOHOL

Common Synonyms Butanol Butyl alcohol 1-Butanol 1-Hydroxybutane n-Propylcarbutol	Water liquid Colorless Alcohol odor Floats and mixes slowly with water. Flammable, irritating vapor is produced.
Stop discharge if possible. Keep people away. Call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical or carbon dioxide. Water and alcohol foam may be ineffective on fire. Cover exposed containers with water.
Exposure	CAUTION MEDICAL AID VAPOR Irritating to eyes, nose and throat if inhaled; will cause nausea, headache, dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF SWALLOWED, but do not vomit and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Restrict access. Disperse and flush.	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms : Butanol, Butyl alcohol, 1-Butanol, 1-Hydroxybutane, n-Propylcarbutol. 3.2 Coast Guard Compatibility Classification : Alcohol. 3.3 Chemical Formula : C ₄ H ₉ CHOH. 3.4 IMCO United Nations Numerical Designation : 33-1120.	2. LABEL  4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped) : Liquid. 4.2 Color : Colorless. 4.3 Odor : Alcohol like, pungent, strong characteristic, mildly alcoholic, non-residual.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment : Organic vapor respirator or air supplied mask, chemical goggles or face splash shield. 5.2 Symptoms Following Exposure : Anesthesia, nausea, headache, dizziness, irritation of respiratory passages, mild irritation to the skin and eyes. 5.3 Treatment for Exposure: INHALATION : Remove from exposure immediately, call a physician if breathing is irregular or has stopped, start resuscitation and administer oxygen. INGESTION : Induce vomiting and call a physician. EYES : Flush with water for at least 15 minutes. 5.4 Toxicity by Inhalation (Threshold Limit Value) : 100 ppm. 5.5 Short-Term Inhalation Limits : 150 ppm for 30 min. 5.6 Toxicity by Ingestion : Grade 3 LD ₅₀ 6.5 g/kg (rat). 5.7 Late Toxicity : None. 5.8 Vapor (Gas) Irritant Characteristics : A vapor cause a slight stinging of the eyes or respiratory system if present in high concentrations. Effect is temporary. 5.9 Liquid or Solid Irritant Characteristics : Minimum hazard. If spilled on clothing and allowed to remain, may cause irritation and reddening of the skin. 5.10 Odor Threshold : 25 ppm.	

6 FIRE HAZARDS 6.1 Flash Point : 34°C (93°F) C.C. 6.2 Flammable Limits in Air : 1.4 - 11.2% 6.3 Fire Extinguishing Agents : Carbon dioxide, dry chemicals. 6.4 Fire Extinguishing Agents Not to be Used : Not pertinent. 6.5 Special Hazards of Combustion Products : Not pertinent. 6.6 Behavior in Fire : Not pertinent. 6.7 Ignition Temperature : 650°F. 6.8 Electrical Hazard : Class I, Group D. 6.9 Burning Rate : 3.2 mm/min.	8 WATER POLLUTION 8.1 Aquatic Toxicity : 1000 ppm 24 hr. goldfish died fresh water. 8.2 Waterway Toxicity : Data not available. 8.3 Biological Oxygen Demand (BOD) : 1 - 12 lb./lb. 5 days 15°C 5 days. 8.4 Food Chain Concentration Potential : None.																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water : No reaction. 7.2 Reactivity with Common Materials : No reaction. 7.3 Stability During Transport : Stable. 7.4 Neutralizing Agents for Acids and Caustics : Not pertinent. 7.5 Polymerization : Not pertinent. 7.6 Inhibitor of Polymerization : Not pertinent.	9 SELECTED MANUFACTURERS 1. Celanese Corp. Celanese Chemical Co. Div. 245 Park Ave. New York, N.Y. 10017. 2. Dow-Badische Co. Williamsburg, Virginia 23185. 3. Union Carbide Corp. Chemicals & Plastics Div. 270 Park Ave. New York, N.Y. 10017.																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-P-Q	10 SHIPPING INFORMATION 10.1 Grades or Purity : 99+. 10.2 Storage Temperature : Ambient. 10.3 Inert Atmosphere : Not requirement. 10.4 Venting : Open flame, etc.																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations : Flammable Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation <table data-bbox="865 1412 1125 1692"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>1</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td> Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>2</td></tr> <tr> <td> Aquatic Toxicity</td><td>2</td></tr> <tr> <td> Asbestos Effect</td><td>5</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>5</td></tr> <tr> <td> Water</td><td>1</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications <table data-bbox="865 1692 1125 1800"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (H)</td><td>1</td></tr> <tr> <td>Flammability (F)</td><td>3</td></tr> <tr> <td>Reactivity (R)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Asbestos Effect	5	Reactivity		Other Chemicals	5	Water	1	Self Reaction	0	Category	Classification	Health Hazard (H)	1	Flammability (F)	3	Reactivity (R)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm : Liquid. 13.2 Molecular Weight : 74.12. 13.3 Boiling Point at 1 atm : 243.9°F = 117.7°C = 390.7°K. 13.4 Freezing Point : 122.1°F = 50°C = 323°K. 13.5 Critical Temperature : 553.6°F = 289.8°C = 563.0°K. 13.6 Critical Pressure : 640.2 psia = 43.95 atm = 4.412 MN/m ² . 13.7 Specific Gravity : 0.810 (20°C liquid). 13.8 Liquid Surface Tension : 24.6 dynes/cm = 0.246 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension : 2.5 mN/m = 0.0025 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity : Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas) : 1.083. 13.12 Latent Heat of Vaporization : 286 Btu/lb = 142 cal/g = 59.8 X 10 ³ J/kg. 13.13 Heat of Combustion : -14,230 Btu/lb = -7066 cal/g = -34,010 J/kg. 13.14 Heat of Decomposition : Not pertinent. 13.15 Heat of Solution : Data not available. 13.16 Heat of Polymerization : Not pertinent.
Category	Rating																																				
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NOTES (Continued on page 4008)																																					

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BAS

sec-BUTYL ALCOHOL

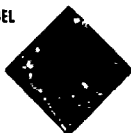
Common Synonyms 2-Butanol 2-Hydroxybutane Methyl ethyl carbinol	Physical Properties Very liquid Colorless Alcohol odor Floats and mixes slowly with water. Flammable, irritating vapor is produced.
First Aid Stop exposure if possible. Keep people away. Shut off ignition sources and call fire department if fire starts. Contact with liquid and vapor: Stay upwind and use water spray to knock down vapor. In fire and burn: Flush charged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical or carbon dioxide. Water and alcohol foam may be ineffective on fire. Avoid exposed containers with water.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, dizziness or difficult breathing. Move to fresh air. If breathing has stopped, artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to eyes. Flush eyes with plenty of water. Flush skin with plenty of water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operators of nearby water intake.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Restrict access. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms 2-Butanol Butylene Glycol 2-Hydroxybutane Methyl ethyl carbinol 3.2 Coast Guard Compatibility Classification Alcohol 3.3 Chemical Formula CH ₃ CH ₂ CHOHCH ₃ 3.4 IMCO United Nations Hazardous Chemical Designation 3.121	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Strong, pleasant
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Wear gloves, eye protection, and supplied mask, chemical goggles, or face shield. 5.2 Symptoms Following Exposure: Headache, dizziness, and respiratory irritation. Liquid is severely irritating to the eyes and may cause excuburn. 5.3 Treatment for Exposure: INHALATION: Remove from exposure immediately, call a physician if breathing is irregular or has stopped, start resuscitation and administer oxygen. INGESTION: Induce vomiting and call a physician. EYES: Flush with water for at least 15 minutes. 5.4 Toxicity by Inhalation (Threshold Limit Value): 150 ppm 5.5 Short-Term Inhalation Limits: 200 ppm for 60 min 5.6 Toxicity by Ingestion: Grade I - 15g/kg (rat), single oral dose 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 75°F (24°C) 6.2 Flammable Limits in Air: 1.7% - 9.0% 6.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 763°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 4.1 in./min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Exxon Chemical Co. Houston, Texas 77001 2. Shell Chemical Co. Industrial Chemicals Div. Houston, Texas 77001 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-P-Q	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99+ 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame or resistor for pressure vacuum																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="966 1412 1201 1692"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>4</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>1</td></tr> <tr><td>Liquid or Solid Irritant</td><td>0</td></tr> <tr><td>Poisons</td><td>1</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>1</td></tr> <tr><td>Aquatic Toxicity</td><td>1</td></tr> <tr><td>Acute Effect</td><td>2</td></tr> <tr><td>Reaction</td><td></td></tr> <tr><td>With Chemicals</td><td>2</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self-Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed	Category	Rating	Fire	4	Health		Vapor Irritant	1	Liquid or Solid Irritant	0	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Acute Effect	2	Reaction		With Chemicals	2	Water	0	Self-Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 74.12 13.3 Boiling Point at 1 atm: 211°F = 99.5°C = 372.7°K 13.4 Freezing Point: -174.5°F = -114.7°C = 158.8°K 13.5 Critical Temperature: 505.0°F = 262.8°C = 536.0°K 13.6 Critical Pressure: 608.4 psia = 41.39 atm = 4.193 MN/m ² 13.7 Specific Gravity: 0.807 at 20°C (liquid) 13.8 Liquid Surface Tension: 23.0 dynes/cm = 0.23 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.09 13.12 Latent Heat of Vaporization: 243 Btu/lb = 135 cal/g = 565 X 10 ³ J/kg 13.13 Heat of Combustion: -15,500 Btu/lb = -8600 cal/g = -360 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	4																												
Health																													
Vapor Irritant	1																												
Liquid or Solid Irritant	0																												
Poisons	1																												
Water Pollution																													
Human Toxicity	1																												
Aquatic Toxicity	1																												
Acute Effect	2																												
Reaction																													
With Chemicals	2																												
Water	0																												
Self-Reaction	0																												
NOTES Continued on pages 5 and 6																													

REVISED 1978

BAM

n-BUTYLAMINE

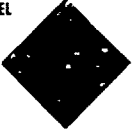
Common Synonyms 1. Azobutane Butylamine Mono-n-butylamine N-butylamine	Liquid Colorless Fishy, ammonia like odor Mixes with water
SAFETY DATA SHEET (SDS) INFORMATION This document contains information that is essential for the safe handling and use of the product. It is intended to provide a summary of the most important safety information. For more detailed information, consult the full SDS.	
Fire	Flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Will burn with a white, smoky flame Ext. agent: dry chemical, foam, carbon dioxide Water may be ineffective
 Exposure	CAUTION: IRRITANT VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause dizziness, headache, coughing or difficult breathing If swallowed will cause nausea and vomiting LIQUID Will burn skin and eyes If swallowed will cause nausea and vomiting If in contact with eyes will cause severe irritation and edema of the cornea If swallowed will cause severe irritation and edema of the cornea If swallowed will cause severe irritation and edema of the cornea
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability, air contaminant, water contaminant Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1. Aminobutane Butylamine, Mono-n-butylamine, N-butylamine 3.2 Coast Guard Compatibility Classification: Aliphatic amine 3.3 Chemical Formula: CH ₃ (CH ₂) ₃ NH ₂ 3.4 IMCO/United Nations Numerical Designation: 3.2 1125	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Fish like ammonia like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supplied mask, rubber gloves, coverall goggles, face shield, full rubber apron 5.2 Symptoms Following Exposure: Inhalation causes irritation, nausea, vomiting, headache, faintness, severe coughing, and chest pains. Can cause lung edema. Ingestion causes severe irritation of mouth and stomach. Contact with eyes causes severe irritation and edema of the cornea. Contact with skin causes burns, abrasions, and through skin may cause nausea, vomiting and shock. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, call a physician, give oxygen if breathing is difficult, if not breathing, give artificial respiration. INGESTION: give large amounts of water, get medical attention. EYES: flush with water at least 15 min., get medical care. SKIN: remove contaminated clothing, flush skin with plenty of water at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm 5.5 Short-Term Inhalation Limits: 5 ppm, 4 min 5.6 Toxicity by Ingestion: Grade 3 oral LD ₅₀ = 500 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 30°F (0°C) 10°F (1°C) 6.2 Flammable Limits in Air: 1.7% - 9.8% 6.3 Fire Extinguishing Agents: Alcohol, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire 6.6 Behavior in Fire: Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode in fire 6.7 Ignition Temperature: 94°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 5.79 ft/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 30-70 ppm 24 hr. week class critical range, fresh water 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 26% theoretical 5 days 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May corrode some metals in presence of water 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Union Carbide Corp. Chemical and Plastics Div. 70 Park Avenue New York, N.Y. 10017 2. Virginia Chemicals, Inc. 3340 West Norfolk Rd. Portsmouth, Va. 23703 3. Air Products and Chemicals, Inc. U.S. Highway 90 P.O. Box 114 Allentown, Pa. 18106								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) APORS	10. SHIPPING INFORMATION 10.1 Grade or Purity: Pure 100% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 12.3 HFA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 73.14 13.3 Boiling Point at 1 atm: 78.3°F = 25.7°C = 298.8°K 13.4 Freezing Point: -56.5°F = -49.7°C = 224°K 13.5 Critical Temperature: 484°F = 251°C = 524°K 13.6 Critical Pressure: 603 psia = 41.4 atm = 4.16 MN/m ² 13.7 Specific Gravity: 0.741 at 20°C (liquid) 13.8 Liquid Surface Tension: 33.11 dynes/cm = 0.6341 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 2.5 13.11 Ratio of Specific Heats of Vapor (Gas): (not listed) 13.12 Latent Heat of Vaporization: 117 Btu/lb = 106 cal/g = 4.2 x 10 ³ J/kg 13.13 Heat of Combustion: -17,595 Btu/lb = -9,775 cal/g = -409.0 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 137 Btu/lb = 76.2 cal/g = 319 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	3								
Reactivity (Yellow)	0								
NOTES									

Continued on pages 5 and 6

BTL

sec-BUTYLAMINE

Common Synonyms	Liquid White Ammonia like odor
	Mixes with water
	Short attention to safety calls for equipment. Avoid contact with skin and eyes. Keep promptly away from heat, open flame, and electrical sparks. No discharge if possible. If discharge occurs, use water spray to knock down vapor. If fire occurs, use dry chemical or carbon dioxide. Do not use water. Do not use high pressure water. Do not use steam.
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Do not extinguish with water. Use dry chemical or carbon dioxide. Extinguish with dry chemicals. Do not use water. Do not use steam. Do not use high pressure water. Do not use steam.
Exposure	CAUTION FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If inhaled, move victim to fresh air. If necessary, give artificial respiration. If necessary, give artificial respiration. If necessary, give artificial respiration. If necessary, give artificial respiration. LIQUID Will burn skin and eyes If swallowed will cause nausea and vomiting If swallowed, give plenty of water. If necessary, give artificial respiration. If necessary, give artificial respiration. If necessary, give artificial respiration. If necessary, give artificial respiration. IF SWALLOWED, give plenty of water. If necessary, give artificial respiration. If necessary, give artificial respiration. If necessary, give artificial respiration. If necessary, give artificial respiration. IF SWALLOWED, give plenty of water. If necessary, give artificial respiration. If necessary, give artificial respiration. If necessary, give artificial respiration. If necessary, give artificial respiration.
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not known if it is toxic to fish Not known if it is toxic to birds
1 RESPONSE TO DISCHARGE (See response methods NFPA 704 NFPA 704-4)	2 LABEL
Issue warning: high flammability air contaminant water contaminant Restrict access Disperse and Push	
3 CHEMICAL DESIGNATIONS	4 OBSERVABLE CHARACTERISTICS
3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Aliphatic amine 3.3 Chemical Formula: CH₃CH₂CH₂CH₂NH₂ 3.4 IMCO/United Nations Numerical Designation: Not listed	4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Ammonia like
5 HEALTH HAZARDS	
5.1 Personal Protective Equipment: Chemical safety goggles, rubber gloves and, upon respiratory protection, use equipment not sparking shoes 5.2 Symptoms Following Exposure: Inhalation causes irritation. Burns of the respiratory system exposure to concentrated vapors can cause asphyxiation. Ingestion causes burning of mouth and stomach. Contact with eyes cause lachrimation conjunctivitis, burns, corneal edema. Contact with skin causes irritation or burns dermatitis. 5.3 Treatment for Exposure: If INHALATION, remove patient from exposure, keep him breathing, if not breathing, INGESTION, give large amount of water, induce vomiting, consult physician. EYES, flush thoroughly with water for 15 min., call physician, immediately. SKIN, remove all contaminated clothing, flush affected area with large quantities of water, consult physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion, Grade 3 oral LD₅₀: 350 mg/kg rat 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that persons will not usually tolerate moderate or high concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe dermatitis if in contact with skin and if dried, severe burns on skin contact and very obnoxious to the eyes. 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS

- 6.1 Flash Point: 16.1°C
- 6.2 Flammable Limits in Air: Data not available
- 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide
- 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
- 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may be formed in fire
- 6.6 Behavior in Fire: Vapor is heavier than air and may travel to a source of ignition and flashback. Container may explode in fire
- 6.7 Ignition Temperature: 712.1
- 6.8 Electrical Hazard: Data not available
- 6.9 Burning Rate: 6.15 m/min

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials: May corrode some metals in presence of water
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Flush with water
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1. Pennwalt Corporation
Three Parkway
Philadelphia, Pa. 19102
2. Virginia Chemicals, Inc.
3440 West Norfolk Rd.
Portsmouth, Va. 23703
3. BASF Wyandotte Corp.
1609 Budd Avenue
Wyandotte, Mo. 64412

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Pure
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: Not required
- 10.4 Venting: Operate flame arresters

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 4-73
A P Q R S

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable liquid
- 12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	
Health	
Vapor Irritant	3
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	
Aesthetic Effect	1
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0
- 12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (H)	3
Flammability (F)	3
Reactivity (R)	0

PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
- 13.2 Molecular Weight: 73.1
- 13.3 Boiling Point at 1 atm: 45.5°C (114.0°F)
- 13.4 Freezing Point: -115.1°C (-175.2°F)
- 13.5 Critical Temperature: Data not available
- 13.6 Critical Pressure: Data not available
- 13.7 Specific Gravity: 0.721 at 20°C (liquid)
- 13.8 Liquid Surface Tension: 22.42 dynes/cm at 0.02322 N/m at 20°C
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: 2.62
- 13.11 Ratio of Specific Heats of Vapor (Gas): 1.073 at 20°C
- 13.12 Latent Heat of Vaporization: 37.09 Btu/lb = 95.94 cal/g = 4.163 x 10³ J/kg
- 13.13 Heat of Combustion: -17,600 Btu/lb = -8,750 cal/g = -40.9 x 10³ J/kg
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: 1.70 Btu/lb = 0.73 cal/g = 3.0 x 10³ J/kg
- 13.16 Heat of Polymerization: Not pertinent

NOTES

BIIA

tert-BUTYLAMINE

Common Synonyms 2-Aminobutane 2-Amino-2-methylpropane 1,1-Dimethylethylamine IPA Trimethylaminomethane	Liquid Colorless Ammonia-like odor Floats and mixes with water. Flammable; irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with water spray or alcohol foam. Water may be ineffective.
Exposure	CAUTION: IRRITANT VAPOR Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing. LIQUID Irritating to skin and eyes. Harmful if swallowed. If in contact with skin, wash with water. If swallowed, do not induce vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response to Incidents Handbook, CG 444.4) Issue warning: high flammability and contaminant. Restrict access. Evacuate area. Direct and Push.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Aminobutane 2-Amino-2-methylpropane 1,1-Dimethylethylamine (IBA) Trimethylaminomethane 3.2 Coast Guard Compatibility Classification: Aliphatic amine 3.3 Chemical Formula: (C ₄ H ₉) ₃ NH 3.4 IMCO/United Nations Numerical Designation: 3.2 1993	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like ammonia
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose, mouth, and lungs. Ingestion causes irritation of mouth and stomach. Contact with liquid causes severe irritation of eyes and moderate irritation of skin. 5.3 Treatment for Exposure: INHALATION: move to fresh air, give artificial respiration if breathing has stopped. INGESTION: give large amounts of water and induce vomiting. EYES: immediately flush with water for at least 15 min; seek medical attention. SKIN: flush with water; wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3 oral LD ₅₀ = 150 mg/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 16°C 6.2 Flammable Limits in Air: 1.7 - 8.9% (at 21°C) 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire. 6.6 Behavior in Fire: 6.7 Ignition Temperature: 16°C 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: ~7 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Liquid will attack some forms of plastics. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Monsanto Company 900 N. Lindbergh Blvd. St. Louis, Mo. 63166 2. Eastman Organic Chemicals Patchogue, N.Y. 11769 3. March Chemical Co. 920 W. Saint Paul Avenue Milwaukee, Wis. 53233
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 148.3) A P Q R S	10. SHIPPING INFORMATION 10.1 Grades or Purities: 99+% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 73.14. 13.3 Boiling Point at 1 atm: 11.3°C = 45°C = 318°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Data not available. 13.6 Critical Pressure: Data not available. 13.7 Specific Gravity: 0.696 at 20°C (liquid). 13.8 Liquid Surface Tension: 19 dynes/cm = 0.019 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 3.13. 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available. 13.12 Latent Heat of Vaporization: 1670 Btu/lb = 92 kcal/g = 3.88 x 10 ⁵ J/kg. 13.13 Heat of Combustion: -17600 Btu/lb = -9790 cal/g = -410 x 10 ³ J/kg. 13.14 Heat of Decomposition: 13.15 Heat of Solution: 170 Btu/lb = 96 cal/g = 4.0 x 10 ⁵ J/kg. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on pages 5 and 6)	

BTN

BUTYLENE

Common Synonyms 1 Butene		Liquefied compressed gas Colorless Fragrant gasoline-like odor	
Floats and boils on water Flammable, visible vapor cloud is produced.			
Stop discharge if possible. Keep people away. Stop if you are alone and do not feel confident about the situation. Notify your supervisor and the fire department. Notify the local health department. Notify the local environmental agency.			
Fire		FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area May form explosive peroxide. May be ignited by static electricity.	
Exposure		VAPOR If inhaled, will cause dizziness and difficult breathing. May cause irritation to the eyes, nose, and throat. May cause frostbite. LIQUID Will cause frostbite. May cause irritation to the eyes, nose, and throat.	
Water Pollution		Not harmful to aquatic life May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability. Restrict access. Evacuate area.		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1 Butene 3.2 Coast Guard Compatibility Classification: Other 3.3 Chemical Formula: C ₄ H ₈ 3.4 IMCO/United Nations Numerical Designation: 201012		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Compressed gas 4.2 Color: Colorless 4.3 Odor: Sweetish	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical goggles, gloves, self-contained breathing apparatus or organic canister. 5.2 Symptoms Following Exposure: May cause irritation, dizziness, or slight anesthesia at high vapor concentrations. Vapor concentrations are not usually a hazard at room temperature except in enclosed spaces. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air and apply first aid as directed on label. EYES AND SKIN: Flush with water for at least 15 minutes. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Not pertinent. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Physically harmful to the skin because it is very volatile and evaporates quickly. May cause frostbite. 5.10 Odor Threshold: Data not available.			

6 FIRE HAZARDS

- 6.1 Flash Point: Not pertinent
 6.2 Flammable Limits in Air: 1.6% - 10%
 6.3 Fire Extinguishing Agents: Stop flow of gas.
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent.
 6.5 Special Hazards of Combustion Products: Not pertinent.
 6.6 Behavior in Fire: Containers may explode in fire. Vapor is heavier than air and may travel long distance to a source of ignition and flash back.
 6.7 Ignition Temperature: 1250°F
 6.8 Electrical Hazard: Not pertinent.
 6.9 Burning Rate: 8.8 mm/min.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: None.
 8.2 Waterway Toxicity: None.
 8.3 Biological Oxygen Demand (BOD): None.
 8.4 Food Chain Concentration Potential: None.

9 SELECTED MANUFACTURERS

1. Air Products and Chemicals, Inc., Allentown, Pa. 18105
 2. Gulf Oil Corp., Gulf Oil Chemicals Co., Division, Pittsburgh, Pa. 15230
 3. Petro-Tex Chemical Corp., Houston, Texas 77017

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
 7.2 Reactivity with Common Materials: No reaction.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Data not available.
 10.2 Storage Temperature: Ambient.
 10.3 Inert Atmosphere: No requirements.
 10.4 Venting: Safety relief.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 A B C D E F G

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable compressed gas.
 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed.
 12.3 NFPA Hazard Classifications: Not listed.

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm.: Gas.
 13.2 Molecular Weight: 56.10
 13.3 Boiling Point at 1 atm.: 20.7°C = 68.5°F = 268.9°K.
 13.4 Freezing Point: -22.7°C = -8.9°F = 250.5°K.
 13.5 Critical Temperature: 295.5°C = 544.5°F = 411.5°K.
 13.6 Critical Pressure: 58.4 psia = 39.7 atm = 4.02 MN/m².
 13.7 Specific Gravity: 0.595 at 20°C (liquid).
 13.8 Liquid Surface Tension: 12.5 dynes/cm = 0.0125 N/m at 20°C.
 13.9 Liquid-Water Interfacial Tension: 16.5 dynes/cm = 0.0165 N/m at 20°C.
 13.10 Vapor (Gas) Specific Gravity: 1.9.
 13.11 Ratio of Specific Heats of Vapor (Gas): 1.104.
 13.12 Latent Heat of Vaporization: 108 Btu/lb = 97.4 cal/g = 391 x 10³ J/kg.
 13.13 Heat of Combustion: -9.45° Btu/lb = -10.826 cal/g = -453.26 x 10³ J/kg.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: Not pertinent.

(Continued on pages 7 and 8)

NOTES

REVISED 1978

BTO

BUTYLENE OXIDE

Common Synonyms 1,2-Butylene oxide 1,2-Epoxybutane 1-Butene oxide Alpha-butylene oxide		Liquid	Colorless	Sharp odor
		Mixes with water		
<u>File</u>		FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area		
<u>Exposure</u>		VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing. LIQUID Will burn skin and eyes If swallowed will cause nausea and vomiting		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Issue warning: high flammability, air contaminant Protect: access Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Butene oxide 1,2-Butylene oxide, alpha-Butylene oxide, 2-Epoxybutane 3.2 Coast Guard Compatibility Classification: Alkylene oxide 3.3 Chemical Formula: C ₄ H ₈ O 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 1. Physical State (as shipped): Liquid 2. Color: Colorless 3. Odor: Pungent		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Clean protective clothing, rubber gloves, chemical work goggles, self-contained breathing apparatus				
5.2 Symptoms Following Exposure: Inhalation: irritable odor and irritation, respiratory injury may occur at higher levels. Ingestion: causes irritation of mouth and stomach. Contact with eyes, liquid or vapor may cause burns of eyes. If inhaled, causes possible type of skin burn if free to evaporate. If confined to skin, burn may cause skin sensitization, not readily absorbed in toxic amounts.				
5.3 Treatment for Exposure: INHALATION: if any ill effects occur, immediately remove person to fresh air and get medical help; if breathing stops, start artificial respiration. INGESTION: induce vomiting promptly and get medical help. EYES: promptly flush with plenty of water for at least 15 min. and get medical help. SKIN: promptly flush with plenty of water, remove all contaminated clothing and wash before reuse.				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade 2, oral LD ₅₀ = 1,410 mg/kg (rat)				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: $< -20^{\circ}\text{F}$ ($< -28^{\circ}\text{C}$) 6.2 Flammable Limits in Air: 1.5% - 18.3% 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: Containers may explode in fire. Use water to cool container from safe distance. 6.7 Ignition Temperature: 949 $^{\circ}\text{F}$ 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterborne Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: May occur when in contact with strong acids or bases 7.6 Inhibitor of Polymerization: Data not available	9. SELECTED MANUFACTURERS 1. Dow Chemical U.S.A. Midland, Mich. 48640 2. Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233								
11. HAZARD ASSESSMENT CODE (See Hazard 3 Assessment Handbook, CG 448-3) VAPORS	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure vacuum								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>2</td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	2	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 72 13.3 Boiling Point at 1 atm: 145.2 $^{\circ}\text{F}$ = 63.0 $^{\circ}\text{C}$ = 336 $^{\circ}\text{K}$ 13.4 Freezing Point: $< -55^{\circ}\text{F}$ = $< -48^{\circ}\text{C}$ = $< 223^{\circ}\text{K}$ 13.5 Critical Temperature: Data not available 13.6 Critical Pressure: Data not available 13.7 Specific Gravity: 0.82 at 25°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 2.49 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available 13.12 Latent Heat of Vaporization (est.): 160 Btu/lb = 103 J/g = 4.2×10^4 J/kg 13.13 Heat of Combustion: -15,200 Btu/lb = -8,470 cal/g = -3.4 $\times 10^7$ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Data not available
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	2								
Reactivity (Yellow)	2								
NOTES									

BHP

tert-BUTYL HYDROPEROXIDE

Common Synonyms Cubes T3H		Watery liquid	Colorless	Odorless
Floats and mixes slowly with water				
Fire		FLAMMABLE. May explode if subjected to heat, flame, or shock. May cause fire and explode on contact with combustibles. Vapor may explode if ignited in an enclosed area.		
Exposure		VAPOR: Irritating to eyes, nose and throat. LIQUID: Irritating to skin and eyes. Harmful if swallowed.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 44-4) Is not burning: high flammability. Reserve a case. Mechanical containment. Chemical and physical treatment.		2. LABELS  		
3. CHEMICAL DESIGNATIONS 2.1 Synonyms: Cubes T3H 2.2 Coast Guard Compatibility Classification: Not applicable 2.3 Chemical Formula: $(CH_3)_3COOH$ 3.4 IMCO/United Nations Numerical Designation: 2.2.2.2.2		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Data not available		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, well-fitting gloves, barrier cream. 5.2 Symptoms Following Exposure: Liquid causes severe burns of skin and eyes. 5.3 Treatment for Exposure: INGESTION: induce vomiting and follow with gastric lavage. INHALATION: remove individual from area, stimulated through a gas mask, breathe pure air and oxygen if needed. SKIN/EYE/NOSE/MOUTH CONTACT: Wash with lots of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 1 skin irritant. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes high irritation of the eye, respiratory system. In event of high concentrations, the eyes are irritated. 5.9 Liquid or Solid Irritant Characteristics: Powerful irritant to skin and eyes. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS

- 6.1 Flash Point: 100-110°C
- 6.2 Flammable Limits in Air: Not pertinent
- 6.3 Fire Extinguishing Agents: Dry chemical, foam or carbon dioxide
- 6.4 Fire Extinguishing Agents Not to be Used: None known
- 6.5 Special Hazards of Combustion Products: Not pertinent
- 6.6 Behavior in Fire: May explode in fire
- 6.7 Ignition Temperature: Not pertinent
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

1. Olin Corp.
120 Alexander St.
Princeton, N.J. 08540
2. Penwalt Corp.
Piquette Ave.
Birmingham, N.Y. 14240
3. Waco Chemical Corp.
U.S. Poison Center Division
Marshall, Texas 75670

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials: Reacts vigorously with easily oxidized materials including wood and some metals.
- 7.3 Stability During Transport: Shock and heat sensitive, self-accelerating decomposition at 200°F
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: 100% pure
- 10.2 Storage Temperature: 60-65°F
- 10.3 Inert Atmosphere: Data not available
- 10.4 Venting: Data not available

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 44-3
A-P-0-7

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
- 13.2 Molecular Weight: 94.12
- 13.3 Boiling Point at 1 atm: Decomposes
- 13.4 Freezing Point: -111°C (152°F) = 215°K
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 0.81 (at 20°C in water)
- 13.8 Liquid Surface Tension: Data not available
- 13.9 Liquid-Water Interfacial Tension: Data not available
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: $\Delta H_{comb} = -1400 \text{ kcal/kg}$
 $\Delta H_{comb} = -5850 \text{ kJ/kg}$
 $\Delta H_{comb} = -15.7 \text{ MJ/kg}$
- 13.14 Heat of Decomposition: $\Delta H_{dec} = 175 \text{ kcal/kg}$
 $\Delta H_{dec} = 730 \text{ kJ/kg}$
 $\Delta H_{dec} = 19.5 \text{ MJ/kg}$
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

12. HAZARD CLASSIFICATIONS

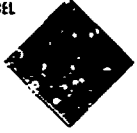
- 12.1 Code of Federal Regulations: Flammable Liquid
- 12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Fire | 4 |
| Health | 4 |
| Vapor Irritant | 1 |
| Liquid or Solid Irritant | 1 |
| Poison | 2 |
| Water Pollution | 3 |
| Human Toxicity | 3 |
| Acute Toxicity | 3 |
| NOHSA Effect | 3 |
| Reactivity | 4 |
| Other Chemicals | 4 |
| Water | 0 |
| Self-Reaction | 4 |
- 12.3 NFPA Hazard Classifications
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 4 |
| Reactivity (Yellow) | 4 |

NOTES

REVISED 1978

BTM

n-BUTYL MERCAPTAN

Common Synonyms n-Butyl Mercaptan	Liquid Colorless to yellow Skunk like odor Floats on water. Poisonous vapor is produced.
Fire	FLAMMABLE Irritating gases may be produced when heated. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR POISONOUS IF INHALED Irritating to eyes. LIQUID Irritating to skin and eyes. Harmful if swallowed.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Manual, CG 445-4) Issue warning - High flammability. Rear of access. Mechanical containment. Should be removed. Chemical and physical reaction.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: n-Butyl Mercaptan 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: C ₄ H ₉ SH 3.4 IMCO/United Nations Numerical Designation: 1112	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to yellow 4.3 Odor: Strong skunk-like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: May require complex respiratory protection apparatus. 5.2 Symptoms Following Exposure: Inhalation causes irritation to the respiratory tract, weakness, vomiting, and respiratory paralysis may develop. Irritation to the eyes may occur. Irritation to the skin may occur. 5.3 Treatment for Exposure: INHALATION: Remove from exposure area. Administer oxygen. If breathing is difficult, administer artificial respiration. EYES: Wash with plenty of water. SKIN: Wash with plenty of water. INGESTION: Do not induce vomiting. If swallowed, give water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Grade 1 - Irritant. Starting up to 100 ppm. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: 100 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 11.1°C 6.2 Flammable Limits in Air: 1.5% to 10.5% 6.3 Fire Extinguishing Agents: Dry chemical, water, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: None. 6.5 Special Hazards of Combustion Products: Irritating sulfur dioxide gas. 6.6 Behavior in Fire: Vapor will be heavier than air and may travel along surface to source of ignition and flashback. 6.7 Ignition Temperature: 19.4°C 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 1.4 m/s	8. WATER POLLUTION 8.1 Aquatic Toxicity: Toxic to aquatic life in fresh water. 8.2 Waterlow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: No pertinent. 7.5 Polymerization: No pertinent. 7.6 Inhibitor of Polymerization: No pertinent.	9. SELECTED MANUFACTURERS Pennwalt Corporation Industrial Chemicals Department Three Parkway Philadelphia, PA 19106 Phillips Petroleum Company Chemical Department Special Products Division Phillips Building Bartlesville, OK 74004 Eastman Kodak Co. Eastern Organic Chemicals Rochester, NY 14604								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 445-4 A11AW	10. SHIPPING INFORMATION 10.1 Grade or Purity: 98% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No reaction. 10.4 Venting: Precautionary.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NFPA Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (H)</td> <td>2</td> </tr> <tr> <td>Flammability (F)</td> <td>2</td> </tr> <tr> <td>Reactivity (R)</td> <td>1</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (H)	2	Flammability (F)	2	Reactivity (R)	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 94.2 13.3 Boiling Point at 1 atm: 35.5°C (95.9°F) 13.4 Freezing Point: -12.1°C (9.4°F) 13.5 Critical Temperature: 184.1°C (363.4°F) 13.6 Critical Pressure: 27.2 bar (394.7 psi) 13.7 Specific Gravity: 0.842 (20°C liquid) 13.8 Liquid Surface Tension: 26.3 dynes/cm (60.26 mN/m) at 20°C 13.9 Liquid-Water Interfacial Tension: 15.5 dynes/cm (34.9 mN/m) at 20°C 13.10 Vapor (Gas) Specific Gravity: 2.2 13.11 Ratio of Specific Heats of Vapor (Gas): 1.07 13.12 Latent Heat of Vaporization: 54.0 Btu/lb (125.5 kJ/kg) at 35.5°C (95.9°F) 13.13 Heat of Combustion: 19.40 Btu/lb (44.7 kJ/kg) at 25°C (77°F) 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (H)	2								
Flammability (F)	2								
Reactivity (R)	1								
NOTES									

BMN

n-BUTYL METHACRYLATE

Common Synonym Methacrylic acid, butyl ester Butyl methacrylate Butyl 2-methylacrylate n-Butyl 2-methylacrylate	Liquid Colorless Mild odor Floats on water
Fire	Flammable Flash point: 100°F (38°C) Boiling point: 160°F (71°C) Freezing point: -100°F (-73°C) Vapor pressure: 1.5 mm Hg (20°C) Specific gravity: 0.85 (20°C) Refractive index: 1.41 (20°C) Density: 0.85 g/cm³ (20°C) Solubility: Insoluble in water Miscible with: acetone, alcohol, benzene, ether, gasoline, kerosene, oil, toluene, xylene
Exposure	Liquids Irritating to skin and eyes Harmful if swallowed Inhalation: Irritating to respiratory tract Ingestion: Irritating to gastrointestinal tract Skin contact: Irritating to skin
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE See Response Manual Handbook, CG 446-4 Methacrylate is nonhazardous Should be removed Chemical and physical treatment	2. LABELS Not required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Methacrylic acid, butyl ester; Butyl methacrylate; Butyl 2-methylacrylate; Butyl alpha-methylacrylate; Butyl 2-methyl-2-propenoate 3.2 Coast Guard Compatibility Classification: A/B/Life 3.3 Chemical Formula: $CH_2=CHCO_2CH_2CH_2CH_2CH_3$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild odor, acrylate
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Not required except when using concentrated vapors 5.2 Symptoms Following Exposure: Irritation to eyes, nose, throat, and skin; dizziness; headache; nausea; vomiting; diarrhea; and skin rash 5.3 Treatment for Exposure: INHALATION: Remove to fresh air and administer first aid as required. EYES: Flush with copious amounts of water for 15 minutes and seek medical attention. SKIN: Wash with soap and water. INGESTION: Induce vomiting with a physical emetic 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 0 (LD ₅₀) Not available 5.7 Late Toxicity: Both defects in rats, gross and chronic effects in fish 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 100°F (38°C) 6.2 Flammable Limits in Air: 1.5% to 11.5% 6.3 Fire Extinguishing Agents: (1) Alcohol foam; carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Containers may explode 6.7 Ignition Temperature: 160°F (71°C) 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 4.5 in/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Not available								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: May occur when heated 7.6 Inhibitor of Polymerization: Hydroquinone, 20 ppm hydroquinone	9. SELECTED MANUFACTURERS Rohm and Haas Co. Independence Mall West Philadelphia, Pa. 19106 E. I. du Pont de Nemours & Co. Plastics Department 1400 Market St. Wilmington, Del. 19805								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-1) A 1.1	10. SHIPPING INFORMATION 10.1 Grades or Purities: Not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Pressure relief								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 MFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (H)</td> <td>1</td> </tr> <tr> <td>Flammability (F)</td> <td>2</td> </tr> <tr> <td>Reactivity (R)</td> <td>1</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (H)	1	Flammability (F)	2	Reactivity (R)	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 116.2 13.3 Boiling Point at 1 atm: 160°F (71°C) 13.4 Freezing Point: -100°F (-73°C) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.85 at 20°C (liquids) 13.8 Liquid Surface Tension: 28.5 dynes/cm at 20°C 13.9 Liquid-Water Interfacial Tension: 28.5 dynes/cm at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 4.40 Btu/lb (10.4 kJ/kg) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: 4.20 Btu/lb (10.1 kJ/kg)
Category	Classification								
Health Hazard (H)	1								
Flammability (F)	2								
Reactivity (R)	1								
NOTES									

BTP

p-tert-BUTYLPHENOL

Common Synonyms		Solid	White	Disinfectant like odor
		May float or sink in water		
Fire	Combustible			
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause difficult breathing			
	SOLID Will burn skin and eyes If swallowed will cause nausea and vomiting			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_{10}H_{14}O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Aromatic		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Chemical workers goggles, clean hands, protective clothing				
5.2 Symptoms Following Exposure: Inhalation of vapors causes irritation of respiratory system. Ingestion causes irritation of mouth and stomach. Contact with eyes causes burns. Contact with dry skin causes severe frostbite. Skin contact with vapor causes moderate irritation, even a mild burn.				
5.3 Treatment for Exposure: INHALATION: move to fresh air, begin artificial respiration. Breathing has ceased: INGESTION: force milk or water and then immediate medical attention. Induce vomiting, treat symptomatically. EYES: immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention promptly. SKIN: flush with plenty of water. Remove person's clothing if it is soiling.				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion, Grade 2 (oral LD ₅₀): 2500 mg/kg rats				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS		8. WATER POLLUTION	
6.1 Flash Point: 230°F (110°C) (closed) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	
7. CHEMICAL REACTIVITY		9. SELECTED MANUFACTURERS	
7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerizations: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		The Dow Chemical Co. 2040 Dow Center Midland, Mich. 48640 2. Aldrich Chemical Co. 5410 W. North Paul Ave. Milwaukee, Wis. 53231 3. Eastern Organic Chemicals Rochester, N.Y. 14650	
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3		10. SHIPPING INFORMATION	
II		10.1 Grades or Purity: Technical 98.5% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open	
12. HAZARD CLASSIFICATIONS		13. PHYSICAL AND CHEMICAL PROPERTIES	
12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 150 13.3 Boiling Point at 1 atm: $263.1^{\circ}\text{F} = 129^{\circ}\text{C} = 412^{\circ}\text{K}$ 13.4 Freezing Point: $210^{\circ}\text{F} = 99^{\circ}\text{C} = 372^{\circ}\text{K}$ 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.07 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (solid) $-16,940 \text{ Btu/lb} = -9,400 \text{ kJ/kg}$ $-16,940 \times 10^3 \text{ J/kg}$ 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
		NOTES	

BUTYLTRICHLOROSILANE									
Common Synonyms: n-Butyltri-chlorosilane	Liquid Colorless Sharp, irritating odor Reacts violently with water. Irritating visible vapor cloud is produced.								
AVOID CONTACT WITH EYES OR SKIN. IF CONTACT OCCURS, WASH IMMEDIATELY WITH WATER AND CONSULT A PHYSICIAN. Wear goggles with side shields, chemical resistant gloves, and protective clothing. Avoid contact with skin. If liquid or vapor comes in contact with skin, wash immediately with plenty of water. If liquid or vapor gets into eyes, flush immediately with plenty of water. If swallowed, drink plenty of water. Do not induce vomiting. Seek medical attention if symptoms persist.									
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with dry chemical, carbon dioxide, or foam. DO NOT USE WATER FOR FLOODING.								
Exposure	VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. LIQUID Will burn skin and eyes. Harmful if swallowed. IF ONLY SKIN IS EXPOSED, Wash immediately with plenty of water. IF SWALLOWED, Drink plenty of water. IF INHALED, Move to fresh air. IF NECESSARY, Seek Medical Attention.								
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.								
1. RESPONSE TO DISCHARGE (See Response Methods Manual Book CG 446-4) Evacuate area. Contain spill. Restrict access. Disperse and flush.									
2. LABEL  CORROSIVE									
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: n-Butyltri-chlorosilane 3.2 Coast Guard Competibility Classification: Not applicable 3.3 Chemical Formula: C₄H₉Cl₃Si 3.4 IMCO/United Nations Numerical Designation: 3.1.4*	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sharp hydrochloric acid like pungent and irritating								
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Avoid vapor type respiratory protection. Wear eye protection, gloves, and other protective equipment as necessary to protect skin and eyes. 5.2 Symptoms Following Exposure: Effects are irritative to eyes, upper respiratory system, throat, and lungs. Ingestion causes burns to mouth and stomach. 5.3 Treatment for Exposure: Seek medical attention at all exposures. If necessary, INHALATION: Remove from exposure and administer oxygen if required. EYES: Flush with water for 15 min. SKIN: Wash with water. INGESTION: Do NOT induce vomiting. Consult physician for treatment. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Thresh. old: Data not available									
6 FIRE HAZARDS 6.1 Flash Point: 100°F (38°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water spray 6.5 Special Hazards of Combustion Products: Hydrogen chloride, hydrogen sulfide, silicon tetrachloride may result 6.6 Behavior in Fire: Difficult to extinguish. Reactions may occur 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available									
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously to generate hydrogen chloride fumes which are toxic 7.2 Reactivity with Common Materials: Will react with common metals such as aluminum, magnesium, and zinc to form flammable hydrogen gas 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water. Flush with weak ammonia solution if long time with acid 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent									
8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Foul Chain Concentration Potential: None									
9 SELECTED MANUFACTURERS Dow Corning Corporation P.O. Box 902 Midland, Mich. 48646 Eastman Organic Chemicals Attention: Sales Department Northway, N.J. 07047 PRC Inc. P.O. Box 40 Greenville, Pa. 15940									
10 SHIPPING INFORMATION 10.1 Grade or Purity: 99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Nitrogen or Argon 10.4 Yeast: Preservative									
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual Book CG 446-3 N O									
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive 12.2 NAS Hazard Rating for Bulk Water Transportation: Not rated 12.3 HFA Hazard Classifications: <table border="1" style="width: 100%; margin-top: 5px;"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard - Basic</td> <td>1</td> </tr> <tr> <td>Environmental Risk</td> <td>1</td> </tr> <tr> <td>Reaction - Normal</td> <td>1</td> </tr> </tbody> </table>		Category	Classification	Health Hazard - Basic	1	Environmental Risk	1	Reaction - Normal	1
Category	Classification								
Health Hazard - Basic	1								
Environmental Risk	1								
Reaction - Normal	1								
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 208.5 13.3 Boiling Point at 1 atm: 204.1°F (95.6°C) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.29 @ 20°C (liquid) 13.8 Liquid Surface Tension: 24 dyne/cm @ 20°C (liquid) 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 3.5 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 40.5 Btu/lb @ 204.1°F (95.6°C) 13.13 Heat of Combustion: 14,800 Btu/lb (6,700 kJ/kg) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 1,200 cal/mole (5,000 J/mole) 13.16 Heat of Polymerization: Not pertinent									
(continued on page 7 and 8)									

NOTES

CTD

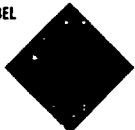
1,4-BUTYNEDIOL

Caution Synonyms 2 Butyne 1,4-diol 4 Dihydroxy-2 butyne		Solid crystals or watery solution	Solid is white to light yellow Solution is brownish yellow
Sinks and mixes with water			
Stop discharge if possible Call fire department As directed wash with soap and water Isolate and move discharged material Notify local health and fire departments			
Fire		Combustible Extinguish with water, alcohol or dry chemical or carbon dioxide	
Exposure		CALL FOR MEDICAL AID LIQUID OR SOLID Irritating to skin and eyes Harmful if swallowed R: Toxic contaminant of clothing and shoes S: If affected area is wet to skin or water H: IN EYES: hold open and flush with plenty of water H: SWALLOWED: induce vomiting if conscious have victim drink water or milk	
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and pollution control agencies Notify operators of nearby water intakes	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446.4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 2 Butyne 1,4 diol 1,4 Dihydroxy-2 butyne 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: HOCH ₂ -(C≡C) ₂ -OH 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or 35% aqueous solution 4.2 Color: Solid: colorless to pale yellow Solution: straw to amber color 4.3 Odor: Data not available	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Neoprene rubber gloves and safety goggles; face shield 5.2 Symptoms Following Exposure: May cause dermatitis 5.3 Treatment for Exposure: SKIN CONTACT: wash affected skin area thoroughly with water. EYE CONTACT: Immediately wash with water for at least 15 minutes and get medical attention 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 50 to 500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause skin irritation and reddening of the skin 5.10 Odor Threshold: Not pertinent			

6 FIRE HAZARDS 6.1 Flash Point: 263°F O.C. (open butynediol) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, alcohol foam, dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Watercowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS GAF Corporation Chemical Division Calvert City, Kentucky 42029
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Tech 1 (Lake 96+ 35% solution) 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Data not available 10.4 Venting: Data not available
11 HAZARD ASSESSMENT CODE (See Hazard Assess. Handb. CG 446.3) SS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 36.09 13.3 Boiling Point at 1 atm: 460°F = 238°C = 511°K 13.4 Freezing Point: 140°F = 58°C = 331°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.07 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -11,020 Btu/lb = -6120 cal/g = -256.2 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES Continued on pages 5 and 6	

BAD

iso-BUTYRALDEHYDE

Common Synonyms 2-Methylpropanal Isobutyric aldehyde Isobutyraldehyde Isobutyraldehyde	Watery liquid Colorless Pleasant gasoline-like odor Floats and mixes slowly with water Flammable, irritating vapor is produced
Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stop discharge if possible. Stay upwind and use water spray to knock down vapor. Evacuate and remove downwind material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical foam or a nondestructive water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause difficult breathing. Move to fresh air. If breathing has stopped, use artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin. Will burn eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability. Restrict access. Disperse and flush.	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Isobutyraldehyde Isobutyraldehyde Isobutyraldehyde 2-Methylpropanal 3.2 Coast Guard Compatibility Classification: Aldehyde 3.3 Chemical Formula: (C ₄ H ₈ O) 3.4 IMCO/United Nations Numerical Designation: 3.2 2045	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Appropriate protective clothing including rubber gloves, rubber shoes and protective eyewear. 5.2 Symptoms Following Exposure: Vapor is irritating to the eyes and mucous membranes. 5.3 Treatment for Exposure: EYES: immediately flush with plenty of water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2.0 (5 to 5 g/kg body wt). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.047 ppm	

6 FIRE HAZARDS 6.1 Flash Point: 11°F (C) - 40°F (C) 6.2 Flammable Limits in Air: 2.0% - 10.0% 6.3 Fire Extinguishing Agents: Foam, dry chemical or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Data not available. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back. Fires are difficult to control due to severe re-ignition. 6.7 Ignition Temperature: 355°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 4.8 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 162 lb/lb in 5 days. 8.4 Food Chain Concentration Potential: None.																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Dow Chemical Co. Williamsburg, Va. 23185 2. Eastman Kodak Co. Texas Eastman Co. Division Longview, Texas 75601 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-P-Q	10 SHIPPING INFORMATION 10.1 Grades or Purities: Dry grade 98.0% wet grade 96.0%, commercial 97% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure-vacuum																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="898 1433 1134 1714"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>2</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>2</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Aesthetic Effect</td><td>3</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="898 1714 1134 1821"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	2	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	3	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 72.11 13.3 Boiling Point at 1 atm: 147°F = 64.4°C = 317°K 13.4 Freezing Point: -112°F = -80°C = 193°K 13.5 Critical Temperature: 464°F = 240°C = 513°K 13.6 Critical Pressure: 600 psia = 41 atm = 4.2 MN/m ² 13.7 Specific Gravity: 0.791 at 20°C (liquid) 13.8 Liquid Surface Tension: 22.0 dynes/cm = 0.0220 N/m at 24°C 13.9 Liquid-Water Interfacial Tension: 7.2 dynes/cm = 0.0072 N/m at 22.7°C 13.10 Vapor (Gas) Specific Gravity: 2.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.093 13.12 Latent Heat of Vaporization: 180 Btu/lb = 98 cal/g = 4.1 x 10 ³ J/kg 13.13 Heat of Combustion: -13,850 Btu/lb = -7693 cal/g = -322.1 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	3																																				
Health																																					
Vapor Irritant	2																																				
Liquid or Solid Irritant	1																																				
Poisons	2																																				
Water Pollution																																					
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Reactivity																																					
Other Chemicals	2																																				
Water	0																																				
Self Reaction	1																																				
Category	Classification																																				
Health Hazard (Blue)	2																																				
Flammability (Red)	3																																				
Reactivity (Yellow)	0																																				
NOTES (Continued on pages 5 and 6.)																																					

REVISED 1978

BTR

n-BUTYRALDEHYDE

Common Synonyms Butyraldehyde Butaldehyde Butyric aldehyde Butanal Butylaldehyde	Watery liquid Colorless Pungent odor Floats and mixes slowly with water. Flammable, irritating vapor is produced.
Additional information: This chemical is highly flammable and reacts violently with strong oxidizing agents. It is also highly irritating to the eyes, skin, and respiratory system.	
Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache or loss of consciousness. LIQUID Irritating to skin. Will burn eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning: highly flammable. Restrict access. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Butanal Butyraldehyde Butyric aldehyde Butyl aldehyde 3.2 Coast Guard Compatibility Classification: Aldehyde 3.3 Chemical Formula: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$ 3.4 IMCO/United Nations Numerical Designation: 3.2 1129	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent aldehyde; pungent and intense
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective goggles, gloves, and organic canister gas mask. 5.2 Symptoms Following Exposure: Inhalation will cause irritation and possibly nausea, vomiting, headache, and loss of consciousness. Contact with eyes causes burns. Skin contact may be irritating. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; if breathing has stopped, give artificial respiration; if breathing is difficult, give oxygen; call a doctor at once. SKIN AND EYES: immediately flush with water for at least 15 min.; get medical care for eyes; remove contaminated clothing and wash underlying skin. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade I: 5-15 g/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of the skin. 5.10 Odor Threshold: 0.0046 ppm.	

6. FIRE HAZARDS 6.1 Flash Point: 15°F (0°C - 20°F) (C.C.) 6.2 Flammable Limits in Air: 2.5% - 10.6% 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, foam. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back. Fires are difficult to control due to ease of reignition. 6.7 Ignition Temperature: 446°F. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 4.4 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterlow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 1.62 lb/lb 5 days, 106% 5 days (theor.). 8.4 Food Chain Concentration Potential: Data not available.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: None. 7.2 Reactivity with Common Materials: None. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: May occur in presence of heat, acids, or alkalis. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Dow Chemical Co. Williamsburg, VA 23185 2. Eastman Kodak Co. Texas Eastman Division Longview, Texas 75601 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A-PQ	10. SHIPPING INFORMATION 10.1 Grade or Purity: Water saturated 97% dry 99.5% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure/vacuum.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="967 1371 1219 1651"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>2</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>1</td></tr> <tr> <td>Aquatic Toxicity</td><td>3</td></tr> <tr> <td>Nesthetic Effect</td><td>1</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="967 1651 1219 1759"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	2	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Nesthetic Effect	1	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 72.11. 13.3 Boiling Point at 1 atm: 167°F = 74.8°C = 348.0°K. 13.4 Freezing Point: -142°F = -96.4°C = 176.8°K. 13.5 Critical Temperature: 484°F = 251°C = 524°K. 13.6 Critical Pressure: 690 psia = 40 atm = 4.1 MN/m ² . 13.7 Specific Gravity: 0.803 at 20°C (liquid). 13.8 Liquid Surface Tension: 24.6 dynes/cm = 0.0246 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 5.7 dynes/cm = 0.0057 N/m at 22.3°C. 13.10 Vapor (Gas) Specific Gravity: 2.5. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.089. 13.12 Latent Heat of Vaporization: 194 Btu/lb = 102 cal/g = 4.27 × 10 ³ J/kg. 13.13 Heat of Combustion: -15,200 Btu/lb = -8450 cal/g = -353 × 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	3																																				
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Vapor Irritant	2																																				
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NOTES (Continued on pages 5 and 6)																																					

REVISED 1978

n-BUTYRIC ACID

Common Synonyms Butanoic acid Butanoic acid Ethylacetic acid Propanecarboxylic acid Butyric acid	Liquid Colorless Pungent butter odor Floats and mixes with water Freezing point is 23°F	Butanoic acid Butanoic acid Ethylacetic acid Propanecarboxylic acid Butyric acid
Fire	Combustible	Butanoic acid Butanoic acid Ethylacetic acid Propanecarboxylic acid Butyric acid
Exposure	CALL FOR MEDICAL AID	Butanoic acid Butanoic acid Ethylacetic acid Propanecarboxylic acid Butyric acid
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes	Butanoic acid Butanoic acid Ethylacetic acid Propanecarboxylic acid Butyric acid
1. RESPONSE TO DISCHARGE	2. LABEL	
3. CHEMICAL DESIGNATIONS	4. OBSERVABLE CHARACTERISTICS	Butanoic acid Butanoic acid Ethylacetic acid Propanecarboxylic acid Butyric acid
31 Synonyms: Butanoic acid Butanoic acid Butyric acid Ethylacetic acid Propanecarboxylic acid 32 Coast Guard Compatibility Classification: Organic acid 33 Chemical Formula: <chem>CH3CH2CH2COOH</chem> 34 IMCO/United Nations Chemical Designation: Not listed	41 Physical State (as shipped): Liquid 42 Color: Clear 43 Odor: Rancid disagreeable strong penetrating like rancid butter	Butanoic acid Butanoic acid Ethylacetic acid Propanecarboxylic acid Butyric acid
5. HEALTH HAZARDS		
51 Personal Protective Equipment: Self contained breathing apparatus, rubber gloves, vapor proof plastic goggles, impervious apron and boots 52 Symptoms Following Exposure: Inhalation causes irritation of mucous membrane and respiratory tract; may cause nausea and vomiting. Ingestion causes irritation of mouth and stomach. Contact with eyes may cause serious injury. Contact with skin may cause burns; chemical is readily absorbed through the skin and may cause damage by its source. 53 Treatment for Exposure: INHALATION: remove victim to fresh air; give oxygen if breathing is difficult; call a physician. INGESTION: give large amount of water and induce vomiting. EYES: irrigate with water for 15 min. and get medical attention. SKIN: flush affected areas immediately and thoroughly with water. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade 2 Oral LD₅₀ (Rat) 2 g/kg (rat) 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Vapor is a strong irritant in such that it causes temporary blindness. 59 Liquid or Solid Irritant Characteristics: Rancid irritant. May cause pain and second degree burns after a few minutes. 510 Odor Threshold: 0.002 ppm		

6. FIRE HAZARDS 6.1 Flash Point: 166°F (74°C) 110°F (43°C) 6.2 Flammable Limits In Air: 2.1% - 13.4 6.3 Fire Extinguishing Agents: Dry chemical, alcohol, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: 842°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 2.7 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 400 ppm = trout lethal, fresh water 200 ppm 24 hr bluegill 11 m fresh water *Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 1150 lb. 5 days 1150 lb. 20 days 8.4 Food Chain Concentration Potential: Seafowl may be tainted following a spill but chemical does not concentrate in food chain																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack aluminum or other light metals with formation of flammable hydrogen gas 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Celanese Chemical Co. 522 Fifth Avenue New York, N.Y. 10036 2. Eastman Chemical Products, Inc. Kingsport, Tenn. 37662 3. Mallinckrodt Chemical Works 223 Westside Avenue P.O. Box 384 Jersey City, N.J. 07303																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A P Q	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 99.4% + 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive Material 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Category</th> <th style="width: 40%;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td></td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td></td> </tr> <tr> <td>Poisons</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>2</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Acute Effect</td> <td>1</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>0</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Category</th> <th style="width: 40%;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire		Health		Vapor Irritant	2	Liquid or Solid Irritant		Poisons	1	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Acute Effect	1	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 88.1 13.3 Boiling Point at 1 atm: 62°F = 16°C = 317°K 13.4 Freezing Point: -13°F = -25°C = 268°K 13.5 Critical Temperature: 471°F = 244°C = 517°K 13.6 Critical Pressure: 764 psia = 52 atm = 5.3 MPa 13.7 Specific Gravity: 0.955 at 20°C 13.8 Liquid Surface Tension: 26.74 dynes/cm = 0.02674 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.0 13.11 Ratio of Specific Heats of Vapor (Gas): 1.079 at 20°C 13.12 Latent Heat of Vaporization: 117 Btu/lb = 92.7 cal/g = 388 X 10 J/kg 13.13 Heat of Combustion: -10,620 Btu/lb = -5,900 cal/g = 247 X 10 J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 8.7 Btu/lb = 45 cal/g = 1.9 X 10 J/kg 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire																																					
Health																																					
Vapor Irritant	2																																				
Liquid or Solid Irritant																																					
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Flammability (Red)	2																																				
Reactivity (Yellow)	0																																				

CDA

CACODYLIC ACID

Common Synonyms Hydroxydimethylarsinic oxide Dimethylarsinic acid ANSAR Silver 510		Solid Colorless or dyed blue Sinks and mixes with water
AVOID CONTACT WITH EYES AND SKIN. IF EXPOSED, WASH IMMEDIATELY WITH WATER.		
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED	
 Exposure	DUST FOR MESH 500 POISONOUS IF INHALED OR IF SKIN IS EXPOSED SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED AVOID SWALLOWING AND AVOID CONTACT WITH SKIN AND EYES. IF SWALLOWED, DRINK WATER AND INDUCE VOMITING. IF ON SKIN, WASH IMMEDIATELY WITH WATER. IF IN EYES, WASH IMMEDIATELY WITH WATER.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: poison water contaminant Should be removed Chemical and physical treatment		2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Hydroxydimethylarsinic oxide, Dimethylarsinic acid, Ansar, Silver 510 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: (CH ₃) ₂ AsO ₂ H 3.4 IMCO/United Nations Numerical Designation: 6.1 1502		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White; water solutions may be dyed blue 4.3 Odor: None
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator, goggles, protective clothing 5.2 Symptoms Following Exposure: Chemical is essentially non-irritating in contact with skin and eyes. Ingestion causes arsenic poisoning; hot symptoms are delayed. 5.3 Treatment for Exposure: Be alert for delayed arsenic poisoning symptoms: EYES AND SKIN: Flush with water. INGESTION: Induce vomiting and call physician at once. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral rat LD ₅₀ = 500 mg/kg 5.7 Late Toxicity: Arsenic poisoning 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: May form toxic oxides of arsenic when heated 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8 WATER POLLUTION 8.1 Aquatic Toxicity: 100 ppm 96 hr scud, not toxic 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS The Ansul Company Chemical Division 1 Stanton Street Marinette, Wis. 54143
11 HAZARD ASSESSMENT CODE See Haz 2 Assessment Handbook, CG 446.3 NN		10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial 40% solution in water, dyed blue 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 FEPA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 134 13.3 Boiling Point at 1 atm: > 102°C = > 218°F = > 473 K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: at 20°C (solid) 13.8 Limit of Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: heat = 6,180 Btu/lb = 14,400 cal/g = 140 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: heat = 54 Btu/lb = 30 cal/g = 1.1 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent
(continued on pages 3 and 4)		
NOTES		

CAT

CADMIUM ACETATE

Common Synonyms Cadmium acetate dihydrate		Solid	Colorless	Odorless
		Sinks and mixes with water		
AVOID CONTACT WITH SKIN. IF CONTACT OCCURS, WASH IMMEDIATELY WITH WATER.				
Fire		Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE.		
 Exposure		DUST POISONOUS IF INHALED If inhaled will cause coughing or difficult breathing. SOLID POISONOUS IF SWALLOWED		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cadmium acetate dihydrate 3.2 Coast Guard Competibility Classification: Not listed 3.3 Chemical Formula: $(Cd(CH_3COO)_2) \cdot 2H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation causes coughing, sneezing, symptoms of lung damage. Ingestion produces severe toxic symptoms; both kidneys and liver injuries may occur. Contact with dust causes irritation. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; seek medical attention. INGESTION: induce vomiting; allay gastrointestinal irritation by swallowing milk or egg whites at frequent intervals; perform gastric lavage; seek medical attention. EXPOSURE: flush with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.2 mg/m (as cadmium) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 LD ₅₀ < 50 mg/kg 5.7 Late Toxicity: Delayed liver, lung, and kidney damage has followed respiratory exposures to cadmium salts in industry. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic cadmium oxide fumes may form in fires 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Concentrated by shellfish
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 American Hoechst Corp. Chemicals and Plastics Div. Rt. 202, 208 North Somerville, N. J. 08876 2 Mallinckrodt Chemical Works 223 Westside Avenue P. O. Box 154 Jersey City, N. J. 07301 3 J. T. Baker Chemical Co. Phillipsburg, N. J. 08865
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Pure 99% Reagent 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 266.52 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.34 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 % of Specific Vents of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	(See inside on pages 1 and 4)
NOTES	

CADMIUM BROMIDE

Common Synonyms: Cadmium bromide tetrahydrate		Solid	White	Odorless
		Mixes with water		
AVOID CONTACT WITH SKIN AND EYES IN KIEFFER ASSAY Wear dust respirator and gloves. Avoid contact with skin and eyes. Do not breathe vapors. Do not get material on face, neck, or in eyes. If contact occurs, flush with water.				
Fire		Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and gloves.		
		CAUTION: MEDICAL AID DUST POISONOUS IF INHALED If inhaled will cause coughing or difficult breathing. If inhaled, remove person to fresh air. If breathing is difficult, give artificial respiration. If swallowed, give milk or water to drink. If on skin, wash with soap and water. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed will cause nausea, vomiting and loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with copious amounts of water. IF IN EYES, flush eyes open with water for 15 minutes. IF SWALLOWED, do not induce vomiting. If conscious, drink water. If unconscious, do not give anything by mouth. IF SWALLOWED, give 1-2 glasses of water to drink. If unconscious, give 1-2 glasses of water to drink.		
Exposure				
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Do not pour down drain or into water. Do not pour down drain or into water.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 646-4) Issue warning: water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 31 Synonyms: Cadmium bromide tetrahydrate 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: $\text{CdBr}_2 \cdot 4\text{H}_2\text{O}$ 34 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: White 43 Odor: None		
5. HEALTH HAZARDS				
51 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves 52 Symptoms Following Exposure: Inhalation causes coughing, sneezing, symptoms of lung damage. Ingestion produces severe toxic symptoms, both kidneys and liver injuries may occur. Contact with eyes causes irritation. 53 Treatment for Exposure: INHALATION: remove patient to fresh air, seek medical attention. INGESTION: induce vomiting, dilute (irritation by going milk or egg whites at frequent intervals), perform gastric lavage, seek medical attention. EYES: flush with water for at least 15 min. 54 Toxicity by Inhalation (Threshold Limit Value): 0.2 mg/m ³ as cadmium 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: (Grade 4) LD ₅₀ < 50 mg/kg 57 Late Toxicity: Delayed liver, kidney, and lung damage has followed respiratory exposure to cadmium salts in industry. 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: Data not available				

6 FIRE HAZARDS

- 61 **Flash Point:** Not flammable
- 62 **Flammable Limits in Air:** Not flammable
- 63 **Fire Extinguishing Agents:** Not pertinent
- 64 **Fire Extinguishing Agents Not to be Used:**
Not pertinent
- 65 **Special Hazards of Combustion Products:**
Toxic, cadmium oxide fumes may form
in fires
- 66 **Behavior in Fire:**
- 67 **Ignition Temperature:** Not pertinent
- 68 **Electrical Hazard:** Not pertinent
- 69 **Burning Rate:** Not pertinent

8 WATER POLLUTION

- 81 **Aquatic Toxicity:** Data not available
82 **Waterlow Toxicity:** Data not available
83 **Biological Oxygen Demand (BOD):** None
84 **Food Chain Concentration Potential:**
(Concentrated by the fish)

9. SELECTED MANUFACTURERS

- 1 American Hoechst Corp
Chemicals and Plastics Div
Rt 20, 206 North
Somerville N.J. 08876
- 2 Gallard Schlesinger Chemical Mfg Co
584 Mineola Ave
Carle Place N.Y. 11514
- 3 Research Organic Inorganic Chemical Corp
Sun Valley Calif 91352

10. SHIPPING INFORMATION

- 101 **Grades or Purity:** Commercial 99+%,
Anhydrous 99+%
- 102 **Storage Temperature:** Ambient
- 103 **inert Atmosphere:** No requirements
- 104 **Handling:** Open

11. HAZARD ASSESSMENT CODE

(See Maryland Assessment Handbook CG 446.)

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13 1 **Physical State at 15°C and 1 atm:** Solid
- 13 2 **Molecular Weight:** 144.2
- 13 3 **Boiling Point at 1 atm:** Not pertinent.
(decomposes)
- 13 4 **Freezing Point:** Not pertinent
- 13 5 **Critical Temperature:** Not pertinent
- 13 6 **Critical Pressure:** Not pertinent
- 13 7 **Specific Gravity:** > 1 at 20°C (solid)
- 13 8 **Liquid Surface Tension:** Not pertinent
- 13 9 **Liquid-Water Interfacial Tension:**
Not pertinent.
- 13 10 **Vapor (Gas) Specific Gravity:**
Not pertinent
- 13 11 **Ratio of Specific Heats of Vapor (Gas):**
Not pertinent
- 13 12 **Latent Heat of Vaporization:**
Not pertinent
- 13 13 **Heat of Combustion:** Not pertinent
- 13 14 **Heat of Decomposition:** Not pertinent.
- 13 15 **Heat of Solution:**
 $-2.1 \text{ Btu/lb} = -1.3 \text{ cal/g}$
 $= -0.04 \times 10^3 \text{ J/kg}$
- 13 16 **Heat of Polymerization:** Not pertinent

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
- 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classifications: Not listed

5 HEALTH HAZARDS

- 51 **Personal Protective Equipment:** Dust mask, goggles or face shield, rubber gloves
- 52 **Symptoms Following Exposure:** Inhalation causes coughing, sneezing, symptoms of lung damage. Ingestion produces severe toxic symptoms. Both kidneys and liver injuries may occur. Contact with eyes causes irritation.
- 53 **Treatment for Exposure:** INHALATION: remove patient to fresh air, seek medical attention. INGESTION: induce vomiting, allow stimulation by giving milk or egg whites at frequent intervals, perform gastric lavage, seek medical attention. EYES: flush with water for at least 15 min.
- 54 **Toxicity by Inhalation (Threshold Limit Value):** 0.2 mg/m³ as cadmium
- 55 **Short-Term Inhalation Limits:** Data not available
- 56 **Toxicity by Ingestion:** Grade 4 LD₅₀ < 50 mg/kg
- 57 **Late Toxicity:** Delayed liver, kidney, and lung damage has followed respiratory exposure to cadmium salts in industry.
- 58 **Vapor (Gas) Irritant Characteristics:** Data not available
- 59 **Liquid or Solid Irritant Characteristics:** Data not available
- 510 **Odor Threshold:** Data not available

NOTES

CADMIUM CHLORIDE

Common Synonyms	Solid crystals White Odorless Sinks and mixes with water
To life and limb, in the highest measure. No hazard and no pollution.	
Fire	Not flammable
Exposure	CALL FOR MEDICAL AID SOLID Harmful if swallowed. IF SWALLOWED, DO NOT INDUCE VOMITING. Have victim drink water or milk. Have victim swallow solid contents. IF SWALLOWED, DO NOT INDUCE VOMITING OR HAVE CONVERSATION. Do not eat or drink. Keep victim warm.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Not a local hazard and no pollution. Not a respiratory or aquatic water intake.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant. Should be removed.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: CdCl ₂ 3.4 IMCO United Nations Numerical Designation: Not listed.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Crystalline solid. 4.2 Color: White. 4.3 Odor: Odorless.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety glasses, rubber gloves, and respirator with proper filter. 5.2 Symptoms Following Exposure: Ingestion causes gastrointestinal distress, pain and penetration. Nervous disturbances, liver injury, and convulsions have been observed in severe intoxications. 5.3 Treatment for Exposure: INGESTION: induce vomiting and follow with castor oil. Have a saline cathartic and demulcents. Consider nasogastric intubation and fluid therapy. CANCER: ED ₀₁ has been effective in acutely poisoned animals and in a few humans. BAL has been found to be effective in animal experiments to justify its use in human intoxication. Since the BAL sodium complex has a nephrotoxic action, the physician will have to decide whether or not to use this salt. 5.4 Toxicity by Inhalation (Threshold Limit Value): 2 ppm 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 4 LD ₅₀ below 50 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure. 5.10 Odor Threshold: Not pertinent.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not flammable.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 150 ppm. White blood cell in fresh water. 8.2 Waterfowl Toxicity: LC50 >5000 ppm. 8.3 Biological Oxygen Demand (BOD): Not pertinent. 8.4 Food Chain Concentration Potential: Not pertinent.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Specialty Chemical Division Marathon, Pa. 19061 2. Chemetron Corp. Isorank Chemicals Division Cleveland, Ohio 44113 3. Mallinckrodt Chemical Works Industrial Chemicals Division St. Louis, Mo. 63102
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SN	10. SHIPPING INFORMATION 10.1 Grades or Purity: Data not available. 10.2 Storage Temperature: Data not available. 10.3 Inert Atmosphere: Data not available. 10.4 Venting: Data not available.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poison, Class B. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 228.11. 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 4.05 at 25°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

CFB

CADMIUM FLUOROBORATE

Common Synonyms Cadmium fluoroborate Cadmium fluoroborate solution	Liquid Colorless Odorless Sinks and mixes with water
AVOID CONTACT WITH DUST AND VAPOR. KEEP PEOPLE AWAY. Wear goggles and wear a respirator if there is a possibility of exposure. In case of emergency, call for medical attention. Notify your health and safety officer.	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and wear a respirator if there is a possibility of exposure.
 Exposure	CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED If inhaled will cause coughing or difficult breathing. If inhaled, remove person to fresh air. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. If swallowed, do not induce vomiting. Give person 1-2 glasses of water. If INGESTED, do not induce vomiting. Give person 1-2 glasses of water. If SWALLOWED, do not induce vomiting. Give person 1-2 glasses of water. If SWALLOWED, do not induce vomiting. Give person 1-2 glasses of water. If SWALLOWED, do not induce vomiting. Give person 1-2 glasses of water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify your health and safety officer.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4. Issue warning: water contains heat. Dispense and flush.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cadmium fluoroborate 3.2 Coast Guard Competibility Classification: Not listed 3.3 Chemical Formula: $(\text{CdBF}_2)_2 \cdot \text{H}_2\text{O}$ 3.4 INCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves and apron, safety glasses and face shield. 5.2 Symptoms Following Exposure: Ingestion produces severe toxic symptoms; both kidney and liver injuries may occur; may be fatal. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: remove patient to fresh air; seek medical attention. INGESTION: call a physician at once; if victim is conscious, induce vomiting by giving a table spoonful of salt in a glass of warm water and repeat until vomit is clear; give milk or whites of eggs beaten with water; keep patient warm and quiet. EYES: flush with plenty of water and get medical attention. SKIN: flush with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.2 mg/m ³ as cadmium. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 250 mg/kg (rat). 5.7 Late Toxicity: Delayed liver, kidney, and lung damage has followed respiratory exposure to cadmium in toxic industry. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic hydrogen fluoride and cadmium oxide fumes may form in fires. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Concentrated by shellfish								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Alud Chemical Corp. P.O. Box 1087K Morristown, N.Y. 07960 2. The Harshaw Chemical Co. 1945 E. 9th St. Cleveland, Ohio 44106 3. Gallard-Schlesinger Chemical Mfg. Co. 544 Mineola Avenue Carle Place, N.Y. 11514								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P	10. SHIPPING INFORMATION 10.1 Grades or Purities: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NIHA Hazard Classifications: <table data-bbox="1014 1450 1270 1537"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	0	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 254.06 (calculated) 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.60 at 20°C (liquids) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	0								
Reactivity (Yellow)	0								
NOTES (continued on pages 1 and 6)									

CMN

CADMIUM NITRATE

Common Synonyms Cadmium nitrate tetrahydrate		Solid	White	Odorless
Sinks in water				
AVOID CONTACT WITH SKIN, EYES, AND CLOTHING. IF CONTACT OCCURS, WASH IMMEDIATELY WITH WATER. IF IN EYES, FLUSH WITH WATER FOR 15 MIN. IF INGESTED, DRINK WATER AND SEEK MEDICAL ATTENTION.				
Fire		Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE.		
 Exposure		DUST POISONOUS IF INHALED If inhaled will cause headache, coughing, or difficult breathing. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed will cause nausea and vomiting.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 44-4) Toxic warning: water contaminant Dispense and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cadmium nitrate tetrahydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{Cd}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ 3.4 INCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, safety goggles, dust mask 5.2 Symptoms Following Exposure: Inhalation of fumes can produce coughing, chest constriction, headache, nausea, vomiting, pneumonia. Chronic poisoning is characterized by emphysema and kidney injury. Ingested or causes gastrointestinal disturbance and severe toxic symptoms. High kidney and liver injuries may occur. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION: remove patient to fresh air; seek medical attention. INGESTION: give large amounts of water and induce vomiting; give milk or egg whites; seek medical attention. EYES: flush with copious amounts of water for 15 min.; consult a physician. SKIN: wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.2 mg/m ³ as cadmium 5.5 Short-Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 3 oral mouse LD ₅₀ = 100 mg/kg 5.7 Late Toxicity: Delayed liver, lung, and kidney damage has followed repeated exposures to cadmium salts in industry. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen and cadmium oxide fume may form in fires 6.6 Behavior in Fire: Will increase intensity of fire when in contact with combustible material 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.06 ppm^a 96-hr LC₅₀ 1 D₁₀ fresh water 0.2 ppm 10 days stockback, killed fresh water ^aAs cadmium ^bTime period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Shellfish concentrate 900-1600 times								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: Mixtures with wood or other combustibles may catch fire 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Gases: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. The Harshaw Chemical Co. 1945 E. 97th Street Cleveland, Ohio 44106 2. Mallinckrodt Chemical Works 223 Westside Avenue P.O. Box 384 Jersey City, N.J. 07303 3. Allied Chemical Corp. Specialty Chemicals Div. P.O. Box 1087R Morristown, N.J. 07960								
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 44-3) NS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 282.4^b 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 13.5°C = 56°F = 273 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.45 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -9.7 kcal/mole = -40.7 kJ/mole = 16.5 cal/g = 0.691 X 10³ J/kg 13.16 Heat of Polymerization: Not pertinent								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>3</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>2</td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	1	Reactivity (Yellow)	2	
Category	Classification								
Health Hazard (Blue)	3								
Flammability (Red)	1								
Reactivity (Yellow)	2								
NOTES 1. Continued on pages 2 and 3									

COX

CADMIUM OXIDE

Common Synonyms Cadmium fume		Solid	Yellow brown	Odorless
Sinks in water				
Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE.				
Fire				
		DUST POISONOUS IF INHALED If inhaled will cause coughing.		
Exposure		SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE See Response Summary paragraph CG 446.4. Should be removed. Chemical and physical treatment.		2. LABELS See Hazard Label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cadmium fume 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: (Cd) 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow brown to brown 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: BA. Must use approved respirator, goggles, rubber gloves. 5.2 Symptoms Following Exposure: A single exposure to cadmium oxide fumes can cause severe or fatal lung irritation. Chronic poisoning is characterized by lung injury, emphysema, and kidney dysfunction. Ingestion produces severe toxic effects. Both kidney and liver damage may occur. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION: If there has been known exposure to dense cadmium oxide fume or cough, chest tightness, or respiratory distress occur after possible exposure, place patient at bed rest and call a physician. INGESTION: Induce vomiting, stop irritation by giving milk or egg whites at frequent intervals, perform gastric lavage, seek medical attention. EYES: Flush with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ 5.5 Short-Term Inhalation Limit: 0.1 mg/m ³ 10 min 5.6 Toxicity by Ingestion: Oral LD ₅₀ rat 110 mg/kg 5.7 Late Toxicity: Delayed liver, lung, and kidney damage has followed respiratory exposures to cadmium oxide in rodents. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS

- 6.1 Flash Point: Not flammable
- 6.2 Flammable Limits in Air: Not flammable
- 6.3 Fire Extinguishing Agents: Not pertinent
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
- 6.5 Special Hazards of Combustion Products: Toxic cadmium oxide fume may form in fire.
- 6.6 Behavior in Fire:
- 6.7 Ignition Temperature: Not pertinent
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterfoot Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): None
- 8.4 Food Chain Concentration Potential: Concentrated by shellfish.

9. SELECTED MANUFACTURERS

1. American Smelting and Refining Co.
20 Broadway
New York, N.Y. 10038
2. J. T. Baker Chemical Co.
Phillipsburg, N.J. 08865
3. Varlacord Chemicals
446 North Front St.
Elizabeth, N.J. 07202

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials:
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Corrosives: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purities: Request technical
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: Nitrogen recommended
- 10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment paragraph CG 446.3
II

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
- 12.2 NFPA Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classifications: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
- 13.2 Molecular Weight: 128.4
- 13.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 13.4 Freezing Point: Not pertinent
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 6.95 at 20°C (solid)
- 13.8 Liquid Surface Tension: Not pertinent
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Rate of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: Not pertinent
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

Continued on page 1 and 2

NOTES

CMS

CADMIUM SULFATE

Common Name(s)		Solid	White	Odorless
Sinks and mixes slowly with water				
Fire		Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE		
		DUST POISONOUS IF INHALED If inhaled will cause headache, coughing, or difficult breathing		
Exposure		SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed will cause nausea and vomiting.		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-1) Have warning water containment Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: CdSO_4 3.4 HBCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Put on approved respiratory, rubber gloves, safety goggles				
5.2 Symptoms Following Exposure: Inhalation may cause dryness of throat, coughing, constriction in chest, and headache. Ingestion may cause salivation, vomiting, abdominal pain, and diarrhea. Contact with eyes causes irritation.				
5.3 Treatment for Exposure: INHALATION: remove victim from exposure and advise a physician. INGESTION: induce vomiting then dilute irritation with milk or egg whites given at frequent intervals. SKIN: perform gastric lavage, seek medical attention. EYES: flush with water for at least 10 minutes, consult a physician. SKIN: wash with soap and water.				
5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ as an average				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Oral dose: 10 mg/kg (LD ₅₀) 55 mg/kg				
5.7 Late Toxicity: Delayed liver, kidney, and lung damage has followed respiratory exposure to cadmium salts in rodents.				
5.8 Vapor (Gas) Irritant Characteristics: Data not available.				
5.9 Liquid or Solid Irritant Characteristics: Data not available.				
5.10 Odor Threshold: Not listed.				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic cadmium oxide fumes may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: (100 ppm) 96 hr LC₅₀ in fresh water *Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: No fish concentration studies were performed								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS The Harshaw Chemical Co. 4471 17th Street Cleveland, Ohio 44109 2. Mallinckrodt Chemical Works 223 Westlake Avenue P.O. Box 344 Jensen City, N.J. 07034 3. F. I. Baker Chemical Co. Pittsburgh, N.J. 07645								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-2 NS	10 SHIPPING INFORMATION 10.1 Grades or Purities: Technical A 11 hydrate grade Reagent 10.2 Storage Temperature: Not pertinent 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td></td></tr><tr><td>Flammability (Red)</td><td></td></tr><tr><td>Reactivity (Yellow)</td><td></td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)		Flammability (Red)		Reactivity (Yellow)		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 208.46 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 4.7 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 12.4 kcal/mole (solid) 2.15 kcal/mole (aq) 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)									
Flammability (Red)									
Reactivity (Yellow)									
NOTES									

CCA

CALCIUM ARSENATE

Common Synonyms Tricalcium arsenate Tricalcium ortho arsenate Cucumber dust		Solid	White	Odorless
Sinks in water				
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear eye protection. Stop breathing apparatus. Wear gloves and protective clothing. Wash thoroughly after handling.				
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and face shield if breathing apparatus			
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED. If inhaled will cause coughing or difficult breathing. Pneumonia, bronchitis, and other respiratory diseases may result from dust inhalation. SOLID POISONOUS IF SWALLOWED If swallowed will cause nausea and vomiting. Rinse mouth thoroughly with water. If swallowed, do not induce vomiting. If in EYES, flush with water for 15 minutes with plenty of water. If SWALLOWED, do not induce vomiting. Give milk or water to drink. If SWALLOWED, do not induce vomiting. Give milk or water to drink. If SWALLOWED, do not induce vomiting. Give milk or water to drink.			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Not listed as a water pollutant. Not listed as a water pollutant.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CC-14) Issue warning - poison, water contaminant Restrict access Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cucumber dust Tricalcium arsenate Tricalcium orthoarsenate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{Ca}_3(\text{AsO}_4)_2$ 3.4 IMCO/United Nations Numerical Designation: 6.1 1573		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation causes respiratory irritation. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give victim one tablespoonful of salt in glass of water, repeat until vomit is clear, then give 2 tablespoonfuls of 1% pepsin solution or milk of magnesia and force fluids; call a physician in all cases of suspected poisoning. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m^3 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 oral rat $\text{LD}_{50} = 20 \text{ mg/kg}$ 5.7 Late Toxicity: Arsenic compounds may cause skin and lung cancer 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic arsenic fume may be formed in fires 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 1.1 ppm/48 hr/perch/toxic/fresh water 4.3 ppm/264 hr/crabs/toxic/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Possible bioaccumulation problem
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Los Angeles Chemical Co 4545 Ardine Street South Gate, Calif. 90280 2. Pfaltz and Bauer, Inc 126-04 Northern Blvd Flushing, N.Y. 11368
	10. SHIPPING INFORMATION 10.1 Grades or Purity: 70% containing calcium carbonate and calcium hydroxide (limestone and slaked lime) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, FG 446-3) II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 398 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 3.62 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous solid, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	(Continued on pages 1 and 2)
NOTES	

CALCIUM CARBIDE

Common Synonyms Carbide Acetylenes	Solid granules Grey to bluish black Garlic odor Sinks in water, and bubbles appear on surface as flammable gas is produced
No toxic fumes, vapors, or dusts. Short-term exposure to dust may irritate eyes. Avoid contact with skin. If gas escapes, move away. No toxic health or pollution hazard.	
Fire	Not flammable FLAMMABLE, EXPLOSIVE GAS IS PRODUCED ON CONTACT WITH WATER Extinguish by DO NOT USE WATER OR FOAM ON VESSEL FIRES
Exposure	CALL FOR MEDICAL AID SOLID Irritating to skin and eyes Run water over face if the gas escapes. Flush contact of eyes with plenty of water. IF IN EYES, FLUSH EYES FOR AT LEAST 15 MIN.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS No toxic substances are known to be released.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Issue warning - high flammability. Should be removed. Chemical and physical treatment.	2. LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetylenes Carbide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CaC_2 3.4 IMCO/United Nations Numerical Designation: 4.3/1402	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Grey to bluish black 4.3 Odor: Garlic like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety goggles and (for those exposed to unusually dusty operations) a respirator such as those approved by the U.S. Bureau of Mines for nuisance dusts. 5.2 Symptoms Following Exposure: Eye and skin irritation. 5.3 Treatment for Exposure: INHALATION OF DUST: remove from further exposure and call a doctor. SKIN: wash with plenty of water. EYES: flush with clean running water at an eye wash fountain for at least 15 min. and get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: None. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled in clothing and allowed to remain may cause smarting and reddening of the skin. 5.10 Odor Threshold: Not pertinent.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Dry powder preferably allow fire to burn. 6.4 Fire Extinguishing Agents Not to be Used: Water, vaporizing liquid or foam, carbon dioxide. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: If wet by water, highly flammable acetylene gas is formed. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not flammable.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Not pertinent. 8.2 Waterfowl Toxicity: Not pertinent. 8.3 Biological Oxygen Demand (BOD): Not pertinent. 8.4 Food Chain Concentration Potential: None.										
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously with water to form the highly flammable acetylene gas, which may ignite spontaneously. 7.2 Reactivity with Common Materials: Reacts with copper and brass to form explosive compound. 7.3 Stability During Transport: Stable in absence of moisture. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Airco Inc. Airco Alloys and Carbide Div. 3801 Highland Ave. Spartanburg, S.C. 29405 2. Midwest Carbide Corp. Keokuk, Iowa 52632 3. Union Carbide Corp. Chemicals and Plastics Div. 270 Park Ave. New York, N.Y. 10017										
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-3) RR-C	10. SHIPPING INFORMATION 10.1 Grade or Purity: Data not available. 10.2 Storage Temperature: Data not available. 10.3 Inert Atmosphere: Data not available. 10.4 Venting: Data not available.										
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Solid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table data-bbox="900 1435 1152 1532"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>4</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> <tr> <td></td><td>W</td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	4	Reactivity (Yellow)	2		W	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 64.10. 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.22 at 18°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification										
Health Hazard (Blue)	1										
Flammability (Red)	4										
Reactivity (Yellow)	2										
	W										
NOTES											

(Continued on pages 5 and 6)

CCC

CALCIUM CHLORATE

Common Synonyms		Solid	White	Odorless
		Sinks and mixes with water.		
Calcium Chlorate A. per. ch. was 1. Chlorate is a strong oxidant 2. Active with fish and pollution control agencies				
Fire	Not flammable. May explode on contact with combustibles Irritating gases may be produced when heated Combat fires from safe distance or protect fire from Flood discharge area with water			
Exposure	Call for medical aid DUST Irritating to eyes, nose and throat Move victim to fresh air For eyes: hold closed and flush with plenty of water SOLID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush contaminated areas with plenty of water If IN EYES: hold eyelids open and flush with plenty of water If SWALLOWED: do not induce vomiting. Have victim drink water or milk and have victim seek medical attention If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do not induce vomiting. Call for medical aid			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify health authorities if wildlife affected Notify operators of nearby water intakes			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445-3) Issue warning - oxidizing material water contaminant Should be removed Chemical and physical treatment Disperse and flush		2. LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $\text{Ca}(\text{ClO}_3)_2$ 3.4 IMCO/United Nations Numerical Designation: 511452		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, dust respirator, coveralls or other protective clothing 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of upper respiratory system. Dust irritates eyes and skin. Ingestion causes abdominal pain, nausea, vomiting, diarrhea, pallor, shortness of breath, unconsciousness 5.3 Treatment for Exposure: INHALATION: remove to fresh air. EYES: flush with water for 1 min. SKIN: flush with water. INGESTION: induce vomiting and get medical attention 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral $\text{LD}_{50} = 4,500 \text{ mg/kg (rat)}$ 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable but may cause fire with other materials 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Flood with water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: When involved in a fire may cause an explosion. Irritating gases may be generated when heated 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May form an explosive mixture with finely divided combustible material. The mixture may ignite when rubbed 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Cera, Inc. Menomonee Falls, Wis. 53051 2 Gallard Schlesinger Chemical Manufacturing Corp. 584 Mineola Ave. Carle Place, N.Y. 11514 3 Dynamit Nobel AG 105 Stonehurst Court Northvale, N.J. 07647
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 445-3) 55	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial May be shipped as dihydrate 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 207 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: 644 F = 340°C = 613 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.710 at 0°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: test 1 = 54 Btu/lb = -40 cal/g = -1.3 X 10³ J/kg 13.16 Heat of Polymerization: Not pertinent
(Continued on pages 5 and 6) NOTES	

CLC

CALCIUM CHLORIDE

Common Synonyms Calcium chloride, anhydrous Calcium chloride hydrates		Solid or water solution	White to off-white	Odorless
Sinks and mixes with water				
Avoid contact with liquid and solid. Keep people away. Wear rubber overalls, including gloves. Stop discharge at possible. Isolate and remove discharge on a trail. Notify local health and safety authorities.				
Fire		Not flammable		
Exposure		CALL FOR MEDICAL AID SOLUTION OR SOLID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, do not induce vomiting. If conscious, have victim drink water. IF SWALLOWED, do not induce vomiting. If unconscious or having convulsions, do not give anything by mouth.		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and safety authorities. Notify operators of nearby water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Calcium chloride anhydrous; Calcium chloride hydrates. 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{CaCl}_2 \cdot x\text{H}_2\text{O}$ where $x = 0$ to 6 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or water solution 4.2 Color: White to off white 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety glasses or face shield; dust type respirator; rubber gloves 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes (particularly by dust) causes irritation and possible transient corneal injury. Contact of solid with dry skin causes mild irritation. Strong solutions can cause marked irritation or even a superficial burn. 5.3 Treatment for Exposure: INHALATION: move to fresh air; if discomfort persists, get medical attention. INGESTION: give large amounts of water. EYES: promptly flush with water and continue washing for at least 15 min.; consult an ophthalmologist. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, oral $\text{LD}_{50} = 1,000 \text{ mg/kg (rats)}$ 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 555 ppm/168 hr: rock bass-killed; tap water 10,650 ppm/96 hr: sunfish 1 D₅₀; fresh water 2,400 ppm/48 hr: marine fish 11 D₅₀; sea water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Anhydrous grade dissolves with evolution of some heat 7.2 Reactivity with Common Materials: Metals will slowly corrode in aqueous solutions 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. Michigan Chemical Corp. 351 E. Ohio St. Chicago, Ill. 60611 3. Allied Chemical Corp. Industrial Chemicals Div. P.O. Box 1139R Morristown, N.J. 07960
	10 SHIPPING INFORMATION 10.1 Grades or Purity: 51, 52, 53, 99, 99.9% water solutions containing 51-86% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 110.99 (solid) 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.15 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -292 Btu/lb = -162 cal/g = -6.79 × 10⁵ J/kg 13.16 Heat of Polymerization: Not pertinent (Continued on pages 5 and 6)
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

CCR

CALCIUM CHROMATE

Common Synonyms Calcium chromate (VI) Gelbin yellow ultramarine Steinbuhl yellow Calcium chromate dihydrate		Solid	Yellow	Odorless
Sinks and mixes slowly with water				
Avoid contact with skin (Part 1, 2). Keep people away. Wear rubber overclothing including gloves. Stop discharge if possible. Isolate and remove discharges (Part 1). Notify local health and pollution control agencies.				
Fire	Not flammable Will increase the intensity of a fire Flood discharge area with water			
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficulty breathing If in eyes hold eyelids open and flush with plenty of water If breathing has stopped give artificial respiration If breathing is difficult give oxygen SOLID Will burn skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected area with plenty of water If INGESTED hold victim's head over a sink and flush with plenty of water If SWALLOWED and victim is CONSCIOUS have victim drink water or milk and induce vomiting by vomiting If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing except keep victim warm			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes. Notify local health and pollution control agencies Notify operators of water treatment plants			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning - water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Calcium chromate (VI) Calcium chromate dihydrate Gelbin Yellow Ultramarine Steinbuhl Yellow 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{CaCr}_2\text{O}_7 \cdot 2\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion causes severe circulatory collapse and chronic nephritis. Contact with eyes causes irritation. Contact with skin may cause dermatitis and ulcers. 5.3 Treatment for Exposure: INHALATION: remove to fresh air. INGESTION: give large amounts of water, induce vomiting. EYES: flush with water for at least 15 min. SKIN: treat local injuries like acid burns, scrub with dilute (2%) sodium hypochlorite solution. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion, Grade 3 LD ₅₀ 400 mg/kg 5.7 Late Toxicity: Lung cancer may develop 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point Not flammable 6.2 Flammable Limits in Air Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used. Not pertinent 6.5 Special Hazards of Combustion Products. Toxic chromium fume may be formed in fires 6.6 Behavior in Fire. The hydrated salt loses water when hot and changes color, but no increase in hazard occurs 6.7 Ignition Temperature Not pertinent 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD). None 8.4 Food Chain Concentration Potential: Bioconcentration up to 2000 fold possible under constant exposure. Not significant under spill conditions
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization Not pertinent 7.6 Inhibitor of Polymerization Not pertinent	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Specialty Chemicals Div. P.O. Box 1067R Morristown, N.J. 07960 2. Gafford Schleusener Chemical Mfg. Co. 584 Miranda Avenue Carl Place, N.Y. 11514 3. Pfaltz and Bauer, Inc. 126-04 Northern Blvd. Flushing, N.Y. 11365
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) NS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 192.1 13.3 Boiling Point at 1 atm. Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: >1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution 73 Btu/lb = 41 cal/g = 1.7×10^5 J/kg 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations. Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation Not listed 12.3 NFPA Hazard Classifications: Not listed	
(Continued on pages 5 and 6)	
NOTES	

CCN

CALCIUM CYANIDE

Common Synonyms Cyanide of calcium		Solid	White to gray or black	Almond odor
		Sinks and mixes with water		
AVOID CONTACT WITH SOLID FLOOD AROUND WASH OFF IMMEDIATELY IF ON SKIN OR CLOTHING IF IN EYES, FLUSH WITH WATER IF SWALLOWED, DO NOT INDUCE VOMITING				
Fire		Not flammable POISONOUS GASES ARE PRODUCED WHEN HEATED DO NOT USE WATER TO EXTINGUISH FIRE ON DISCRIPTION ADD WATER TO PUT OUT		
		CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Irritating to eyes, nose and throat May cause death IF INHALED, MOVE TO FRESH AIR IMMEDIATELY IF IN EYES, FLUSH WITH WATER IF SWALLOWED, DO NOT INDUCE VOMITING		
Exposure		SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes IF SWALLOWED, DO NOT INDUCE VOMITING IF IN EYES, FLUSH WITH WATER IF SWALLOWED, DO NOT INDUCE VOMITING IF SWALLOWED, DO NOT INDUCE VOMITING		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS MAY BE DANGEROUS IF IT ENTERS WATER INTAKES N/A		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison air contaminant, water contaminant Restrict access Evacuate area Should be removed Chemical and physical treatment		2. LABEL 		
3 CHEMICAL DESIGNATIONS 31 Synonyms: Cyanide of Calcium Cyanogas G Fumigan, Cyanogas A Dust 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: Ca(CN) ₂ plus inert ingredients 34 IMCO/United Nations Numerical Designation: 6.1/1575		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White to gray to black 4.3 Odor: Compound reacts with moisture in air to form hydrogen cyanide gas which has a characteristic almond like odor		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self contained breathing apparatus and full protective clothing including rubber footwear 5.2 Symptoms Following Exposure: Inhalation or ingestion causes headache, nausea, vomiting and weakness, high concentrations are rapidly fatal 5.3 Treatment for Exposure: Call a doctor immediately. INHALATION: break amyl nitrite pearl in cloth and hold tightly under nose for 15 sec., repeat 5 times at 15 sec. intervals, use artificial respiration if breathing stops. EYES: flush with water for 15 min. do not allow water to enter nose or mouth. SKIN: flush with water, do not allow water to enter nose or mouth. INGESTION: break an amyl nitrite pearl in a cloth and hold tightly under nose for 15 sec. if patient is conscious induce vomiting and repeat until vomit is clear. repeat inhalation of amyl nitrite 5 times at 15 sec. intervals, use artificial respiration if breathing has stopped 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 mg./m. (as cyanide) 5.5 Short-Term Inhalation Limits: 5 mg./m. for 30 min 5.6 Toxicity by Ingestion: Grade 4, oral LD ₅₀ = 39 mg./kg. (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable
 6.2 **Flammable Limits in Air:** Not flammable
 6.3 **Fire Extinguishing Agents:** Use dry
 chemical, sand or earth on adjacent fires
 6.4 **Fire Extinguishing Agents Not to be Used:**
 Do not use water or carbon dioxide on
 adjacent fires
 6.5 **Special Hazards of Combustion Products:**
 Decomposes in fire to give very toxic
 gases including hydrogen cyanide
 6.6 **Behavior in Fire:** Not pertinent
 6.7 **Ignition Temperature:** Not pertinent
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:**
 0-12 ppm 96 hr. sunfish/11 m. fished
 water
 >25 ppm 48 hr. cockle/14% salt water
 8.2 **Waterlow Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):**
 Data not available
 8.4 **Flood Chain Concentration Potential:**
 None

9. SELECTED MANUFACTURERS

- 1 American Cyanamid Co.
 Agricultural Division
 P.O. Box 400
 Princeton, N.J. 08540
 2 Pfaltz and Bauer, Inc.
 126-04 Northern Boulevard
 Flushing, N.Y. 11368

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Releases very
 poisonous hydrogen cyanide gas slowly
 on contact with water. Release is rapid if
 acid is also present
 7.2 **Reactivity with Common Materials:**
 No reaction
 7.3 **Stability During Transport:** Stable if kept dry
 7.4 **Neutralizing Agents for Acids and
 Caustics:** Not pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

10. SHIPPING INFORMATION

- 10.1 **Grades or Purity:** 42% with 58% inert
 ingredients. May contain up to 1%
 calcium carbide which releases
 flammable acetylene gas when wet
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Sealed containers in well
 ventilated area

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 SS

12 HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:**
 Poisonous class B
 12.2 **NAS Hazard Rating for Bulk Water
 Transportation:** Not listed
 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 3 |
| Flammability (Red) | 0 |
| Reactivity (Yellow) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid
 13.2 **Molecular Weight:** 92
 13.3 **Boiling Point at 1 atm:** Decomposes
 13.4 **Freezing Point:** Not pertinent
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 1.353 at 20°C (solid)
 13.8 **Liquid Surface Tension:** Not pertinent
 13.9 **Liquid-Water Interfacial Tension:**
 Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:**
 Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas)**
 Not pertinent
 13.12 **Latent Heat of Vaporization:**
 Not pertinent
 13.13 **Heat of Combustion:** Not pertinent
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** 264 Btu/lb
 = 147 cal/g = 6.14 x 10³ J/kg
 13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CAF

CALCIUM FLUORIDE

Common Synonyms Fluorap	Solid powder or granules Gray Sinks in water	Odorless
Hazardous to Aquatic Life No data available for toxicity		
Fire	Not flammable	
Exposure	CALCIUM FLUORIDE SOLID Harmful if swallowed Not irritating to skin or eyes EPA CLASSIFICATION: Not Hazardous	
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Fluorap Fluor spar 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CaF_2 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Gray 4.3 Odor: Odorless
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: For dust only 5.2 Symptoms Following Exposure: Little acute toxicity 5.3 Treatment for Exposure: Usually no treatment needed 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 2-I D ₅₀ 5 to 6 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin 5.10 Odor Threshold: Not pertinent		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: 4000 ppm; * <i>tinea vulgaris</i> lethal; fresh water * Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Not pertinent 8.4 Food Chain Concentration Potential: Not pertinent
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Specialty Chemicals Div. Marcus Hook, Pa. 19361 2. Combustion Engineering Inc. C.I. Minerals Div. 443 South Gulph Rd. King of Prussia, Pa. 19406 3. Ozark Mahoning Co. Tulsa, Oklahoma 74119
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 456-4) II	10. SHIPPING INFORMATION 10.1 Grades or Purity: Acid grade 97.4% Ceramic grade 91.5% Fine powder (dry or damp cake) Gravel fluor spar Pellet 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Data not available 10.4 Venting: Data not available
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 78.08 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 3.18 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

(Continued on pages 5 and 6)

CALCIUM HYDROXIDE

Common Synonyms Slaked lime	Solid granules	White	Odorless
Sinks in water			
Available in various grades. Keep away from children. When exposed to air it reacts with carbon dioxide and moisture to form calcium carbonate. Do not breathe dust or fumes. Do not get in eyes, nose, mouth or on skin.			
Fire	Not flammable		
Exposure	ALL LOOK MEDICAL DUST Irritating to nose and throat if inhaled. May cause coughing. SOLID Will burn skin and eyes Harmful if swallowed Keep away from children. Do not breathe dust or fumes. Do not get in eyes, nose, mouth or on skin. If you have been exposed to this material, call your doctor immediately. NOT AN EXPOSURE		
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. DO NOT DISCHARGE INTO WATERWAYS.		
1. RESPONSE TO DISCHARGE See Response Methods Handbook CG 664-4. Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Slaked lime 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: Ca(OH) ₂ 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dry-proof goggles and mask 5.2 Symptoms Following Exposure: Dust irritates eyes, nose, and throat 5.3 Treatment for Exposure: EYES: Flush with lukewarm water for at least 10 min. and consult an ophthalmologist for further treatment without delay. SKIN: Wash off the lim. and consult a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade III Dose Severe Aggravated 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Not pertinent.			

6 FIRE HAZARDS 01 Flash Point: Not flammable 02 Flammable Limits in Air: Not flammable 03 Fire Extinguishing Agents: Not pertinent 04 Fire Extinguishing Agents Not to be Used: Not pertinent 05 Special Hazards of Combustion Products: Not pertinent 06 Behavior in Fire: Not pertinent 07 Ignition Temperature: Not flammable 08 Electrical Hazard: Not pertinent 09 Burning Rate: Not flammable	8 WATER POLLUTION 01 Aquatic Toxicity: 92 ppm 96 hr. toxic to fish, fresh water 240 ppm 24 hr. mosquito fish, 11 day, fresh water 02 Waterford Toxicity: Data not available 03 Biological Oxygen Demand (BOD): None 04 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Ash Grove Cement Co. 1000 Ten Main Center Kansas City, Mo. 64105 2. Engelhard Minerals & Chemical Corp. Minerals and Chemicals Division Menk Park, N. J. 08847 3. United States Gypsum Co. Chemicals Division Chicago, Ill. 60606
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-2 11	10 SHIPPING INFORMATION 101 Grade or Purity: Agricultural 95% Industrial 70-75% chemical 71-73% 102 Storage Temperature: Data not available 103 Inert Atmosphere: Data not available 104 Venting: Data not available
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NIHA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 74.09 133 Boiling Point at 1 atm: Not pertinent 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 2.24 at 20°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent

NOTES

CHY

CALCIUM HYPOCHLORITE

Common Synonyms HTH HTH Dry Chlorine Neutral anhydrous calcium hypochlorite Sentry	Solid granules White Household Bleaching powder odor Sinks and mixes with water
Avoid contact with acid and dust. Keep away from water, gas, and oil. Do not use in confined spaces. Toxic and severe irritant material. Not a health hazard.	
Fire	Not flammable May cause fire on contact with combustible. POISONOUS GASES ARE PRODUCED WHEN HEATED When heated, it will release chlorine gas which is extremely irritating to the respiratory system.
Exposure	CALL FOR MEDICAL AID SOLID Irritating to skin and eyes If swallowed, will cause nausea, vomiting or loss of consciousness. Breathing irritant gas may cause death. May cause irritation to the eyes. If NEYES have been exposed, wash with plenty of water. If SWALLOWED, give ORAL FLUIDS. Do not induce vomiting. If SWALLOWED, do not induce vomiting. If unconscious, do not induce vomiting. If conscious, give ORAL FLUIDS. If SWALLOWED, do not induce vomiting. If unconscious, do not induce vomiting. If conscious, give ORAL FLUIDS.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Not a health hazard.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Twice warning corrosive Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: HTH HTH Dry Chlorine Neutral anhydrous calcium hypochlorite Sentry 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: $\text{Ca}(\text{OCl})_2$ 34 IMCO United Nations Numerical Designation: 51 174X	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: White 43 Odor: Like bleaching powder
5. HEALTH HAZARDS 51 Personal Protective Equipment: Protective goggles, dust mask 52 Symptoms Following Exposure: INHALATION: hypochlorous acid fumes* cause severe respiratory tract irritation and pulmonary edema. INGESTION: pain and inflammation of mouth, pharynx, esophagus, and stomach; erosion of mucous membranes; chiefly of the stomach; vomiting; hemorrhaging may cause vomitus to resemble coffee grounds; circulatory collapse with cold, red, clammy skin; cyanosis; and shallow respirations; confusion; delirium; coma; edema of pharynx, glottis, and larynx; with stridor and obstruction; perforation of esophagus or stomach; with mediastinitis or peritonitis. SKIN CONTACT: may cause vesicular eruptions and eczematoid dermatitis. 53 Treatment for Exposure: INGESTION: swallow immediately milk, egg white, starch paste, milk of magnesia, aluminum hydroxide gel, or magnesium trisilicate gel. Avoid sodium bicarbonate because of the release of carbon dioxide. Do not use acids, antacids, caustics, gastric lavage with tap water or a 1% solution of sodium thiosulfate; milk of magnesia (if left in the stomach is useful as a mild antacid, adsorbent, demulcent, and cathartic; demulcents such as starch, egg white, milk, gelatin, opiate for the control of pain. Treat shock vigorously with intravenous fluids. Prompt surgical intervention when indicated, e.g., tracheotomy, gastrostomy. SKIN: wash with liberal quantities of water and apply a paste of baking soda. 54 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 55 Short-Term Inhalation Limits: Not pertinent 56 Toxicity by Ingestion: Grade II LD ₅₀ above 15 g/kg * Given off only if compound comes in contact with acid.	

(continued on page 4)

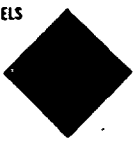
6. FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Poisonous gases may be produced when heated 67 Ignition Temperature: Not flammable 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not flammable	8. WATER POLLUTION 81 Aquatic Toxicity: 0.5 ppm/* trout killed fresh water * Time period not specified 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Not pertinent 84 Food Chain Concentration Potential: Not pertinent										
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: May cause fire on contact with wood or straw. Corrosive to most metal. 73 Stability During Transport: The 70% grade may decompose violently if exposed to heat or direct sunlight. Gases of chlorine and chlorine monoxide above 140°F (toxicous gases). 74 Neutralizing Agents for Acids and Caustics: Dilute with water. 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Olin Corp. Chemical Division Brandenburg, Ky. 40304 2. Pennwalt Corp. Chemical Division 4655 Riddle Ave. Wyandotte, Mich. 48191 3. P.P.G. Industries Inc. Industrial Chemical Division Barberton, Ohio 44201										
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NS	10. SHIPPING INFORMATION 101 Grade or Purity: 70% (cell preparations) 65% (non preparations) 102 Storage Temperature: Data not available 103 Inert Atmosphere: Data not available 104 Venting: Data not available										
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Oxidizing material 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: <table data-bbox="956 1482 1212 1581"> <thead> <tr> <th>Category</th><th>Classification*</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1 2</td></tr> <tr> <td>Flammability (Red)</td><td>0 0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2 2</td></tr> <tr> <td></td><td>oxy oxy</td></tr> </tbody> </table> * First column refers to non fire situation	Category	Classification*	Health Hazard (Blue)	1 2	Flammability (Red)	0 0	Reactivity (Yellow)	2 2		oxy oxy	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 174.99 133 Boiling Point at 1 atm: Not pertinent 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 2.35 at 20°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (G) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
Category	Classification*										
Health Hazard (Blue)	1 2										
Flammability (Red)	0 0										
Reactivity (Yellow)	2 2										
	oxy oxy										
5. HEALTH HAZARDS (Cont'd.) 57 Leak Toxicity: None 58 Vapor (Gas) Irritant Characteristics: Not pertinent 59 Liquid or Solid Irritant Characteristics: Irritates eyes, skin, and mucous membranes 510 Odor Threshold: Not pertinent											

(continued on page 4)

REVISED 1978

CAM

CALCIUM, METALLIC

Common Synonyms		Solid	Silvery to grayish white	Odorless
		Sinks in water. Reacts slowly with water.		
Fire		FLAMMABLE		
Exposure		SOLID Will burn skin and eyes.		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning: high flammability. Disperse and flush.		2. LABELS  		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Competibility Classification: Not applicable. 3.3 Chemical Formula: Ca 3.4 HMCO/United Nations Numerical Designation: 4.1 (40)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Silvers; turns to grayish white on exposure to air. 4.3 Odor: None.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles and rubber gloves. 5.2 Symptoms Following Exposure: Contact with eyes or skin produces caustic burns. 5.3 Treatment for Exposure: EYES or SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.				

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (flammable solid). 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Dry graphite, soda ash, powdered sodium chloride, or appropriate metal fire extinguishing dry powder. 6.4 Fire Extinguishing Agents Not to be Used: Water, halogenated hydrocarbons, dry chemical, carbon dioxide. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Burns violently, especially if finely divided. 6.7 Ignition Temperature: 1474 ± 18°F. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.		8. WATER POLLUTION 8.1 Aquatic Toxicity: See Calcium hydrosulfide (CAH). 8.2 Waterfowl Toxicity: See Calcium hydrosulfide (CAH). 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts to form flammable hydrogen gas, which may ignite. The reaction is not violent. 7.2 Reactivity with Common Materials: Reacts with moist air to form skin of hydroxide. The reaction is not hazardous. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Pfister Minerals Metals and Composite Products Division 253 E. 42 Street New York, N.Y. 10017 2. Gallard Schlegel Chemical Manufacturing Co. Atomergic Chemicals Division 584 Mincola Ave. Corte Place, L.I., N.Y. 11514 3. Cerac, Inc. 13360 West Silver Spring Rd. Menomonee Falls, Wis. 53051.									
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) H R R		10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 99.9% redistilled 99.9% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Sealed containers must be in a ventilated area.									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable solid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NEPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> </tbody> </table>		Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 40.1. 13.3 Boiling Point at 1 atm: 2714°F = 1490°C = 1763°K. 13.4 Freezing Point: 1562°F = 850°C = 1123°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.55 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: 6790 Btu/lb = 1770 cal/g = 158 × 10³ J/g. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.	
Category	Classification										
Health Hazard (Blue)	1										
Flammability (Red)	1										
Reactivity (Yellow)	2										
NOTES											

(Continued on pages 5 and 6)

CNT

CALCIUM NITRATE

Common Synonyms		Solid	White	Odorless
		Sinks and mixes with water		
CAUTION: May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.				
Fire	Not flammable May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED WHEN HEATED			
Exposure	DUST Irritating to eyes, nose and throat SOLID Irritating to skin and eyes. Harmful if swallowed			
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Evacuate - avoid breathing material Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Calcium nitrate tetrahydrate 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $\text{Ca}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: 1.4.4		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator and rubber gloves 5.2 Symptoms Following Exposure: Dose causes mild irritation of eyes 5.3 Treatment for Exposure: EYES or SKIN: flush with water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable but may cause fire on contact with combustibles 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Flood with water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: May give off toxic oxides of nitrogen when involved in fire 6.6 Behavior in Fire: Greatly intensifies the burning of all combustible materials 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 10000 ppm 96 hr LC50 fish 11 mo 1 yr water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Contact with combustible material may cause fire 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. J. I. Baker Chemical Co. Phillipsburg, N. J. 08865 2. Mallinckrodt Chemical Works 223 West Side Avenue P. O. Box 384 Jersey City, N. J. 07310 3. Barium and Chemicals, Inc. P. O. Box 219 Steubenville, Ohio 44222
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Analytical reagent 99.9% or purified technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 NN	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 146 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: 1.042°C = 34.27°C = 93.69°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.50 at 15°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Heat = -40 Btu/lb = -50 cal/g = -2.1 x 10³ J/kg 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	

Continued on pages 2 and 3

NOTES

Continued on pages 1 and 2

CALCIUM OXIDE

Common Synonyms Limited time Quicklime	Solid granules White to gray Odorless Sinks and reacts violently with water. Water appears to boil.	
Keep away from children. Wash hands thoroughly after handling. Wear rubber gloves if there are splashes or spills. Do not inhale dust and fumes. Avoid contact with eyes and skin.		
Fire	Not flammable May cause fire on contact with water and combustibles Extinguish with dry powder or carbon dioxide. Do not use water on adjacent fires.	
Exposure	CALL FOR MEDICAL AID DUST Irritating to nose and throat May irritate lungs SOLID Will burn skin and eyes. Harmful if swallowed Ingestion: Swallow nothing and drink milk or water. If swallowed immediately dilute with several glasses of water. If swallowed immediately dilute with several glasses of water. If swallowed immediately dilute with several glasses of water. DO NOT INDUCE VOMITING	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE (See Response Materials Manual, CG 404-4) Issue warning - call spillage Restrict access Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Quicklime Unslaked lime 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CaO 3.4 IMCO United Nations Hazardous Designation: 4.0 (1910)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White to gray 4.3 Odor: Odorless
5. HEALTH HAZARDS		
5.1 Personal Protective Equipment: Protect respiratory system and any type of respirator prescribed for free flow 5.2 Symptoms Following Exposure: Causes burns on mucous membrane and skin. Inhalation of dust causes sneezing 5.3 Treatment for Exposure: INGESTION: If victim consciousness have him drink water or milk. Do NOT induce vomiting. SKIN AND EYES: Flush with water and seek medical help 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 mg/m³ 5.5 Short-Term Inhalation Limits: 0.1 mg/m³ for 15 min 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Causes stinging of the skin and first degree burns on short exposure and may cause secondary burns on long exposure 5.10 Odor Threshold: Not pertinent		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Do not use water on adjacent fires 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazards: Not pertinent 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: 92 ppm 96 hr LC50 in 10% fresh water 240 ppm 24 hr LC50 in 10% salt water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Not pertinent 8.4 Food Chain Concentration Potential: Not pertinent								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Heat may cause ignition of combustibles. Material is stable during reaction. 7.2 Reactivity with Common Materials: No reaction with water present. Then white effect is that of heat liberated. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerizations: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Alcon Chemical Corp. Specialty Chemical Division Marcus Hook, Pa. 19366 2. Ash Grove Chemical Co. 1001 Lee Manufacturing Kansas City, Mo. 64105 3. United States Gas Products Chemical Division Chicago, Ill. 60606								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-2) 2R	10. SHIPPING INFORMATION 10.1 Grades or Purity: 98.5% 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Data not available 10.4 Yardling: Data not available								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: CFR 16 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NIHA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Heads Hazard (Red)</td> <td>1</td> </tr> <tr> <td>Flammables (Red)</td> <td>0</td> </tr> <tr> <td>Reactive (Yellow)</td> <td>1</td> </tr> </tbody> </table>	Category	Classification	Heads Hazard (Red)	1	Flammables (Red)	0	Reactive (Yellow)	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 56.06 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.3 at 20°C, liquid 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Heads Hazard (Red)	1								
Flammables (Red)	0								
Reactive (Yellow)	1								

NOTES

CCP

CALCIUM PEROXIDE

Common Synonyms Calcium Oxide		Solid powder Sinks in water	Yellow to white Odorless
1. IDENTIFICATION 1.1 Chemical Name: Calcium Oxide 1.2 CAS Number: 1317-76-1 1.3 Molecular Weight: 56.08 1.4 Formula: CaO			
Fire	Not flammable May cause fire on contact with combustibles Containers may explode in fire Flashed due to contact with water When exposed to air, it will ignite		
Exposure	DUST Irritating to eyes, nose and throat Harmful if inhaled Harmful if swallowed SOLID Irritating to skin and eyes Harmful if swallowed HAZARDS Inhalation of dust irritates nose and throat. Dust also irritates eyes and skin on contact and irritates mouth and stomach if ingested. Treatment for Exposure: INHALATION: remove to fresh air. EYES: flush with water for 1 min. and consult physician. SKIN: flush with water. INGESTION: give large amounts of water.		
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Page 100) Issue warning: oxidizing material Disperse and flush		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Calcium oxide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CaO 3.4 HCS/United Nations Hazard Designation: 2.1 125°		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow-white 4.3 Odor: None	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: U.S. N. M. approved toxic dust respirator, general purpose gloves, chemical safety goggles, full cover clothing 5.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Dust also irritates eyes and skin on contact and irritates mouth and stomach if ingested. 5.3 Treatment for Exposure: INHALATION: remove to fresh air. EYES: flush with water for 1 min. and consult physician. SKIN: flush with water. INGESTION: give large amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Lethal: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Skin Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent			

6 FIRE HAZARDS 6.1 Flash Point: Not flammable but may cause fire on contact with combustible material 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Flood with water or use a powder (e.g. graphite or powdered limestone) 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Can increase severity of fire. Containers may explode 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts very slowly with water at room temperature to form lime water and oxygen gas 7.2 Reactivity with Common Materials: Heavy metals and dirt can accelerate decomposition. Lime and oxygen. The reaction is not explosive 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS FMC Corporation Industrial Chemical Division 431 Third Avenue New York, N.Y. 10017 2. Barium and Chemicals, Inc. P.O. Box 218 Newburgh, Ohio 44652
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Page 100) H R R	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 90+ % 10.2 Storage Temperature: Stable 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 74.1 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.12 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: -135 Btu/lb -115 cal/g = -1.1 x 10³ J/kg 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

(continued on pages 7 and 8)

CALCIUM PHOSPHATE

Common Synonyms MCP Monocalcium phosphate monohydrate Calcium biphosphate DCP Dicalcium phosphate Calcium pyrophosphate	Subst Smells and mixes with water	White	Odorless
Not a discharge of poison, it being not an acid. Acid is only in the dust and dust No acid in form of discharge or material No acid in form of dust or material			
Fire	Not flammable		
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If eyes are irritated, flush with plenty of water If nose is irritated, flush with plenty of water If throat is irritated, gargle with water SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting If on skin, wash with plenty of water If on clothes, remove clothing and wash with plenty of water If in eyes, flush with plenty of water If in nose, flush with plenty of water If in mouth, swallow and drink plenty of water If swallowed, get medical attention If swallowed and vomited, do not have convulsions If in eyes, flush with plenty of water		
Water Pollution	Effect of low concentrations on aquatic life: unknown May be dangerous if it enters water intakes. No acute or chronic toxicity to fish No acute or chronic toxicity to birds		
1. RESPONSE TO DISCHARGE See hazardous materials monographs CG 464.4 Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESCRIPTIONS 3.1 Synonyms: (a) MCP Monocalcium phosphate, monohydrate, Calcium phosphate, monohydrate, monohydrate, Acid calcium phosphate, calcium superphosphate, Calcium biphosphate, Primars, calcium phosphate (b) DCP Dicalcium phosphate (c) hydroxide or dihydrate, (d) basic calcium phosphate, Calcium monohydrogen phosphate, Secondary calcium phosphate, (e) TCP Calcium <i>(Continued on page 6)</i>	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS			
5.1 Personal Protective Equipment: Dust mask, goggles and gloves 5.2 Symptoms Following Exposure: Inhalation of MCP or DCP may cause irritation of upper respiratory tract. prolonged inhalation of concentrated pyrophosphate may cause a deposit of TCP in the lungs. Ingestion of large quantities of any form of calcium phosphate may cause nausea, vomiting, cramps, and diarrhea. MCP may also be corrosive to a membrane of mouth, throat, and gastrointestinal tract. Local irritation of the eye may result from contact with any of these phosphates. prolonged or repeated exposure to MCP may lead to chronic conjunctivitis. Contact with skin by MCP may cause local irritation or chronic dermatitis, prolonged or repeated contact with concentrated aqueous solutions of DCP may cause local irritation. 5.3 Treatment for Exposure: INHALATION: move to clear air, see physician in case of persistent coughing, expectoration, chest pain, or shortness of breath. INGESTION: get medical attention quickly, induce vomiting by giving large amounts of water or warm salty water, or by treating back of patient's throat; continue until vomiting is clear, follow with milk, eggs, or olive oil to soothe stomach. EYES: immediately flush with large quantities of running water for at least 15 min, holding eyelids apart to insure thorough flushing of eyes and lids; do not attempt to neutralize with chemical agents; get medical attention quickly if physician is not available; continue irrigation for another 15 min. SKIN: immediately flush with water; remove contaminated clothing under shower; do not attempt to neutralize with chemical agent; get medical attention for persistent irritation. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 0 LD₅₀ > 15g/kg <i>(Continued on page 6)</i>			

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aqueous Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Some calcium phosphates form acid solutions in water. These may attack metals with formation of flammable hydrogen gas which may collect in enclosed spaces 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Corrosives: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Stauffer Chemical Co. Industrial Chemical Division Weopuer, Ohio 43080 2. Mallinckrodt Chemical Works 223 Westside Avenue P.O. Box 344 Jersey City, N.J. 07303 3. Monsanto Company 400 North Lindbergh Blvd. St. Louis, Mo. 63166
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) NA (MCP) H+D+P Calcium phosphates	10. SHIPPING INFORMATION 10.1 Grade or Purity: NE LNP Definitive Reagent 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Vacuum: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: Molecular from phosphate 282.14; Calcium phosphate 136.06; Calcium phosphosphate 284 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.3 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
3. CHEMICAL DESIGNATIONS (Cont'd) phosphoric acid, calcium phosphate 3.2 Chemical Compatibility Classification: Not listed 3.3 Chemical Formula: (a) $\text{Ca}_3(\text{PO}_4)_2 \cdot \text{H}_2\text{O}$ (b) CaHPO_4 or $\text{CaH}_2\text{P}_2\text{O}_7$ (c) $\text{Ca}_2(\text{P}_2\text{O}_7)_2$ (d) $\text{Ca}_2\text{P}_2\text{O}_7$ 3.4 HACO/Linked Notations Numerical Designation: Not listed	(continued on pages 7 and 8)
5. HEALTH HAZARDS (Cont'd) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

CPP

CALCIUM PHOSPHIDE

Common Synonyms Phosphor	Solid Gray Musty odor Reacts violently with water. Poisonous, flammable; vapor is produced
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear goggles and suit contained breathing apparatus. Call fire department. Be late and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE IGNITES WHEN EXPOSED TO MOISTURE POISONOUS GASES ARE PRODUCED IN FIRE Wear goggles and suit contained breathing apparatus. Extinguish with dry chemical or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE. Cool exposed containers with water.
 Exposure	CALL FOR MEDICAL AID VAPOR PRODUCED IN REACTION WITH WATER POISONOUS IF INHALED Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. DUST Irritating to eyes. Move victim to fresh air. If in eyes, hold eyes closed and flush with plenty of water. SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. If swallowed, give victim plenty of water. If IN EYES, hold eyes closed and flush with plenty of water. If SWALLOWED and SKIN OR CLOTHING have not in direct contact with or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify appropriate federal water intakes.
1 RESPONSE TO DISCHARGE (See Hazmat Response Methods Handbook, CG 444-1) Issue warning: high flammability, poison air contaminant, water contaminant. Restrict access. Evacuate area (large discharge only). Should be removed.	2. LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Phosphor 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: Ca_3P_2 3.4 IMCO/United Nations Numerical Designation: 4.3/1360	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Gray 4.3 Odor: Musty like acetylene
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator, protective gloves and clothing, goggles. 5.2 Symptoms Following Exposure: Inhalation or ingestion causes faintness, weakness, nausea, vomiting. External contact with dust causes irritation of eyes and skin. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, call a physician and alert to possibility of phosphine poisoning. EYES or SKIN: flush with water. INGESTION: give large amounts of water, call physician and alert to possibility of phosphine poisoning. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: 1.100 mg/m³	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable but may ignite spontaneously if wetted. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Extinguish adjacent fires with dry chemical or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water, foam. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Can cause spontaneous ignition if wet. Contributes dense smoke of phosphoric acid. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously, generating phosphine (a poisonous, spontaneously flammable gas). 7.2 Reactivity with Common Materials: Can react with surface moisture to evolve phosphine, which is toxic and spontaneously flammable. 7.3 Stability During Transport: Stable if dry. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Ventron Corp. Alfa Products P.O. Box 159 Beverly, Mass. 01915 2. Vetoac, Inc. 1460 W. Silver Spring Rd. Menomonee Falls, Wis. 53051
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) RR	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 182.2. 13.3 Boiling Point at 1 atm: Decomposes. 13.4 Freezing Point: (approx.) 2,910°F = 1,600°C = 1,870°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.51 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable solid. 12.2 NAB Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	
NOTES	

Continued on pages 1 and 8

CRE

CALCIUM RESINATE

Common Synonyms Metallic resinate Calcium abetate Calcium resin Calcium resin, fused		Solid Yellow to dark brown Odorless Sinks in water
Call fire department. Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible MAY IGNITE WHEN EXPOSED TO AIR Extinguish with dry chemical, foam or carbon dioxide.	
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes: Hold eyes open and flush with plenty of water. If contact has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES: Hold eyelids open and flush with plenty of water. If SWALLOWED: Do not induce vomiting. Have victim drink water or milk and have vomit induced vomiting. If SWALLOWED: Do not induce vomiting. Have victim drink water or milk and have vomit induced vomiting.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Some local health officials advise against notifying water intakes.	
1. RESPONSE TO DISCHARGE (See Response Manual Handbook, CG 446-4) Should be removed. Chemical and physical treatment.		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Calcium abetate, Calcium resinate, fused, calcium resin, fused wood resin, Metallic resinate. 3.2 Coast Guard Competibility Classification: Not listed. 3.3 Chemical Formula: (approx.) $\text{Ca}(\text{OOCCH}_3)_2$. 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Amber, very dark brown. 4.3 Odor: None.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, gloves. 5.2 Symptoms Following Exposure: Inhalation of fumes from heated chemical may cause irritation of nose and throat. Ingestion causes irritation of nose and throat. Contact with eyes causes irritation. Contact of molten material with skin causes burns. 5.3 Treatment for Exposure: INHALATION: move victim to fresh air, get medical help immediately. INGESTION: give large amounts of water, induce vomiting. EYES: flush immediately with cold water, get medical help immediately. SKIN: if molten chemical burns skin, apply cold water immediately, get medical help for burn treatment. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS 6.1 Flesh Point: Not pertinent (combustible solid). 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water. 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: 480°F (may ignite spontaneously). 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Crosby Chemicals, Inc. P.O. Box 460 Picaville, Miss. 39466. 2. Reichold Chemicals, Inc. Newport Division P.O. Box 1433 Pensacola, Fla. 32506.
10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.		
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: (43, approx.) 13.3 Boiling Point at 1 atm: > 610°F = > 316°C = > 589°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.13 at 25°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Data not available. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable solid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		
NOTES		

(Continued on pages 5 and 6)

CPH

CAMPHENE

Common Synonyms 1,3-Dimethyl-2-methylene-norbornane 2,2-Dimethyl-3-methylene-norbornane		Solid White Camphor like odor
Floats on water		
Spills/Discharge: If possible, keep people away. Call fire department. Avoid contact with solid and dust. Isolate and contain any discharge's material. Notify local health and pollution control agencies.		
Fire	Combustible Extinguish with dry chemicals. Do not use water. Do not use foam.	
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause headache or difficult breathing. If in eyes, flush eyes with clean water for 15 minutes. If in mouth, have victim swallow and drink water. If inhaled, have victim move to fresh air. SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eye open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water to "flush" it down. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing, except keep victim warm.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife agencies. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,2-Dimethyl-3-methylenenorbornane 1,3-Dimethyl-2-methylenenorcamphane 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: C ₁₁ H ₁₈ 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Camphoraceous
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Gloves and face shield. 5.2 Symptoms Following Exposure: Inhalation: eye, irritation of nose and throat. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: move victim to fresh air; call physician immediately. EYES: flush immediately with clean, cool water; call physician immediately. SKIN: wash with alcohol; follow with soap and water wash. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS 6.1 Flash Point: 108°F O.C., 92°F C.C. (typical) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water. 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Not pertinent.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Ford Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Hercules Inc. Organics Department Wilmington, Del. 19899 2. Reichold Chemicals Inc. Newport Division 407 S. Pace Boulevard Pensacola, Fla. 32596 3. SCM Corporation Glidden-Durkee Div. P.O. Box 389 Jacksonville, Fla. 32201
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II		10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial 72% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: ORM-A 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 MFPA Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 136. 13.3 Boiling Point at 1 atm: 310°F = 154°C = 427°K. 13.4 Freezing Point: 122°F = 50°C = 323°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.87 at 15°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: -19,400 Btu/lb = -1,800 cal/g = -452 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
(Continued on pages 1 and 2)		
NOTES		

CPO

CAMPHOR OIL

Common Synonyms Liquid camphor		Only liquid Colorless or brown or blue Penetrating camphor odor Usually floats on water
Stop discharge if possible Call fire department Avoid contact with liquid Isolate and remove discolored material Notify local health and pollution control agencies		
Fire	Combustible Extinguish with dry chemical, foam or carbon dioxide	
Exposure	CALL FOR MEDICAL AID VAPOR Not irritating to eyes, nose or throat Move to fresh air LIQUID Irritating to skin and eyes If swallowed, will cause nausea, vomiting or loss of consciousness Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES: hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk	
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes Notify local health and pollution control officials Notify operators of nearby water intakes	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445.4) Issue warning: water contaminant Mechanical containment Should be removed		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Liquid impure camphor Liquid gum camphor 3.2 Coast Guard Compatibility Classification Ketone 3.3 Chemical Formula: C ₁₅ H ₂₄ O 3.4 IMDG/United Nations Numerical designation: 31110		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless, brown, blue 4.3 Odor: Like camphor, fragrant and penetrating
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Eye protection 5.2 Symptoms Following Exposure: Within 5 to 90 minutes after swallowing, the following may be noted: nausea and vomiting, feeling of warmth, headache, confusion, excitability, restlessness, delirium, and hallucinations; increased muscular excitability, tremors, and jerky movements; epileptiform convulsions, followed by depression (convulsions sometimes occur early in the syndrome and may be severe, but they do not have the grave prognosis of strychnine convulsions); coma; central nervous depression may at times be the primary clinical response; death results from respiratory failure or from status epilepticus; slow convalescence (days or weeks), often with persistent gastric distress 5.3 Treatment for Exposure: For an oral ingestion, administer gastric lavage, cathartics, diuretics, and sedatives. Control convulsions with a short-acting barbiturate, chloral hydrate, or ether. Do NOT use an hypnotic or opiate. 5.4 Toxicity by Inhalation (Threshold Limit Value): 2 ppm 5.5 Short-Term Inhalation Limits: 1 ppm for 30 min 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS

- 6.1 **Flash Point:** 117°F (41°C)
 6.2 **Flammable Limits in Air:** Data not available
 6.3 **Fire Extinguishing Agents:** Foam, carbon dioxide, or dry chemical
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
 6.5 **Special Hazards of Combustion Products:** Not pertinent
 6.6 **Behavior in Fire:** The solid often evaporates without first melting
 6.7 **Ignition Temperature:** 466°C
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Data not available

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:** No reaction
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterfowl Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. CPO International, Inc.
 S. B. Penick and Co. Division
 100 Church St.
 New York, N. Y. 10007
 2. Glaxo Chemicals, Inc.
 51 Weaver St.
 Greenwich, Conn. 06830
 3. R. W. Greel & Co., Inc.
 1 Rockefeller Plaza
 New York, N. Y. 10020

10 SHIPPING INFORMATION

- 10.1 **Grades or Purity:** Each lot of camphor oil has a unique composition which varies with the season of the year and the country of origin. At least a dozen grades are known; all have Chinese names. Most can purify sold in the U. S. as synthetic and is quite pure.
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446.3)
 A-T-U

12 HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Combustible Liquid
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 2 |
| Health | |
| Vapor Irritant | 0 |
| Liquid or Solid Irritant | 1 |
| Poisonous | 1 |
| Water Pollution | |
| Human Toxicity | 3 |
| Aquatic Toxicity | 1 |
| Aesthetic Effect | 2 |
| Reactivity | |
| Other Chemicals | 2 |
| Water | 0 |
| Self Reaction | 0 |
- 12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid (liquid if even slightly impure)
 13.2 **Molecular Weight:** Not pertinent
 13.3 **Boiling Point at 1 atm:** > 392°F = > 200°C = > 427°K
 13.4 **Freezing Point:** Not pertinent
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 0.923 at 25°C (liquid)
 13.8 **Liquid Surface Tension:** Data not available
 13.9 **Liquid-Water Interfacial Tension:** Data not available
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 13.12 **Latent Heat of Vaporization:** Not pertinent
 13.13 **Heat of Combustion:** Data not available
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** Not pertinent
 13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 5 and 6

NOTES

REVISED 1978

CLS

CAPROLACTAM, LIQUID

Common Synonyms Aminocaproic lactam 2-Ketohexamethylbenzamine 2-Oxohexamethylbenzamine epsilon-Caprolactam Hexahydro-2H-azepine-2-one		Liquid	Colorless	Mild odor
Sinks and mixes with water				
Stop discharge if possible. Keep people away. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.			
Exposure	Call for medical aid. LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			
1. RESPONSE TO DISCHARGE (See Response Manual Handbook, CG 446-3) Issue warning: water contaminant. Disperse and flush.		2. LABELS No label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Aminocaproic lactam, epsilon-Caprolactam, Hexahydro 2H-azepine-2-one, 2-Ketohexamethylbenzamine. 3.2 Coast Guard Compatibility Classification: Caprolactam solution. 3.3 Chemical Formula: H ₂ NCH ₂ CH ₂ CH ₂ CO 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Gas mask or self-contained breathing apparatus, rubber gloves and boots, goggles or face shield. 5.2 Symptoms Following Exposure: Inhalation causes coughing or mild irritation. Contact with hot liquid will burn eyes and skin. 5.3 Treatment for Exposure: INHALATION: remove patient to fresh air. EYES: wash with copious quantities of water for at least 15 min.; call physician. SKIN: wash with water; call physician in case of thermal burn. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 2, oral rat LD ₅₀ = 2,140 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: 0.3 mg/m ³ .				

6 FIRE HAZARDS

- 6.1 **Flash Point:** 257°F O.C. 230°F C.C.
 6.2 **Flammable Limits in Air:** 1.84% (L.L.)
 6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide.
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
 6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen.
 6.6 **Behavior in Fire:** Not pertinent.
 6.7 **Ignition Temperature:** Data not available.
 6.8 **Electrical Hazard:** Not pertinent.
 6.9 **Burning Rate:** 2.4 mm/min.

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available.
 8.2 **Waterfowl Toxicity:** Data not available.
 8.3 **Biological Oxygen Demand (BOD):** Data not available.
 8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

1. Dow Badische Company
Williamsburg, Va. 23185
 2. Allied Chemical Corporation
Plastics Division
P. O. Box 2365R
Morristown, N. J. 07960
 3. Nipiro Incorporated
P. O. Box 1485
Augusta, Ga. 30903

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction.
 7.2 **Reactivity with Common Materials:** No reaction.
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
 7.5 **Polymerization:** Not pertinent.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** 99%
 10.2 **Storage Temperature:** 75°C
 10.3 **Inert Atmosphere:** Nitrogen cushion.
 10.4 **Venting:** Pressure/vacuum.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
A-P-Q

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed.
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 1 |
| Health | |
| Vapor Irritant | 0 |
| Liquid or Solid Irritant | 0 |
| Poison | 4 |
| Water Pollution | |
| Human Toxicity | 2 |
| Aquatic Toxicity | |
| Aesthetic Effect | 0 |
| Reactivity | |
| Other Chemicals | 2 |
| Water | 0 |
| Self Reaction | 1 |
- 12.3 **NFPA Hazard Classifications:** Not listed.

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid.
 13.2 **Molecular Weight:** 113.
 13.3 **Boiling Point at 1 atm:** 515°F = 268°C = 541°K.
 13.4 **Freezing Point:** 154°F = 68°C = 341°K.
 13.5 **Critical Temperature:** 944.4°F = 506°C = 780°K.
 13.6 **Critical Pressure:** 660 psia = 45 atm = 4.6 MN/m.
 13.7 **Specific Gravity:** 1.02 at 77°C (liquid).
 13.8 **Liquid Surface Tension:** (est.) 20 dynes/cm = 0.020 N/m at 77°C.
 13.9 **Liquid-Water Interfacial Tension:** (est.) 40 dynes/cm = 0.040 N/m at 77°C.
 13.10 **Vapor (Gas) Specific Gravity:** 3.9.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
 13.12 **Latent Heat of Vaporization:** 209 Btu/lb = 116 cal/g = 4.85 × 10³ J/kg.
 13.13 **Heat of Combustion:** -13,700 Btu/lb = -7,640 cal/g = -320 × 10³ J/kg.
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** Not pertinent.
 13.16 **Heat of Polymerization:** -324 Btu/lb = -180 cal/g = -7.5 × 10³ J/kg.

(Continued on pages 5 and 6)

NOTES

CPT

CAPTAN

Common Synonyms N [(Trichloromethylthio)-4-cyclohexene-1,2-dicarboximide N-trichloromethylthio-cis- Δ^4 -cyclohexene-1,2-dicarboximide Orthoide Vanicide	Solid Sinks in water	White to brown Slight odor
VOID CONTACT WITH SOLID AND DUST. KEEF PEOPLE AWAY. Wear goggles, gloves, and a flame three-piece apparatus and rubber overalls when handling this chemical. Call fire department. Stay upwind. Use water spray to knock down dust. Keep away from open flame and hot surfaces. Notify local health and safety authorities.		
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and self-contained breathing apparatus. Extinguish with water, dry chemicals, foam, or carbon dioxide. Cool exposed containers with water.	
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Move victim to fresh air. Provide first aid: victims get out of dust with plenty of water. If breath is being stopped, give artificial respiration. If unconscious, do not give anything by mouth. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If in eyes, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have a vomit-inducing agent given. If SWALLOWED and victim is UNCONSCIOUS, DO NOT INDUCE VOMITING. ALLERGENS: dermal and respiratory irritant.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if at entry water intakes. Extremely difficult to remove from fish. Notify personnel about water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning: poison water contaminant. Restrict access. Should be removed. Chemical and physical treatment.		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: N [(Trichloromethylthio)-4-cyclohexene-1,2-dicarboximide N-Trichloromethylthio-cis- Δ^4 -cyclohexene-1,2-dicarboximide Orthoide Vanicide 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: C ₁₁ H ₁₀ Cl ₃ N ₂ O ₂ 3.4 IMCO/United Nations Numerical Designation: 6.1 (609)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White to buff 4.3 Odor: Slight pungent
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, rubber gloves, and goggles. 5.2 Symptoms Following Exposure: Vapor irritates eyes. Ingestion causes depression, tachycardia, labored respiration, diarrhea. 5.3 Treatment for Exposure: Remove from exposure. Keep airways open. Administer artificial respiration if necessary. EYES: flush with water for 15 min. and get medical attention. SKIN: wash with soap and water. INGESTION: maintain respiration; induce vomiting; passage stomach if patient is unconscious; give symptomatic and supportive treatment; save agent and submit for laboratory examination. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3: oral rat LD ₅₀ = 450 mg/kg. 5.7 Late Toxicity: None observed in several species. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS 6.1 Flash Point: Flammable solid. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Water, carbon dioxide, foam. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Irritating and toxic gases are produced in a fire; they may include sulfur dioxide, hydrogen chloride, phosgene, and oxides of nitrogen. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 30 ppm, 24 hr, zebrafish, 11 m, fresh water. 8.2 Waterfowl Toxicity: >5,000 ppm LC ₅₀ . 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: Bioaccumulation not likely.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. R. T. Vanderbilt Company, Inc. 230 Park Avenue New York, N.Y. 10017 2. Stauffer Chemical Co. Mountain View, Calif. 94040 3. Chevron Chemical Co. 940 Hensley Street Richmond, Calif. 94804
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 442-3) II	10. SHIPPING INFORMATION 10.1 Grade or Purity: Technical 90-97% also available as dusts, wettable powders, and aqueous suspension. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arrester).
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous class B. 12.2 MAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 300.6. 13.3 Boiling Point at 1 atm: Decomposes. 13.4 Freezing Point: 33°C = 1°91° = 44° K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.74 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: (evap) = 7,100 Btu/lb = -3,940 cal/g = -165 X 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on pages 4 and 5)	

CBY

CARBARYL

Common Synonyms: Sevin 1-Naphthyl N-methylcarbamate		Solid powder, or in solution	White to gray	Weak odor
Solid sinks in water; solution may float on water				
Stop discharge if possible. Call fire department. Avoid contact with solid and solution. Wash exposed areas thoroughly with soap and water. Notify local health and wildlife officials. Notify operators of nearby water intakes.				
Fire		Solid not flammable, but usually dissolved in combustible liquid. Extremely flammable if in solution.		
Exposure		CALL FOR MEDICAL AID. SOLID OR SOLUTION Irritating to skin and eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, do not induce vomiting. Have victim drink water, or milk and have victim induce vomiting. IF SKIN IS IRRITATED, wash with soap and water. IF SKIN IS IRRITATED, wash with soap and water. CONVULSIONS: do not induce vomiting. Keep victim warm.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning if water contaminant. Should be removed.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 31 Synonyms: 1-Naphthyl N-methylcarbamate Sevin 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: C₁₁H₁₀NO 34 IMCO/United Nations Numerical Designation: 6.1, 6.2, 1615		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: Off-white 43 Odor: Weak		
5. HEALTH HAZARDS 51 Personal Protective Equipment: Data not available 52 Symptoms Following Exposure: Data not available 53 Treatment for Exposure: SKIN AND EYE CONTACT: flood affected tissues with water. INGESTION: induce vomiting. 54 Toxicity by Inhalation (Threshold Limit Value): < 5 mg/m³ 55 Short-Term Inhalation Limits: Dust: 30 mg/m for 30 min. 56 Toxicity by Ingestion: Grade 2 LD₅₀ 0.5 to 5 g/kg; LD₅₀ 0.5 to 5 g/kg. 57 Late Toxicity: Liver damage to rats at high dose by mouth. 58 Vapor (Gas) Irritant Characteristics: None 59 Liquid or Solid Irritant Characteristics: Not tested 510 Odor Threshold: Not pertinent				
6. FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Solution fires: Water, foam, dry chemical, CO₂. 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Not flammable 68 Electrical Hazards: Not pertinent 69 Burning Rate: Not flammable				
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent				
8. WATER POLLUTION 81 Aquatic Toxicity: 5.5 ppm 96 hr. Bluegill; 11 mg fresh water; 0.013 ppm 48 hr. white shrimp; 11 mg salt water. Toxic to shrimp and crab species. 82 Waterway Toxicity: LD₅₀ = 217 mg/kg 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None observed				
9. SELECTED MANUFACTURERS Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017				
10. SHIPPING INFORMATION 101 Grades or Purity: Sevin 50 W: wettable powder Sevin sprayable MF: powder Sevin 4 oil 102 Storage Temperature: Data not available 103 Inert Atmosphere: Data not available 104 Venting: Data not available				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) 11				
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: ORV-A 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed				
13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: Not pertinent 133 Boiling Point at 1 atm: Not pertinent 134 Freezing Point: 288°K = 142°C = 418°F 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.23 at 20°C (68°F) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent				
NOTES				

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CBO

CARBOLIC OIL

Common Synonyms: Middle Oil Layered phenol	Liquid Colorless — darkens on exposure to light Sweet — odor Sinks and mixes with water
AVOID CONTACT WITH LIQUID: Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Combustible POISONOUS GASES ARE PRODUCED WHEN HEATED Wear chemical protective suit with self-contained breathing apparatus. Extinguish with water, dry chemical, foam or carbon dioxide.
 Exposure	ALL FOR MEDICAL AID LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Remove contaminated clothing and shoes. Flush affected area with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water. DO NOT INDUCE VOMITING.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Issue warning: poison. Restrict access. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Middle Oil Layered phenol 3.2 Coast Guard Compatibility Classification: Phenol 3.3 Chemical Formula: $C_{12}H_{10}O$ 3.4 IMCO/United Nations Numerical Designation: 90-16-1	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless; darkens on exposure to light 4.3 Odor: Sweet tar like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Fresh air mask for confined areas; rubber gloves; protective clothing; full face shield. 5.2 Symptoms Following Exposure: Will burn eyes and skin. The analgesic action may cause loss of pain sensation. Readily absorbed through skin, causing increased heat, convulsions, and death. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; keep quiet and warm. If breathing stops, start artificial respiration. INGESTION: do NOT induce vomiting. Give milk, egg whites, or large amounts of water. Get medical assistance. No known antidote. EYES AND SKIN: remove contaminated clothing. Flush eyes with water for 15 minutes or until physician arrives. Wash skin with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 5 to 6 g/kg rats 5.7 Late Toxicity: Causes cancer in experimental animals 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant. May cause pain and second degree burns after a few minutes contact. 5.10 Oral Threshold: 0.05 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 188°F (65°C) 6.2 Flammable Limits in Air: 1.7% - 8.6% 6.3 Fire Extinguishing Agents: Water, dry chemical, foam, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Unburned vapor is toxic. 6.6 Behavior in Fire: Yields flammable vapors when heated, which will form explosive mixtures with air. 6.7 Ignition Temperature: 1119°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 3.5 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 11.5 ppm 96 hr. bluegill; 11 mg/l fresh water. 1.5 ppm 48 hr. rainbow trout; 11 mg/l fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 20% 5 days. 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48940 2. Monsanto Co. Monsanto Polymers and Petrochemicals Co. 800 N. Linbergh Blvd. St. Louis, Mo. 63166 3. United States Steel Corp. USSC Chemicals Division Clanton, Pa. 15025																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3.) A P Q	10. SHIPPING INFORMATION 10.1 Grades or Purity: 90-92% phenol; 80-82% phenol. (Remainder consists of cresol and water.) 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure/vacuum.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous liquid or solid, Class B. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="905 1459 1161 1725"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>2</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>3</td></tr> <tr> <td> Poisons</td><td>3</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>2</td></tr> <tr> <td> Aquatic Toxicity</td><td>3</td></tr> <tr> <td> Aesthetic Effect</td><td>3</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>2</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="905 1736 1161 1847"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	2	Liquid or Solid Irritant	3	Poisons	3	Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	Aesthetic Effect	3	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES* 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 94.11 13.3 Boiling Point at 1 atm: 399.2°F = 204.5°C = 478.0°K 13.4 Freezing Point: <105.6°F = <40.9°C = <10.4°K 13.5 Critical Temperature: 780.0°F = 421.1°C = 694.3°K 13.6 Critical Pressure: 589 psia = 40.5 atm = 4.13 MN/m ² 13.7 Specific Gravity: 1.04 at 41°C (liquid) 13.8 Liquid Surface Tension: 41 dynes/cm = 0.041 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.089 13.12 Latent Heat of Vaporization: 129.6 Btu/lb = 72.0 cal/g = 3.04 x 10 ⁵ J/kg 13.13 Heat of Combustion: -23,401 Btu/lb = -7445 cal/g = -311.70 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent. *Data apply to phenol, the principal constituent.
Category	Rating																																				
Fire	1																																				
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NOTES (Continued on pages 1 and 4)																																					

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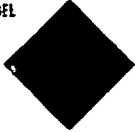
CARBON DIOXIDE

Common Synonyms Carbonic acid gas Carbonic anhydride		Liquefied compressed gas or solid Colorless gas or white solid Odorless Solid sinks and boils in water. Visible vapor cloud is produced.
AVOID CONTACT WITH FLUID AND SOLID STATE PEOPLE AWAY Wear goggles, well-ventilated breathing apparatus, and protective clothing. If exposed, remove clothing as soon as possible. Stop breathing if possible.		
Fire	Not flammable Containers may explode in fire Containers exposed to fire with water	
Exposure	Call for medical aid VAPOR If inhaled will cause dizziness, or difficult breathing Move victims to fresh air If breathing is difficult, give oxygen LIQUID OR SOLID Will cause frostbite Fluid affected areas with pure liquid water DO NOT RUB AFFECTED AREAS	
Water Pollution	Not harmful to aquatic life	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Restrict access Disperse and flush		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Carbonic acid gas Carbonic anhydride 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CO ₂ 3.4 HCSO/Unit and Name Numerical Designation: 2 1013		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied compressed gas or solid ("Dry Ice") 4.2 Color: Colorless 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus in excessively high CO ₂ concentration areas. For handling liquid or solid, wear safety goggles or face shield, insulated gloves, long sleeved shirt, and trousers worn outside boots or over high top shoes to shed spilled liquid. 5.2 Symptoms Following Exposure: Inhalation causes increased respiration rate, headache, subtle physiological changes for up to 35% concentration and prolonged exposure. Higher concentrations can cause unconsciousness and death. Solid can cause skin contact burns. Liquid or solid gas can cause freezing injury to skin or eyes similar to a burn. 5.3 Treatment for Exposure: INHALATION: move victim to fresh air. SKIN: treat burns from contact with solid in same way as frostbite. 5.4 Toxicity by Inhalation (Threshold Limit Value): 9000 ppm 5.5 Short-Term Inhalation Limits: 30,000 ppm for 60 min 5.6 Toxicity by Ingestion: Not pertinent (gas with low boiling point) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Containers may explode when heated 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: 100-200 mg/l - various organisms LC fresh water * Time period not specified 8.2 Waterfowl Toxicity: Inhalation 5-8% - no effect 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1 Chemetron Corporation Cardox Products Division 111 E. Wacker Drive Chicago, Ill. 60601 2 Union Carbide Corporation Linde Division Morristown, N. J. 08655 3 Liquid Carbonic Corporation 135 S. LaSalle St. Chicago, Ill. 60603
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-C-II		10. SHIPPING INFORMATION 10.1 Grades or Purities: Research 99.995% + Instrument 99.99+%, Bone Dry 99.95+%, Commercial 99.5+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Liquid - safety relief solid - open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Nonflammable compressed gas 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 44.0 13.3 Boiling Point at 1 atm: Not pertinent (sublimates) 13.4 Freezing Point: -109.3°F = -78.5°C = 194.7°K 13.5 Critical Temperature: 31.1°C = 304°K 13.6 Critical Pressure: 1070 psia = 72.9 atm = 7.40 MN/m ² 13.7 Specific Gravity: 1.56 at -79°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.53 13.11 Ratio of Specific Heats c _p :Vapor (Gas) 1.0474 13.12 Latent Heat of Vaporization: 140 Btu/lb = 81 cal/g = 4.5 x 10 ⁵ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
(Continued on pages 1 and 6) NOTES		

CBB

CARBON BISULFIDE

Common Synonyms Carbon disulfide	Watery liquid Colorless to yellow Rotten egg to sweet odor Sinks in water. Flammable, irritating vapor is produced.
Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus and rubber overclothing including gloves. Shut off ignition sources and call fire department. Stop discharge if possible. Stay upwind and use water spray to knock out fire. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus and rubber overclothing including gloves. Extinguish with dry chemical or carbon dioxide. Water and foam may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED: do not induce vomiting. Have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods No. 20000, CG 446-4) Issue warning: High Flammability Restrict access Evacuate area	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Carbon disulfide 3.2 Coast Guard Compatibility Classification: Carbon disulfide 3.3 Chemical Formula: CS ₂ 3.4 IMCO United Nations Numerical Designation: 1.1 (1.1)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Fairly sweetish disagreeable offensive like that of decaying cabbage
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Only self-contained breathing mask with full face approved by the United States Bureau of Mines is recommended. If the vapor concentration exceeds 2% by volume or is unknown, supply of air respiratory equipment of appropriate design with full face masks should be used by all persons entering contaminated area. Masks should be used only for emergency situations and should be discarded accordingly. Almost any type of industrial clothing is satisfactory. Splashes of small quantities are not harmful to fabrics and evaporation from clothing is quite rapid. Clothing should, however, be removed and the skin washed with water. Goggles should be used when the eyes are in danger of CS ₂ splashes or sprays. 5.2 Symptoms Following Exposure: ACUTE EXPOSURE: mild to moderate irritation of skin, eyes and mucous membranes from liquid or concentrated vapors; headache, garlicky breath, nausea, vomiting, diarrhea (even after vapor exposure) and occasionally abdominal pain; weak pulse, palpitations, fatigue, weakness in the legs, unsteady gait, vertigo, mania, hallucinations of sight, hearing, taste and smell in acute massive vapor exposures; central nervous depression with respiratory paralysis, death may occur during coma or after a convulsion. 5.3 Treatment for Exposure: INHALATION: remove victim promptly from contaminated area. Administer oxygen and artificial respiration if needed. SKIN CONTACT: wash affected areas with copious quantities of water. INGESTION: induce vomiting and follow with gastric lavage and saline cathartics. 5.4 Toxicity by Inhalation (Threshold Limit Value): 20 ppm 5.5 Short-Term Inhalation Limits: 100 ppm for 30 minutes; 200 ppm for 10 minutes; 100 ppm for 30 minutes and 50 ppm for 60 minutes	

6. FIRE HAZARDS 6.1 Flash Point: -22°F (-30°C) 6.2 Flammable Limits in Air: 1.3% - 10% 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic gases are generated; wear self-contained breathing apparatus 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 21.1°F 6.8 Electrical Hazard: Contact of the liquid or vapor with the surface of a lighted electric light bulb could result in ignition. 6.9 Burning Rate: 2.7 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 35 ppm 48 hr. mortality in 11% fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. EMC Corp. Inorganic Chemicals Div. 643 Third Ave. New York, N.Y. 10017 2. PPG Industries Inc. Industrial Chemicals Div. Barberton, Ohio 44203 3. Stauffer Chemical Co. Industrial Chemicals Div. Delaware City, Delaware 19706																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-X-X	10. SHIPPING INFORMATION 10.1 Grades or Purities: Commercial technical USP 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Inerted 10.4 Venting: Pressure vacuum																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>2+</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>2</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td> Poisons</td><td>3</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>1</td></tr> <tr> <td> Aquatic Toxicity</td><td>2</td></tr> <tr> <td> Aesthetic Effect</td><td>3</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>2</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	2+	Health		Vapor Irritant	2	Liquid or Solid Irritant	2	Poisons	3	Water Pollution		Human Toxicity	1	Aquatic Toxicity	2	Aesthetic Effect	3	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 76.13 13.3 Boiling Point at 1 atm: 119.3°F = 48.5°C = 321.7°K 13.4 Freezing Point: -108.9°F = -77.7°C = 195.4°K 13.5 Critical Temperature: 323.1°F = 161.7°C = 434.9°K 13.6 Critical Pressure: 1100 psia = 76 atm = 7.7 MN/m ² 13.7 Specific Gravity: 1.26 at 20°C (density) 13.8 Liquid Surface Tension: 32 dynes/cm = 0.02 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 48.4 dynes/cm = 0.0484 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: 2.6 13.11 Ratio of Specific Heats of Vapor (Gas): 0.7 13.12 Latent Heat of Vaporization: 154 Btu/lb = 354 cal/g = 3.59 x 10 ³ J/kg 13.13 Heat of Combustion: -1414 Btu/lb = -3230 cal/g = -1352 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
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5. HEALTH HAZARDS (Cont'd) 5.6 Toxicity by Ingestion: Grade 2, rat LD ₅₀ = 0.1-0.99 g/kg 5.7 Late Toxicity: Non specific liver cell damage in rats, higher incidence of upper respiratory disease in humans 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure and may cause secondary burns on long exposure. 5.10 Odor Threshold: 0.21 ppm																																					

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CARBON MONOXIDE

Common Synonyms Monoxide		Compressed gas or liquefied compressed gas		Colorless		Odorless	
Liquid floats and boils on water. Poisonous. Flammable. Visible vapor cloud is produced.							
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wash exposed skin with plenty of water for at least 15 min. If inhaled, get fresh air and seek medical attention. If swallowed, do not induce vomiting. Seek medical attention. If on skin, remove contaminated clothing and shoes. Wash skin with plenty of water for at least 15 min.							
Fire		FLAMMABLE Containers may explode in fire. Will ignite a fire. Burns with a blue flame. No known health effects from fire.					
 Exposure		CAUTION: MEDICAL VAPOR POISONOUS IF INHALED May cause irritation of the respiratory tract. May cause dizziness and headache. LIQUID Will cause frostbite. Do not get liquid on skin or clothes.					
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intake. No known health effects from water pollution.					
1. RESPONSE TO DISCHARGE (See Response Memo, Handbook CG 446-4) Issue warning: poison high Flammable Restrict access Evacuate area				2. LABEL 			
3. CHEMICAL DESIGNATIONS 31 Synonyms: Monoxide 32 Coast Guard Competibility Classification: No appreciable 33 Chemical Formula: CO 34 IMCO/United Nations Numerical Designation: 21016				4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Compressed gas or liquefied gas 42 Color: Colorless 43 Odor: None			
5. HEALTH HAZARDS 51 Personal Protective Equipment: Self-contained breathing apparatus, safety glasses and safety shoes. Type D or Type S canister mask. 52 Symptoms Following Exposure: Inhalation causes headache, dizziness, weakness of limbs, confusion, nausea, unconsciousness and finally death. 0.04% conc. 2 hr. or 0.6% conc. 1 hr. headache and discomfort with moderate exercise. 0.1 to 2% will produce throbbing in the head in about 1 hr. Tendency to stagger in about 1 hr. and confusion of the mind. Headache and nausea in about 2 hrs. 0.20-25% usually produces unconsciousness in about 1 hr. Inhalation of a 0.4% conc. can prove fatal in less than 1 hr. Inhalation of high concentrations can cause sudden unexpected collapse. Contact of liquid with skin will cause frostbite. 53 Treatment for Exposure: INHALATION: Remove from exposure, give oxygen if available, support respiration, call a doctor. SKIN: If burned by liquid, treat as frostbite. 54 Toxicity by Inhalation (Threshold Limit Value): 40 ppm 55 Short-Term Inhalation Limits: 800 ppm, 15 min. 56 Toxicity by Ingestion: Not pertinent gas with low boiling points. 57 Late Toxicity: Toxicity from overexposure persists for many days. 58 Vapor (Gas) Irritant Characteristics: Data not available. 59 Liquid or Solid Irritant Characteristics: Data not available. 60 Odor Threshold: Not pertinent.							

6. FIRE HAZARDS 61 Flash Point: Not pertinent. 62 Flammable Limits in Air: 12% - 5% 63 Fire Extinguishing Agents: Let fire burn out off flow of gas and cool adjacent containers with water. Extinguish tools of wearing self-contained breathing apparatus with dry chemicals or carbon dioxide. 64 Fire Extinguishing Agents Not to be Used: Not pertinent. 65 Special Hazards of Combustion Products: Asphyxiation due to carbon dioxide production may result. 66 Behavior in Fire: Flame has very little color. Containers may explode in fire. 67 Ignition Temperature: 1124°F 68 Electrical Hazard: Data not available. 69 Burning Rate: Not pertinent.	8. WATER POLLUTION 81 Aquatic Toxicity: 1.5 ppm 7 to 8 minutes and 1.00% in killed, fresh water. 82 Waterway Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): None. 84 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: No reaction. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Not pertinent. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Air Products and Chemicals, Inc. Specialty Gas & Equipment Dept. 733 W. Broad Street Emmaus, PA 18049 2. Matheson Gas Products Law, Rutherford, N. J. 07073								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, U.S. 446-3) A B C D E F G	10. SHIPPING INFORMATION 101 Grades or Purity: Liquid 99.6% Gas Research High Purity, C.P. (99.5%) Technical (99.0-99.5) Commercial (97.5-99.5) 102 Storage Temperature: Ambient (for gas) -312 °°F (for liquid) 103 Inert Atmosphere: No requirement. 104 Venting: Safety relief.								
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable compressed gas. 122 HAZARD Rating for Bulk Water Transportation: Not listed. 123 MFPA Hazard Classifications: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>6</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	4	Reactivity (Yellow)	6	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Gas. 132 Molecular Weight: 28.0 133 Boiling Point at 1 atm: -312 °°F = -191.5°C = -313.5K 134 Freezing Point: -326°F = -199°C = -323K 135 Critical Temperature: -220°F = -140°C = -133K 136 Critical Pressure: 50.7 atmos = 34.51 atm = 3.502 MN/m² 137 Specific Gravity: 0.791 at -191.5°C (liquid) 138 Liquid Surface Tension: 9.8 dynes/cm = 0.0098 N/m at -191°C 139 Liquid-Water Interfacial Tension: Not pertinent. 1310 Vapor (Gas) Specific Gravity: 0.97 1311 Ratio of Specific Heats of Vapor (Gas): 1.3962 1312 Latent Heat of Vaporization: 92 X Btu/lb = 51.6 cal/g = 2.16 X 10³ J/kg 1313 Heat of Combustion: -4.43 Btu/lb = -2.412 cal/g = -10.1 X 10³ J/kg 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: Not pertinent. 1316 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	4								
Reactivity (Yellow)	6								

CARBON TETRACHLORIDE

Common Synonyms Carbon Tet Tetrachloroethane		Waxy liquid	Colorless	Sweet odor
		Sinks in water. Poisonous vapor is produced.		
Avoid contact with liquid and vapor. Keep person away from vapors until fully contained through appropriate decontamination procedures. Not reported as flammable under normal conditions, but it may become flammable under certain circumstances.				
Fire		Not Flammable POISONOUS AND IRRITATING GASES ARE PRODUCED WHEN HEATED Use extinguishers and other contained firefighting apparatus.		
		CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush eye(s) for at least 10 minutes with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water if available and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS or HAVING CONVULSIONS, do nothing except keep victim warm.		
Exposure				
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Affects local health and environment. No safe level of contamination in water intake.		
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 666-4. Involuntary persons. Rescue victims. Should be removed.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Benzobismuth Nonaqueous Perchloromethane Tetrachloroethane 3.2 Coast Guard Compatibility Classification: Halogenaed hydrocarbon. 3.3 Chemical Formula: CCl ₄ 3.4 IMCO United Nations Numerical Designation: 2800		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweetish, aromatic, moderately strong ethereal somewhat resembling that of chloroform.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor cartridges for full mask; protect respiratory surfaces. 5.2 Symptoms Following Exposure: Dizziness, muscle titration, anesthesia may be accompanied by nausea and liver damage. Kidney damage also occurs, often producing decrease or stopping of urinary output. 5.3 Treatment for Exposure: EYES AND SKIN: Flush with plenty of water for eyes; get medical attention. Remove contaminated clothing and wash before reuse. INHALATION: Immediately remove to fresh air. Keep patient warm and quiet and get medical attention promptly. Start artificial respiration if breathing stops. INTENTION: Induce vomiting and get medical attention promptly. No specific antidote known. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 5.5 Short-Term Inhalation Limits: 10 ppm for 15 min. 5.6 Toxicity by Ingestion: Grade 2 - Death follows rapidly. 5.7 Low Toxicity: Causes severe liver, kidney and death stages and. 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes moderate irritation such that personnel would find lower concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain it may cause staining and reddening of the skin. 5.10 P.D. Threshold: Greater than 10 ppm.				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Very poisonous phosgene gas when exposed to open flames 6.6 Behavior in Fire: Decomposes to form chlorine and phosgene 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Dynal Chemicals Midland, Michigan 48040 2. EMC Corp. Hortons Chemical Dr. 100 Ford Ave. New York, N.Y. 10011 3. Nauffer Chemicals Industrial Chemical Dr. Le Mans, Maine 04002																																				
11. HAZARD ASSESSMENT CODE See Table B, Appendix B, Hazardous Waste Act, 1980 A X	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial grade, USP 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Pressure Vaccum																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: OSM A 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: center;">Rating</th> </tr> </thead> <tbody> <tr> <td>Explosive</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td> Vapor Irritant</td> <td style="text-align: center;">2</td> </tr> <tr> <td> Liquid or Solid Irritant</td> <td style="text-align: center;">3</td> </tr> <tr> <td> Poisonous</td> <td style="text-align: center;">4</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td> Harmful Toxicity</td> <td style="text-align: center;">2</td> </tr> <tr> <td> Aquatic Toxicity</td> <td style="text-align: center;">2</td> </tr> <tr> <td> Aesthetic Effect</td> <td style="text-align: center;">2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td> Other Chemicals</td> <td style="text-align: center;">+</td> </tr> <tr> <td> Water</td> <td style="text-align: center;">0</td> </tr> <tr> <td> Self Reaction</td> <td style="text-align: center;">0</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: center;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazards (Blue)</td> <td style="text-align: center;">1</td> </tr> <tr> <td>Flammability (Red)</td> <td style="text-align: center;">0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td style="text-align: center;">0</td> </tr> </tbody> </table>	Category	Rating	Explosive	0	Health		Vapor Irritant	2	Liquid or Solid Irritant	3	Poisonous	4	Water Pollution		Harmful Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	+	Water	0	Self Reaction	0	Category	Classification	Health Hazards (Blue)	1	Flammability (Red)	0	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Liquid 13.2 Molecular Weight: 165.8 13.3 Boiling Point at 1 atm.: 70.1 °C (158.2 °F) 13.4 Freezing Point: -10.8 °C (13.0 °F) 13.5 Critical Temperature: 181.1 °C (358.0 °F) 13.6 Critical Pressure: 48.3 atm (4.9 MPa) 13.7 Specific Gravity: 1.042 (20°C/20°C) 13.8 Liquid Surface Tension: 27.0 dynes/cm (0.022 N/m) at 20°C 13.9 Liquid-Water Interfacial Tension: 45.0 dynes/cm (0.045 N/m) at 20°C 13.10 Vapor (Gas) Specific Gravity: 3.5 13.11 Ratio of Specific Heats of Vapor (Gas): 13.12 Latent Heat of Vaporization: 42.2 kJ/mol (10.1 kcal/mol) at 15°C 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
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Flammability (Red)	0																																				
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Continued on page 1 and 2

NOTES

CAR

CARENE

Common Synonyms M-carene Isodurene 4,7,7-Trimethyl-3-norbornene 3,7,7-Trimethylbicyclo[2,1,1] hex-3-ene		Liquid	Colorless	Sweet turpentine-like odor
Floats on water				
Stop discharge if possible. Keep fire away. Avoid contact with liquids. In case a fire occurs discharge immediately. Not a health hazard when inhaled. Not a skin irritant and is not a severe eye irritant.				
Fire	Combustible Compatible with dry chemicals and carbon dioxide. May become more flammable with heat. Not a severe eye irritant.			
Exposure	ALL FOR MEDICAL USE VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, coughing or difficult breathing. If inhaled in large quantities may cause respiratory distress. If inhaled in very large quantities may cause respiratory failure. LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Skin irritation may occur if contact is prolonged. Not a severe eye irritant. If swallowed will cause nausea and vomiting. If inhaled in large quantities may cause respiratory distress. If inhaled in very large quantities may cause respiratory failure. If swallowed will cause nausea and vomiting. If inhaled in large quantities may cause respiratory distress. If inhaled in very large quantities may cause respiratory failure.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. Feeding to shorebirds. May be dangerous if it enters water intakes. Not a severe eye irritant. Not a severe eye irritant.			
1. RESPONSE TO DISCHARGE (See Response to Discharge Handbook, CG 446-4) Toxic, may be a flame hazard. Mechanical contamination Should be removed by chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: M-carene Isodurene 4,7,7-Trimethyl-3-norbornene 3,7,7-Trimethylbicyclo[2,1,1]hex-3-ene 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₁₀ H ₁₆ 3.4 HMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweet, pungent, like turpentine		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor or air-supplied mask, goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes headache, confusion, respiratory distress. Ingestion irritates entire digestive system and may cause nausea if liquid enters lungs. It causes severe pneumonitis. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: move victim to fresh air, call a doctor, administer artificial respiration and oxygen if required. INGESTION: give large amounts of water and induce vomiting, call a doctor. EYES: Flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral rat LD ₅₀ = 4.7 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective on fire 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Will attack some forms of plastics 7.3 Stability - During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Northwest Petrochemical Corp. 2700 Buena Vista Astoria, Wash. 97103
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T 1	10. SHIPPING INFORMATION 10.1 Grades or Purities: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classification: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 136 13.3 Boiling Point at 1 atm: 118°F = 47.8°C = 321°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.840 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: (est.) = 14,170 Btu/lb = 10,740 cal/g = 450 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
(continued on pages 1 and 2)	
NOTES	

CTC

CATECHOL

Common Synonyms: Oxyphenic acid Pyrocatechic acid Pyrocatechin, acid		Solid	White	Odorless
Sinks and mixes with water				
Very slightly soluble in water at room temperature. More soluble in water at higher temperatures. Insoluble in alcohol, ether, and benzene. Soluble in dilute aqueous solutions of sodium hydroxide and potassium hydroxide.				
Fire		Combustible POISONOUS GASES MAY BE PRODUCED WHEN HEATED When exposed to fire, it may produce irritating and/or toxic fumes. It may also produce carbon monoxide and carbon dioxide. It is not flammable.		
Exposure		AIRBORNE DUST DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Inhalation may cause irritation of the respiratory tract. It may also cause irritation of the skin. SOLID Will burn skin and eyes. Harmful if swallowed. When in contact with skin, it may cause irritation. If swallowed, it may cause irritation of the gastrointestinal tract. It may also cause irritation of the skin.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Flush with water. Water contamination. Dispose and flush.		2. LABELS No hazard labels required under code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,2-Benzenediol; Catechol; 1,2-Dihydroxybenzene; ortho-Dihydroxybenzene; Oxyphenic acid; Pyrocatechol; Pyrocatechic acid; Pyrocatechol; Pyrocatechic acid. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: 1,2-DIHYDROXYBENZENE 3.4 INCOG Used Name as Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator if required; rubber gloves; apron; and boots; face shield. 5.2 Symptoms Following Exposure: Irritation of eyes or nose may cause irritation of eyes, nose, and throat. Ingestion may cause convulsions and respiratory failure. Contact with eyes causes burns and if possible permanent impairment of vision. Prolonged or repeated contact with skin may cause burn. 5.3 Treatment for Exposure: INHALATION: If effects occur, get medical attention. INGESTION: promptly give 1 quart of water and induce vomiting; get medical attention promptly; do not give anything if unconscious. EYES AND SKIN: immediately flush with plenty of water for at least 15 min. For eyes get medical attention promptly; remove and wash all contaminated clothing before reuse. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Grade 2 (LD50 = 5 g/kg rats). 5.7 Late Toxicity: Causes tumors in mice. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: (liquid) 274°F (135°C) (261°F (128°C))	8.1	Aquatic Toxicity: (in ppm 48 hr. static, 114 hr. static)
6.2	Flammable Limits in Air: Not pertinent (combustible solids)	8.2	Waterway Toxicity: Data not available
6.3	Fire Extinguishing Agents: Dry chemical, alcohol, foam, carbon dioxide	8.3	Biological Oxygen Demand (BOD): Data not available
6.4	Fire Extinguishing Agents Not to be Used: Water and foam may be ineffective	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: May form toxic fumes at high temperatures		
6.6	Behavior in Fire:		
6.7	Ignition Temperature: Data not available		
6.8	Electrical Hazard: Not pertinent		
6.9	Burning Rate: Not pertinent		
		9 SELECTED MANUFACTURERS	
		1. Union Carbide Corp. Chemical Products Div. Camden, Wash. 98007	
		2. Dow Chemical Co. Midland, Mich. 48660	
		3. Eastman Organic Chemicals Rochester, N.Y. 14650	
7. CHEMICAL REACTIVITY			
7.1	Reactivity with Water: No reaction		
7.2	Reactivity with Common Materials:		
7.3	Stable During Transport: Stable		
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent		
7.5	Polymerization: Not pertinent		
7.6	Inhibitor of Polymerization: Not pertinent		
		10. SHIPPING INFORMATION	
		10.1 Grades or Purity: CP: high purity 99.1+%; NP: extremely high purity 99.9+%	
		10.2 Storage Temperature: Ambient	
		10.3 Inert Atmosphere: No requirement	
		10.4 Venting: Open	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) N		13. PHYSICAL AND CHEMICAL PROPERTIES	
		13.1 Physical State at 15°C and 1 atm: Solid	
		13.2 Molecular Weight: 110.10	
		13.3 Boiling Point at 1 atm: 245.4°F = 21.9°C = 415.5°K	
		13.4 Freezing Point: 214.9°F = 104.4°C = 377.5°K	
12. HAZARD CLASSIFICATIONS		13.5 Critical Temperature: Not pertinent	
12.1	Code of Federal Regulations: Not listed	13.6 Critical Pressure: Not pertinent	
12.2	NAS Hazard Rating for Bulk Water Transportation: Not listed	13.7 Specific Gravity: 1.344 at 20°C (solid)	
12.3	NFPA Hazard Classifications: Not listed	13.8 Liquid Surface Tension: Not pertinent	
		13.9 Liquid-Water Interfacial Tension: Not pertinent	
		13.10 Vapor (Gas) Specific Gravity: Not pertinent	
		13.11 Rate of Specific Heats of Vapor (Gas): Not pertinent	
		13.12 Latent Heat of Vaporization: Not pertinent	
		13.13 Heat of Combustion: -14,206 Btu/lb = -6,220 cal/g = -260 x 10 ³ J/kg	
		13.14 Heat of Decomposition: Not pertinent	
		13.15 Heat of Solution: Not pertinent	
		13.16 Heat of Polymerization: Not pertinent	
		Continued on page 7 and 8	
NOTES			

CPS

CAUSTIC POTASH SOLUTION

Common Synonyms Potassium hydroxide solution Eye	Thick liquid Colorless Odorless Sinks and mixes with water
AVOID CONTACT WITH LIQUID Keep people away Wear rubber overclothing (including gloves) Stop discharge if possible Isolate and remove discharged material Notify local health and pollution control agencies	
Fire	Not flammable
Exposure	CALL FOR MEDICAL AID LIQUID Will burn skin and eyes. Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water If IN EYES, hold eyelids open and flush with plenty of water If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk DO NOT INDUCE VOMITING
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3) Issue warning: corrosive Restrict access Unspill and flush	2 LABEL 
3 CHEMICAL DESIGNATIONS 31 Synonyms: Potassium hydroxide solution Eye 32 Coast Guard Compatibility Classification: Corrosive 33 Chemical Formula: KOH/H ₂ O 34 IMCO/United Nations Numerical Designation: N 01814	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: None
5. HEALTH HAZARDS 51 Personal Protective Equipment: Wide brimmed hat and close fitting safety goggles equipped with rubber side shields. Long sleeved cotton shirt or jacket with buttoned collar and buttoned sleeves. Rubber or rubber coated canvas gloves. Shirt sleeves should be buttoned over the gloves so that any spilled material will run down the outside of the gloves. Rubber safety toe shoes or boots and cotton coveralls. (Trousers cuffs should be worn outside of boots.) Rubber apron. 52 Symptoms Following Exposure: Causes severe burns of eyes, skin, and mucous membranes. 53 Treatment for Exposure: (Not quickly) EYES: flush with water for at least 15 min. SKIN: flush with water, then rinse with dilute vinegar (acetic acid). INGESTION: give water and milk. Do NOT induce vomiting. Call physician at once, even when injury seems to be slight. 54 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 55 Short-Term Inhalation Limits: Not pertinent 56 Toxicity by Ingestion: Grade 2, oral rat LD ₅₀ = 365 mg/kg 57 Late Toxicity: None 58 Vapor (Gas) Irritant Characteristics: Not pertinent 59 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 510 Odor threshold: Not pertinent	

6 FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Not flammable 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not flammable	8. WATER POLLUTION 81 Aquatic Toxicity: 80 ppm/24 hr. min. aquatic fish. 11 in. fresh water (these figures are for 100% potassium hydroxide) 82 Waterflow Toxicity: Data not available 83 Biological Oxygen Demand (BOD): None 84 Food Chain Concentration Potential: None																																				
7 CHEMICAL REACTIVITY 71 Reactivity with Water: None 72 Reactivity with Common Materials: Attacks wool, leather and some metals such as aluminum, tin, lead and zinc, to produce flammable hydrogen gas. Separate from easily ignitable materials. 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Dilute with water and rinse with dilute acid such as acetic acid. 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Diamond Shamrock Corp. Diamond Shamrock Chemical Co. Electro Chemicals Div. Deer Park, Texas 77536 2 Monsanto Co. Monsanto Industrial Chemicals Co. 800 North Lindbergh Blvd. St. Louis, Mo. 63166 3 Occidental Petroleum Corp. Hooker Chemical Corp. Industrial Chemicals Div. Niagara Falls, N.Y. 14302																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P	10 SHIPPING INFORMATION 101 Grades or Purity: 48-50% 102 Storage Temperature: Ambient or elevated 103 Inert Atmosphere: No requirement 104 Venting: Open																																				
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Corrosive material 122 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="943 1425 1191 1683"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>0</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>0</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td> Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>2</td></tr> <tr> <td> Aquatic Toxicity</td><td>1</td></tr> <tr> <td> Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>4</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table> 123 MFPA Hazard Classifications: <table data-bbox="943 1705 1191 1791"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>1</td></tr> </tbody> </table>	Category	Rating	Fire	0	Health		Vapor Irritant	0	Liquid or Solid Irritant	4	Poisons	1	Water Pollution		Human Toxicity	2	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemicals	4	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	1	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: Not pertinent 133 Boiling Point at 1 atm: $> 204^{\circ}\text{F} = > 130^{\circ}\text{C} = > 403^{\circ}\text{K}$ 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.48-1.50 at 29°C (liquid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heat of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: (est.) -17 Btu/lb = -10 cal/g $= -0.4 \times 10^3 \text{ J/kg}$ 1316 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	0																																				
Health																																					
Vapor Irritant	0																																				
Liquid or Solid Irritant	4																																				
Poisons	1																																				
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NOTES																																					

(Continued on page 17, Add.)

REVISED 1978

CAUSTIC SODA SOLUTION

Common Synonyms Sodium hydroxide solution Lye		Thick liquid Sinks and mixes with water	Colorless	Odorless
AVOID CONTACT WITH LIQUID: Keep people away Wear rubber overclothing (including gloves) Stop discharge if possible Isolate and remove discharged material Notify local health and pollution control agencies				
Fire		Not flammable		
Exposure		CALL FOR MEDICAL AID LIQUID Will burn skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES: hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk DO NOT INDUCE VOMITING		
Water Pollution		Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes Notify local health and pollution control officials Notify operators of nearby water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning: Corrosive Restrict access Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Sodium hydroxide solution Lye 3.2 Coast Guard Compatibility Classification Caustic 3.3 Chemical Formula: NaOH • H ₂ O 3.4 IMCO/United Nations Numerical Designation: N 0/1724		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Wide brimmed hat, safety goggles with rubber side shields, tight-fitting cotton clothing, rubber gloves under shirt cuffs, rubber boots and apron 5.2 Symptoms Following Exposure: Causes severe burns of eyes, skin, and mucous membranes 5.3 Treatment for Exposure: (Act quickly!) EYES: Flush with water at once for at least 15 min. SKIN: Flush with water, then rinse with dilute vinegar (acetic acid). INGESTION: Give water and milk. Do NOT induce vomiting. Call physician at once, even when injury seems to be slight 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 2, oral rabbit LD ₅₀ = 500 mg/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and very injurious to the eyes 5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable		8. WATER POLLUTION 8.1 Aquatic Toxicity: 125 ppm (96 hr/mosquito fish/11 m ³ fresh water) 180 ppm (24 hr/sters/lebs/ salt water) (these figures are 100% sodium hydroxide) 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None																																					
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Corrosive to aluminum, zinc, and tin Contact with some metals may generate hydrogen gas, which is explosive and flammable 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Dilute with water, rinse with dilute acetic acid 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Diamond Shamrock Corp. Electrochemicals Division Painesville, Ohio 44077 2. Dow Chemical Co. Midland, Mich. 48640 3. PPG Industries, Inc. Industrial Chemicals Division Barberton, Ohio 44203																																					
11. HAZARD ASSESSMENT CODE (See Hazard's Assessment Handbook CG 446-3) A P		10. SHIPPING INFORMATION 10.1 Grade or Purity: 173% 10.2 Storage Temperature: Ambient or elevated 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open																																					
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive materials 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>0</td></tr><tr><td>Health</td><td>0</td></tr><tr><td>Vapor Irritant</td><td>0</td></tr><tr><td>Liquid or Solid Irritant</td><td>4</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td>2</td></tr><tr><td>Human Toxicity</td><td>3</td></tr><tr><td>Aquatic Toxicity</td><td>2</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td>0</td></tr><tr><td>Other Chemicals</td><td>4</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table> 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>3</td></tr><tr><td>Flammability (Red)</td><td>0</td></tr><tr><td>Reactivity (Yellow)</td><td>1</td></tr></table>		Category	Rating	Fire	0	Health	0	Vapor Irritant	0	Liquid or Solid Irritant	4	Poisons	1	Water Pollution	2	Human Toxicity	3	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity	0	Other Chemicals	4	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: > 260°C (= > 130°C (= > 403°F)) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.54 (20°C) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Rating																																						
Fire	0																																						
Health	0																																						
Vapor Irritant	0																																						
Liquid or Solid Irritant	4																																						
Poisons	1																																						
Water Pollution	2																																						
Human Toxicity	3																																						
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NOTES (continued on pages 5 and 6)																																							

CHC

CHARCOAL

Common Synonyms Vegetable carbon Animal carbon Activated charcoal Wood charcoal Shell charcoal		Solid powder, lumps, or grains	Black	Odorless
May float or sink in water				
Shut off ignition sources. Call fire department. Stay upwind. Use water spray to knock down dust. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Flood discharge area with water		
Exposure		DUST Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. SOLID Not harmful		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not biologically available if in solid form. Not a potential nutrient with nutrients.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Issue warning: high flammability. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Vegetable carbon, Vegetable charcoal, Animal carbon, Animal charcoal, Mineral carbon, Mineral charcoal, Activated charcoal, Wood charcoal, Shell charcoal. 3.2 Chemical Compatibility Classification: Not applicable. 3.3 Chemical Formula: C. 3.4 IMCO/United Nations Numerical Designation: 4.2/1361, 1362.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Powder, lumps, grains or sticks. 4.2 Color: Black. 4.3 Odor: None.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Respirator for dust. 5.2 Symptoms Following Exposure: No significant symptoms. 5.3 Treatment for Exposure: No treatment required. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Non-toxic (actually used in therapy of poisoning cases). 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.				

6. FIRE HAZARDS 6.1 Flash Point: Flammable solid may ignite spontaneously in air. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Water. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Incomplete combustion forms toxic carbon monoxide. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 600-750°F. 6.8 Electrical Hazard: Class I, Group I. 6.9 Burning Rate: Not pertinent.		8. WATER POLLUTION 8.1 Aquatic Toxicity: None. 8.2 Waterfowl Toxicity: None. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: May ignite spontaneously in air. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Barney Cherry Co. Cassady at Eighth Street Columbus, Ohio 43216. 2. North American Carbon Inc. P. O. Box 19737 Columbus, Ohio 43219. 3. Union Carbide Corp. Carbon Products Division 270 Park Avenue New York, N. Y. 10017.	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-3) II		10. SHIPPING INFORMATION 10.1 Grades or Purities: Various grades; those containing appreciable volatile material are more likely to catch fire. All shipments must be exposed to air and so certified. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arrester).	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable solid. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 12. 13.3 Boiling Point at 1 atm: Very high. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: 14,100 Btu/lb = 7,850 cal/g = 328 × 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.	
(Continued on pages 5 and 6)			
NOTES			

CDN

CHLORDANE

Common Synonyms Chlordane 1, 2, 4, 5, 6, 7, 8-Octachloro-2, 3, 3a, 4, 7, 7a-hexahydro-4, 7-methanonendene Toxicity Octa-Klor Velocot 1068	Liquid or solution Brown Sharp odor Sinks in water
AVOID CONTACT WITH EYES. KEEP AWAY Wash eyes with plenty of water. If irritation persists, consult a physician. If on skin, wash with plenty of water. If in eyes, hold eyelids open and flush with plenty of water. If swallowed, induce vomiting and have victim drink water. If in milk and have victim induce vomiting. If swallowed, induce vomiting and have victim drink water. If in milk and have victim induce vomiting.	
Fire	Not flammable but solution may be combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Extinguish with dry chemicals or carbon dioxide. Water may be ineffective on fire. If exposed, remove from area.
 Exposure	CALL FOR MEDICAL AID LIQUID OR SOLUTION POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes. If on skin, wash with plenty of water. If in eyes, hold eyelids open and flush with plenty of water. If swallowed, induce vomiting and have victim drink water. If in milk and have victim induce vomiting. If swallowed, induce vomiting and have victim drink water. If in milk and have victim induce vomiting.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Not recommended for use in water.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison Restrict access Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Chlordane 1, 2, 4, 5, 6, 7, 8, 8-Octachloro-2, 3, 3a, 4, 7, 7a-hexahydro-4, 7-methanonendene, Velocot 1068, CD-68, Tenechlor, Octa Klor 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₁₀ HCl ₈ 3.4 IMCO/United Nations Numerical Designation: 611615	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Brown 4.3 Odor: Penetrating aromatic slightly pungent like chlorine
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Respirator for sprays, fogs, or dust; goggles; rubber gloves 5.2 Symptoms Following Exposure: Moderately irritating to eyes and skin. Ingestion: absorption through skin or inhalation of mist or dust may cause excitability, convulsions, nausea, vomiting, diarrhea, and some local irritation of the gastrointestinal tract. 5.3 Treatment for Exposure: INHALATION: administer oxygen and give fluid therapy; do not give epinephrine, since it may induce ventricular fibrillation; enforce complete rest. EYES: flush with water for at least 15 min. SKIN: wash off skin with adequate quantities of soap and water; do NOT scrub. INGESTION: induce vomiting and follow with gastric lavage and administration of saline cathartics; ether and barbiturates may be used to control convulsions; oxygen and fluid therapy are also recommended; do NOT give epinephrine. Since no specific antidotes are known, symptomatic therapy must be accompanied by complete rest. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m ³ 5.5 Short-Term Inhalation Limits: 2 mg/m ³ for 10 min 5.6 Toxicity by Ingestion: Grade 3, oral LD ₅₀ = 283 mg/kg (rat) 5.7 Late Toxicity: Possible liver damage; loss of appetite and weight 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: Solution 225°F (0°C) 132°F (56°C) Solid is not flammable 6.2 Flammable Limits in Air: 0.7% - 5% (kerosene solution) 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective on solution fire 6.5 Special Hazards of Combustion Products: Irritating and toxic hydrogen chloride and phosgene gases may be formed when kerosene solution of compound burns 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 410°F (kerosene solvent) 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 0.5 ppm/96 hr, goldfish; 11 mg/l fresh water 8.2 Waterfowl Toxicity: LD ₅₀ = 1,200 mg/kg 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: High
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable to 160°F 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Velocot Chemical Corp. 341 East Ohio Street Chicago, Ill. 60611 2. S. B. Penick & Co. 100 Church Street New York, N. Y. 10007 3. Chempar Chemical Co. 260 Madison Avenue New York, N. Y. 10016
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A X Y	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical. A variety of dusts, powders, and solutions in kerosene containing 2-80% chlordane are shipped 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES* 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 409.8 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.6 at 25°C (liquid) 13.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (est.) -4,000 Btu/lb = -2,200 cal/g = -93 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent * Properties refer to undiluted, technical-grade chlordane
Continued on pages 5 and 6 NCES	

CTF

CHLORINE TRIFLUORIDE

Common Synonyms	
Liquefied compressed gas	Greenish yellow liquid or colorless gas
	Strong sweetish odor
Sinks and may boil in water. Reacts violently with water to produce poisonous gas. Boiling point is 33° F.	
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP TIGHTLY AWAY. Wear chemical protective suit with self-contained breathing apparatus. Stop discharge if possible. Evacuate area if release is large discharge. Call fire department. Extinguish with dry chemical. Do not use water on adjacent fires. Do not use water or foam on adjacent fires. Containers may explode in fire.	
Fire	Not flammable. May explode on contact with combustibles. POISONOUS GASES ARE PRODUCED WHEN HEATED. Containers may explode in fire. Wear chemical protective suit with self-contained breathing apparatus. Combat fires from safe distance. Do not use water. Extinguish with dry chemical. Do not use water or foam on adjacent fires. Containers may explode in fire.
	CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED. Irritating to skin, eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing, give oxygen.
Exposure	LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Remove contaminated clothing. Flush affected areas with plenty of water. DO NOT RUB WATER INTO AREAS. IF IN EYES: Flush with water for at least 15 minutes. If swallowed, do not induce vomiting. If swallowed, do not induce vomiting. If swallowed, do not induce vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not a health risk and will be of little or no harm to the environment.

1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison air contaminant water contaminant: corrosive oxidizing material Restrict access Evacuate area	
2. LABELS  	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: CTF 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: ClF ₃ 3.4 IMCO/United Nations Numerical Designation: 2/1749	
4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied compressed gas 4.2 Color: Gas colorless Liquid greenish yellow 4.3 Odor: Acid strong pungent sweetish sweet and irritating	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Neoprene gloves and protective clothing made of glass fiber and Teflon including full hood self contained breathing apparatus with full face mask 5.2 Symptoms Following Exposure: Inhalation causes extreme irritation. If respiratory tract pulmonary edema may result. Vapors are very irritating to eyes and skin. Liquid causes severe burns. 5.3 Treatment for Exposure: Call physician at once after any exposure to this compound. INHALATION: remove victim to fresh air and keep him quiet. Give artificial respiration if breathing has stopped, give oxygen. Enforce rest for 24 hours. EYES: flush with water for at least 15 min., get medical attention. But do not interrupt flushing for at least 10 min. SKIN: flush with water, then with 1-3% aqueous ammonia, then again with water. Apply ice cold pack of saturated Epsom salt or 70° ethyl alcohol. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 ppm (ceiling limits) 5.5 Short-Term Inhalation Limits: 0.1 ppm for 5 min 5.6 Toxicity by Ingestion: Grade 4 LD ₅₀ < 50 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant, causes second and third degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable but may cause fire on contact with some materials. 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Do not use water on adjacent fires unless well protected against hydrogen fluoride gas. 6.5 Special Hazards of Combustion Products: If released from container, fumes are toxic and irritating. 6.6 Behavior in Fire: If released from container, can increase the intensity of fire. Containers may explode. 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts explosively with water, evolving hydrogen fluoride (hydrofluoric acid) and chlorine. 7.2 Reactivity with Common Materials: Causes ignition of all combustible materials and even sand or concrete. Very similar to fluorine gas. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flood with water. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	
8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None	
9. SELECTED MANUFACTURERS 1 Matheson Gas Products Co. East Rutherford, N.J. 07073 2 Air Products and Chemicals, Inc. Specialty Gases Department P.O. Box 516 Allentown, Pa. 18105 3 Union Carbide Corp. Linde Division 270 Park Avenue New York, N.Y. 10017	
10. SHIPPING INFORMATION 10.1 Grades or Purity: 99+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief	

11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A C O																													
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizer 12.2 HAS Hazard Rating for Bulk Water Transportation: <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>0</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>4</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td> Poisons</td><td>4</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>4</td></tr> <tr> <td> Aquatic Toxicity</td><td>2</td></tr> <tr> <td> Aesthetic Effect</td><td>3</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>4</td></tr> <tr> <td> Water</td><td>4</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table>		Category	Rating	Fire	0	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	4	Water Pollution		Human Toxicity	4	Aquatic Toxicity	2	Aesthetic Effect	3	Reactivity		Other Chemicals	4	Water	4	Self Reaction	0
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Reactivity																													
Other Chemicals	4																												
Water	4																												
Self Reaction	0																												
12.3 NFPA Hazard Classifications: Not listed																													
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 92.5 13.3 Boiling Point at 1 atm: 31° = 116° = 284° K 13.4 Freezing Point: -105° = -76.1° = 197.1° K 13.5 Critical Temperature: 307° = 133° = 426° K 13.6 Critical Pressure: 537 psia = 56.9 atm = 577 MN/m ² 13.7 Specific Gravity: 1.55 at 11°C (liquid) 13.8 Liquid Surface Tension: 26.6 dynes/cm = 0.0266 N/m at 0°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 3.2 13.11 Ratio of Specific Heats of Vapor (Gas): 1.2832 13.12 Latent Heat of Vaporization: 126 Btu/lb = 712 cal/g = 2.98 x 10 ³ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent																													

NOTES

(Continued on pages 5 and 6)

CRA

CHLOROACETOPHENONE

Common Synonyms Phenacyl chloride omega-Chloroacetophenone alpha-Chloroacetophenone Phenyl chloromethyl ketone Chloromethyl phenyl ketone Tear gas	Solid White to light yellow Sharp odor Sinks in water
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear goggles if entering the area; apparatus and rubber suit if high concentrations. Call for decontamination. Stop work if CS warning given. Knock down dust before entering and avoid contact with material. Notify health and pollution control agencies.	
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles with indirect breathing apparatus and protective clothing if entering area. Flood discharge area with water.
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED Irritating to eyes, nose and throat. Move victim to fresh air. If eyes badly irritated, flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eye made open and flush with plenty of water. If SWALLOWED, do not induce vomiting. Give plenty of water to drink and have victim seek medical attention. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep person warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife agencies. Notify appropriate health and safety agencies.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: air contaminant Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Phenacyl chloride omega-Chloroacetophenone, alpha-Chloroacetophenone, Phenyl chloromethyl ketone, Tear gas, Chloromethyl phenyl ketone 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₈ H ₇ ClO 3.4 IMCO/United Nations Numerical Designation: 6.1 (1697)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White to pale yellow 4.3 Odor: Pungent
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Full face organic canister mask, self-contained breathing apparatus, rubber gloves, protective clothing. 5.2 Symptoms Following Exposure: Inhalation causes tearing, burning of the eyes and difficulty in breathing; high concentrations may lead to development of acute pulmonary edema after latencies of 1 hr to several days; possible systemic manifestations include agitation, coma, contraction of pupils of eyes, loss of reflexes. External contact causes irritation of skin and intense irritation of eyes. Ingestion causes agitation, coma, contraction of pupils of eye, loss of reflexes. 5.3 Treatment for Exposure: INHALATION: remove victim from contaminated atmosphere at once; give artificial respiration and oxygen if necessary; watch for pulmonary edema for several days. EYES: flush with water; do not rub. SKIN: flush with water. INGESTION: get medical attention; watch for development of pulmonary edema for several days. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.05 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 oral LD ₅₀ = 52 mg/kg (rat) 5.7 Late Toxicity: Fatty infiltration of liver 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: 0.016 ppm	

6. FIRE HAZARDS 6.1 Flash Point: Combustible solid 244°F C.C. (solutions only) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride may form 6.6 Behavior in Fire: Unburned material may become volatile and cause severe eye irritation 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts slowly generating hydrogen chloride. The reaction is not hazardous. 7.2 Reactivity with Common Materials: Reacts slowly with metals causing mild corrosion. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Federal Laboratories, Inc. Saltsburg, Pa. 15681 2. Pfaltz and Bauer, Inc. 126-64 Northern Boulevard Flushing, N.Y. 11368 3. M.C. B. Manufacturing Chemicals 2909 Highland Avenue Norwood, Ohio 45212
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II RR 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Irritant 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Category Classification Health Hazard (Blue) 2 Flammability (Red) 1 Reactivity (Yellow) 0	10. SHIPPING INFORMATION 10.1 Grades or Purity: Sometimes shipped as a solution in an organic solvent 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum 13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 154.6 13.3 Boiling Point at 1 atm: 477°F = 247°C = 520°K 13.4 Freezing Point: 68.138°F = 20.59°C = 293.732°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.32 at 15°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (est.) = -9,340 Btu/lb = -5,170 cal/g = -217 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES (Continued on pages 1 and 6)	

6. FIRE HAZARDS 6.1 Flash Point: (Combustible solids) > 220°F (100°C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water dry chemical foam or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating and toxic hydrogen chloride and oxides of nitrogen may form in fires 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Monsanto Company Monsanto Industrial Chemicals 800 North Lindbergh Boulevard St. Louis, Mo. 63166 2 I. I. duPont de Nemours & Co. Organic Chemicals Department Dyes and Chemicals Division Wilmington, Del. 19898 3 Aldrich Chemical Co. 940 West St. Paul Avenue Milwaukee, Wis. 53233
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 127 g 13.3 Boiling Point at 1 atm: 446°F = 230°C = 503°K 13.4 Freezing Point: 158°F = 70°C = 343°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.43 at 19°C (solids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (cal/g) = 11,000 Btu/lb = -6,000 cal/g = -250 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

(continued on pages 5 and 6)

NOTES

CRB

CHLOROBENZENE

Common Synonyms Monochlorobenzene Phenyl chloride Benzene chloride	Watery liquid Colorless Sweet, almond odor Sinks Flammable vapor is produced
Avoid contact with liquid and vapor. Keep people away. No re-discharge if possible. No fire department. No water spray. No high water vapor. No fire and flame. No discharged material. No fire and flame. No fire and flame.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical foam or carbon dioxide.
Exposure	CARE FOR MEDICAL AID VAPOR: If inhaled, will cause coughing or distress. Not irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operator of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Manual, CG 446-4) Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Benzene chloride MCB Monochlorobenzene Phenyl chloride 3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon 3.3 Chemical Formula: C ₆ H ₅ Cl 3.4 IMCO United Nations Numerical Designation: 1114	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild almond odor, sweet, almond-like, acetyls.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor and dust respirator where appropriate; no gloves; vinyl gloves; chemical safety spectacles; eye shield where appropriate; when not wearing or impermeable clothing for splash protection; hard hat. 5.2 Symptoms Following Exposure: Irritating to skin, eyes and mucous membranes. Repeated exposure may cause dermatitis (redness, itching, swelling). Chronic inhalation of vapors may result in damage to lungs, liver and kidneys. Acute vapor exposures can cause symptoms ranging from coughing to bronchitis and pulmonary edema, and depression. 5.3 Treatment for Exposure: Get medical attention for all exposures and all serious exposures. Treat symptoms. INHALATION: Remove to clean air and give oxygen as needed. INGESTION: dilute by drinking water if vomiting occurs; administer more water. Administer saline laxative. EYES: flush thoroughly with water. SKIN: give contaminated clothing; wash exposed area with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: (Grade 2) D ₅₀ is 2.5 g/kg rat, rabbit 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. Spilled on clothing and allowed to remain may cause staining and redness of the skin. 5.10 Odor Threshold: 0.27 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 43°F (C) 57°F (C) 6.2 Flammable Limits in Air: 1.3% - 7.1% 6.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical foam or water spray. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Burning in open flame can form oxycarbonyl and hydrogen chloride gases. 6.6 Behavior in Fire: Heavy vapor can travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 184°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: test 14.6 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 20 ppm 96 hr bluegill, 11 hr, freshwater 6.2 Waterways Toxicity: Data not available 6.3 Biological Oxygen Demand (BOD): 0.46 lb 5 days 6.4 Food Chain Concentration Potential: Data not available																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Dow Chemical Co. Midland Mich 48040 Monsanto Co. Monsanto Industrial Chemicals Co. 800 North Lindbergh Blvd. St. Louis, Mo. 63166 Montrose Chemical Corp. 800 South Virgil Ave. Los Angeles, Calif. 90005																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 446-4 A1.3	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.9% technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure vacuum																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="840 1485 1092 1747"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Liquid</td><td>1</td></tr> <tr> <td>Gas</td><td>1</td></tr> <tr> <td>Vapor Irritant</td><td>0</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td>1</td></tr> <tr> <td>Human Toxicity</td><td>1</td></tr> <tr> <td>Aquatic Toxicity</td><td>1</td></tr> <tr> <td>Acute Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td>1</td></tr> <tr> <td>Other Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="840 1769 1092 1878"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Liquid	1	Gas	1	Vapor Irritant	0	Liquid or Solid Irritant	1	Poisons	2	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	1	Acute Effect	2	Reactivity	1	Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 112.56 13.3 Boiling Point at 1 atm: 270°F = 132°C = 405°K 13.4 Freezing Point: -0.1°F = -45.6°C = 227°K 13.5 Critical Temperature: 679°F = 354°C = 627°K 13.6 Critical Pressure: 654 psia = 44 kg/cm ² = 4.52 MPa (g) 13.7 Specific Gravity: 1.11 at 20°C (liquids) 13.8 Liquid Surface Tension: 33 dyne/cm = 0.033 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 17 dyne/cm = 0.017 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.04 13.12 Latent Heat of Vaporization: 145 Btu/lb = 75 cal/g = 1400 kJ/kg 13.13 Heat of Combustion, test: 12,000 Btu/lb = 6700 cal/g = 260 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Liquid	1																																				
Gas	1																																				
Vapor Irritant	0																																				
Liquid or Solid Irritant	1																																				
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NOTES (Continued on page 5 of 6)																																					

REVISED 1978

CBN

4-CHLOROBUTYRONITRILE

Common Synonyms 4-Chlorobutyronitrile		Liquid	White to light yellow
Sinks in water			
Not to be charged in water. Keep away from water. Do not use in water. Do not use in water. Do not use in water. Do not use in water.			
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated. Near fires and flames, avoid breathing vapors. Do not use in water. Do not use in water. Do not use in water. Do not use in water.		
Exposure	GASES FORMED IN FIRE VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If inhaled, move victim to fresh air. If water enters eyes, flush with water. If in eyes, flush with water for 15 min. If on skin, wash with water. If swallowed, do not induce vomiting. If on skin, wash with water. If in eyes, flush with water for 15 min. If on skin, wash with water. If swallowed, do not induce vomiting. If on skin, wash with water.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not to be used in water. Do not use in water. Do not use in water. Do not use in water.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning: "water contaminant" Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 4-Chlorobutyronitrile (Practical, mixture with 4-bromobutyronitrile) 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{CH}_2\text{CH}_2\text{CH}_2\text{CN} + \text{CH}_2\text{BrCH}_2\text{CH}_2\text{CN}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: White to pale yellow 4.3 Odor: Data not available	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supply mask or self-contained breathing apparatus for repeated handling large amounts; rubber gloves; safety goggles. 5.2 Symptoms Following Exposure: Chemical is moderately toxic. Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Can penetrate the skin on prolonged contact; only slightly irritating. 5.3 Treatment for Exposure: INHALATION: move victim to fresh air; administer artificial respiration if required; call a doctor. INGESTION: give large amount of water; induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3.1 (D ₅₀ = 400 mg/kg (rat)) 5.7 Lethal Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			
6. FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water, dry chemical foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Toxic and irritating hydrogen cyanide, hydrogen bromide, and hydrogen chloride may form in fires. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available			
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent			
8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None			
9. SELECTED MANUFACTURERS Eastman Kodak Co. 145 State St. Rochester, N.Y. 14650			
10. SHIPPING INFORMATION 10.1 Grades or Purity: 50% - 40% 4-bromobutyronitrile + 4% glutaronitrile. Major components have same hazard ratings. 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open			
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A N Y		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 103.55 13.3 Boiling Point at 1 atm: 174°F = (90°C = 461°F) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.22 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: 3.57 13.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.080 at 20°C 13.12 Latent Heat of Vaporization: (est.) 185 Btu/lb = 501 cal/g = 4.31 X 10 ³ J/kg 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed			
NOTES			

(Continued on pages 2 and 3)

CRF

CHLOROFORM

Common Synonyms Trichloromethane	Watery liquid Colorless Sweet odor Sinks in water. Irritating vapor is produced.
Fire	Not flammable POISONOUS AND IRRITATING GASES ARE PRODUCED WHEN HEATED Heat pipes and vessels containing this liquid.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, nausea, dizziness, or loss of consciousness. May cause death. LIQUID Irritating to skin and eyes. Harmful if swallowed. Harmful if absorbed through skin. If swallowed, do not induce vomiting. Give water to drink. If inhaled, remove to fresh air. Give oxygen if breathing is difficult. If on skin, wash with soap and water. If in eyes, wash with water for 15 minutes. If on clothing, remove and wash separately.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not a serious hazard to aquatic life. Not a serious hazard to humans.
1 RESPONSE TO DISCHARGE See Response Methods Manual, CG 445-41. Issue warning: air contaminant. Restrict access. No fire or fumes.	2. LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Trichloromethane 3.2 Coast Guard Compatibility Classification: Hazardous compound 3.3 Chemical Formula: CHCl_3 3.4 IMCO United Nations Numerical Designation: 4000000	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pleasant, sweet, etheric
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical protective clothing and shoes. Use self-contained breathing apparatus. Above 25, suitable only for a limited use. 5.2 Symptoms Following Exposure: Headache, nausea, dizziness, loss of consciousness. 5.3 Treatment for Exposure: INHALATION: If inhaled, remove to fresh air. Give oxygen if breathing is difficult. If on skin, wash with soap and water. If in eyes, wash with water for 15 minutes. If swallowed, do not induce vomiting. Give water to drink. If on clothing, remove and wash separately. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm for 10-hour work day. 5.5 Short-Term Inhalation Limits: 50 ppm for 10 min. 5.6 Toxicity by Ingestion: Grade 2.1. Do not ingest. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes irritation to eyes, nose, throat, and skin. High concentrations are dangerous. The odor is unpleasant. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If on skin, wash with soap and water. If in eyes, wash with water for 15 minutes. If on clothing, remove and wash separately. 5.10 Odor Threshold: 10 ppm.	

6 FIRE HAZARDS

- 6.1 Flash Point: Not flammable
 6.2 Flammable Limits in Air: Not flammable
 6.3 Fire Extinguishing Agents: Not pertinent
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
 6.5 Special Hazards of Combustion Products: Irritating and irritating gases are produced when heated.
 6.6 Behavior in Fire: Decomposes producing toxic gas.
 6.7 Ignition Temperature: Not flammable
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: Not flammable

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
 8.2 Waterway Toxicity: Irritating to aquatic life
 8.3 Biological Oxygen Demand (BOD): None
 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

- West Chemical Corp.
 Specialty Chemical Division
 Woodbridge, N.J. 07095
 Dow Chemical Co.
 Midland, Mich. 48660
 Stauffer Chemical Co.
 Industrial Chemical Division
 Louisville, Ky. 40203

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
 7.2 Reactivity with Common Materials: No reaction
 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
 7.5 Polymerization: Not pertinent
 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Technical USP
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: Not required
 10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Manual, CG 445-2
 A X

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 119.39
 13.3 Boiling Point at 1 atm: 61.2°C (146.2°F)
 13.4 Freezing Point: -63.5°C (-80.3°F)
 13.5 Critical Temperature: 113.5°C (236.3°F)
 13.6 Critical Pressure: 11.9 MPa (172.5 atm)
 13.7 Specific Gravity: 1.482 (20°C/4°C)
 13.8 Liquid Surface Tension: 42.5 dyne/cm (20°C)
 13.9 Liquid-Water Interfacial Tension: 12.5 dyne/cm (20°C)
 13.10 Vapor (Gas) Specific Gravity: 4
 13.11 Ratio of Specific Heats of Vapor (Gas): 1.134
 13.12 Latent Heat of Vaporization: 196.7 kJ/mol (47.2 kcal/mol)
 13.13 Heat of Combustion: Not pertinent
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: ORM-A
 12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Fire | |
| Health | |
| Vapor Irritant | 2 |
| Liquid or Solid Irritant | 1 |
| Poisons | 2 |
| Water Pollution | |
| Human Toxicity | 4 |
| Aquatic Toxicity | 2 |
| Aesthetic Effect | 2 |
| Reactivity | |
| Other Chemicals | 1 |
| Water | 0 |
| Self Reaction | 0 |
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 0 |
| Reactivity (Yellow) | 0 |

NOTES

REVISED 1978

CHD CHLOROHYDRINS (CRUDE)																													
Common Synonyms Crude epichlorohydrin	Watery liquid Colorless to yellow Garlic odor Sinks and mixes with water. Freebase vapor is produced.																												
 Fire	Combustible Containers may explode in fire. Poisonous gases are produced in fire. (Data not available)																												
 Exposure	VAPOR Poisonous if inhaled. Irritating to eyes, nose and throat. (Data not available)																												
 Water Pollution	Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes. (Data not available)																												
1 RESPONSE TO DISCHARGE See Response Methods Manual, Section 1, 1.1.1.1.1 Spill washing: water contamination. Restrictions: Driven and flush. 2 LABEL POISON																													
3 CHEMICAL DESIGNATIONS 31 Synonym: Crude epichlorohydrin 32 Coast Guard Compatibility Classification: Special class 33 Chemical Formula: <chem>CC(Cl)CO</chem> 34 IMCO United Nations Numerical Designation: 1.1, 2021	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Yellow to colorless 43 Odor: Pungent to strong, irritating																												
5 HEALTH HAZARDS 51 Personal Protective Equipment: Organic vapor mask with high protection efficiency protection factors. 52 Symptoms Following Exposure: May cause central nervous system depression. Vapor is irritating to eyes, nose and throat. Headache, nausea, vomiting, stupor, convulsions and death may result. 53 Treatment for Exposure: INHALATION: Remove to fresh air, keep warm and quiet. Get medical attention as soon as breathing stops. Start artificial respiration. INGESTION: Induce vomiting and drink plenty of water. Do NOT induce vomiting if unconscious. Notify attending physician. EYES: Wash with water for 15 minutes. Get medical attention. Remove contact lenses if wearing and wash before reuse. 54 Toxicity by Inhalation (Threshold Limit Value): ppm 55 Short-Term Inhalation Limit: ppm (10 min) 56 Toxicity by Ingestion: Grade 4, No treatment 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation with that persists at low and high concentrations. Unpleasant. Threshold temperature: 59 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause staining and reddening of the skin. 60 Odor Threshold: 1 ppm																													
6 FIRE HAZARDS 61 Flash Point: 21°C (70°F) (CLC) 62 Flammable Limits in Air: 3-21% 63 Fire Extinguishing Agents: All other than dry chemical. Carbon dioxide water spray. 64 Fire Extinguishing Agents Not to be Used: None 65 Specific Hazards of Combustion Products: None. Inhalation vapors are produced when heated. 66 Behavior in Fire: Containers may explode in case of fire. 67 Ignition Temperature: 340°C 68 Electrical Hazard: Data not available 69 Burning Rate: 10 mm/min																													
7 CHEMICAL REACTIVITY 71 Reactivity with Water: Moderate 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Bases: Not pertinent 75 Polymerization: Can polymerize in presence of strong acids and bases, particularly aluminum 76 Inhibitor of Polymerization: None																													
8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None																													
9. SELECTED MANUFACTURERS Dow Chemical Co. Midland, Mich. 48667 Shell Chemical Co. Indus. & Chem. Div., P.O. Box 1100 Houston, Texas 77201 Union Carbide Corp. Chemical and Plastics Division 270 Park Ave. New York, N.Y. 10017																													
10 SHIPPING INFORMATION 101 Grades or Purities: Mixture of isomers 102 Storage Temperature: Ambient 103 Inert Atmosphere: Not recommended 104 Labeling: Poisonous liquid																													
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, Section 1, 1.1.1.1.1 A1111																													
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Poison Class B 122 NFPA Hazard Rating for Bulk Water Transportation: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td>3</td> </tr> <tr> <td>Vapor Irritant</td> <td>3</td> </tr> <tr> <td>Eye Irritant</td> <td>3</td> </tr> <tr> <td>Poisons</td> <td>4</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>3</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Acute Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>3</td> </tr> <tr> <td>Ward</td> <td></td> </tr> <tr> <td>Self Reaction</td> <td>2</td> </tr> </tbody> </table>		Category	Rating	Fire	1	Health	3	Vapor Irritant	3	Eye Irritant	3	Poisons	4	Water Pollution		Human Toxicity	3	Aquatic Toxicity	3	Acute Effect	2	Reactivity		Other Chemicals	3	Ward		Self Reaction	2
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Acute Effect	2																												
Reactivity																													
Other Chemicals	3																												
Ward																													
Self Reaction	2																												
13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: Not pertinent 133 Boiling Point at 1 atm: Not pertinent 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.18 (20°C liquid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: (cal/g) 142 Btu/lb = 78.8 cal/g = 3.30 x 10 ³ J/kg 1313 Heat of Combustion: (cal/g) = 10,000 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent																													
123 NFPA Hazard Classifications: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard-Blue</td> <td>3</td> </tr> <tr> <td>Flammability-Red</td> <td>3</td> </tr> <tr> <td>Reactivity-Yellow</td> <td>2</td> </tr> </tbody> </table>		Category	Classification	Health Hazard-Blue	3	Flammability-Red	3	Reactivity-Yellow	2																				
Category	Classification																												
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Flammability-Red	3																												
Reactivity-Yellow	2																												

CME

CHLOROMETHYL METHYL ETHER

Common Synonyms Monochloromethyl ether Methyl chloromethyl ether A-1200	Liquid Colorless Irritating odor May float or sink in water. Poisonous. Flammable vapor is produced.
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. LIQUID Will burn skin and eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life unknown. Fouling to shoreline. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 448-4. Issue warning: poison, high. Contaminants: air contaminants, corrosive. Restrict access. Evacuate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Monochloromethyl ether, Methyl chloromethyl ether, and others. 3.2 Consumer Compatibility Classification: Not applicable. 3.3 Chemical Formula: CH_3OCH_2Cl 3.4 HSO/United Nations Numerical Designation: 1.1 (2.4)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Irritating.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles, other proper protective clothing. 5.2 Symptoms Following Exposure: Inhalation causes sore throat, fever, chills, difficulty in breathing. Contact of liquid with eyes causes severe burns and redness; vapor is a powerful tear gas. Skin contact causes severe burns and necrosis. Ingestion causes severe burns of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: Remove from exposure, support respiration, call physician. EYES: Wash with copious quantities of water for at least 15 min., call physician. SKIN: Wash with large amounts of water. INGESTION: Do NOT induce vomiting; give large amounts of water, call a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Grade 2, oral LD_{50} = 427 mg/kg (rat). 5.7 Late Toxicity: Considered to be long cancer producing. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant. May cause pain and second degree burns after a few minutes contact. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 91°F (33°C). 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Irritating and toxic hydrogen chloride and phosgene gases may be formed. 6.6 Behavior in Fire: If burned material may form powerful tear gas. When wet also forms irritating formaldehyde gas. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 10 cm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts to evolve formaldehyde and hydrogen chloride. The reaction is not violent. 7.2 Reactivity with Common Materials: Will react with surface moisture to evolve hydrogen chloride which is corrosive to metal. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flood with water. Rinse with sodium bicarbonate or lime solution. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Dow Chemical Co. Midland, Mich. 48640 Ashland Chemical Co. 940 West St. Paul Ave. Milwaukee, Wis. 53233 Eastman Organic Chemicals Inc. Rochester, N.Y. 14606																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-2) A01UAWAY	10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure relief.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td> Vapor Irritant</td> <td>1</td> </tr> <tr> <td> Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td> Poison</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td> Human Toxicity</td> <td>2</td> </tr> <tr> <td> Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td> Acute Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td> Other Chemicals</td> <td>1</td> </tr> <tr> <td> Water</td> <td>1</td> </tr> <tr> <td> Self Reaction</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed.	Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poison	1	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Acute Effect	2	Reactivity		Other Chemicals	1	Water	1	Self Reaction	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 80.5. 13.3 Boiling Point at 1 atm: 120°F = 49°C = 323°K. 13.4 Freezing Point: -124°F = -103.3°C = 169°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.07 at 25°C (liquid). 13.8 Liquid Surface Tension: 28 dyne/cm = 0.028 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 2.5. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1195. 13.12 Latent Heat of Vaporization: 124 Btu/lb = 55 cal/g = 550 J/g. 13.13 Heat of Combustion: 124 Btu/lb = 55 cal/g = 550 J/g. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	1																												
Health																													
Vapor Irritant	1																												
Liquid or Solid Irritant	1																												
Poison	1																												
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Other Chemicals	1																												
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Self Reaction	1																												
NOTES (continued on page 7 and 8)																													

CPN

p-CHLOROPHENOL

Common Synonyms 4-Chlorophenol	Solid	White to straw	Medicinal odor
Sinks in water			
Avoid contact with solid and dust. Keep in original container. Wear rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating gases may be produced when heated. Wear goggles and suit contained on breathing apparatus. Extinguish with water, dry chemicals, foam or carbon dioxide.		
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause headache or dizziness. If in eyes: Hold eyelids open and flush with plenty of water. If breathing has stopped: Give artificial respiration. If breathing is difficult: Give oxygen. SOLID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected area with plenty of water. If INHALED: Hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS: Have victim drink water or milk. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: Do not induce vomiting. DO NOT INDUCE VOMITING.		
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-1) Issue warning: water contaminant. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 4-Chlorophenol 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: 1,4-Cl ₂ C ₆ H ₄ O 3.4 IMCO/United Nations Numerical Designation: 6.1/2020		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Colorless to straw 4.3 Odor: Strong medicinal	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, face shield, boots and apron, respiratory protection. 5.2 Symptoms Following Exposure: Inhalation causes headache, dizziness, weak pulse. Ingestion causes irritation of mouth and stomach, headache, dizziness, weak pulse. Contact with eyes causes severe irritation and burning. Contact with skin causes irritation and burn. If absorbed causes same symptoms as inhalation. 5.3 Treatment for Exposure: INHALATION: move to fresh air, get medical attention if any symptoms develop. INGESTION: do not induce vomiting unless advised by a physician, give large amounts of milk, egg whites, or water and get medical help immediately, no specific antidote known. EYES: immediately flush with plenty of water for at least 30 min. SKIN: flush with safety shower while removing all contaminated clothing, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3: oral LD ₅₀ = 500 mg/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: 30 ppm.			

6. FIRE HAZARDS 6.1 Flash Point: 250°F C C 6.2 Flammable Limits in Air: Not pertinent (combustible solid) 6.3 Fire Extinguishing Agents: Water foam dry chemical carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Toxic and irritating hydrogen chloride and chlorine gases may form in fires 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.7 ppm/96 hr/crab/lethal range/sea water 0.4 ppm/96 hr/crab/safe range/sea water 14 ppm/24 hr/minnow/11 m/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. The Dow Chemical Co 2030 Dow Center Midland, Mich 48640 2. Progil Inc 509 Madison Avenue New York, N Y 10022 3. Monsanto Company 800 North Lindbergh Blvd St Louis Mo 63166									
		10. SHIPPING INFORMATION 10.1 Grades or Purity: Pure, 99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open									
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) H 55		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 128.6 13.3 Boiling Point at 1 atm: 428°F = 220°C = 493°K 13.4 Freezing Point: 109°F = 43°C = 316°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.31 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: (est.) 160 Btu/lb = 89 cal/g = 1.7×10^5 J/kg 13.13 Heat of Combustion: -9,330 Btu/lb = 5,180 cal/g = 217×10^3 J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>3</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	1	Reactivity (Yellow)	0	<i>(Continued on pages 5 and 6)</i> NOTES	
Category	Classification										
Health Hazard (Blue)	3										
Flammability (Red)	1										
Reactivity (Yellow)	0										

CPL

CHLOROPICRIN, LIQUID

Common Synonyms Trichloronitromethane Nitrochloroform Piclume Nitro trichloromethane		Only liquid	Colorless	Extremely irritating odor
		Sinks in water. Poisonous vapor is produced.		
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear goggles with continued breathing apparatus and rubber overclothing (including gloves) if discharge is possible. Stop discharge if possible. Isolate and remove discharging material. Notify local health and pollution control agencies.				
Fire		Not flammable. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Wear chemical protective suit with self-contained breathing apparatus if exposed or forced with water.		
		CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Exposure				
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Issue warning: poison, water contaminant, air contaminant. Restrict access to area. Should be removed. Chemical and physical treatment.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 31 Synonyms: Trichloronitromethane Nitrochloroform Piclume Nitrotrichloromethane 32 Coast Guard Competibility Classification: Not applicable. 33 Chemical Formula: CCl ₃ NO ₂ 34 IMCO/United Nations Numerical Designation: 6.1/1580		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Intensely irritating lachrymator, intense and penetrating odor which causes a pronounced secretion of tears.		
5. HEALTH HAZARDS 51 Personal Protective Equipment: Organic type canister mask, goggles or face shield, rubber gloves, protective clothing. 52 Symptoms Following Exposure: Inhalation causes nausea, eye watering, stinging, bronchitis and pulmonary edema. Vapor is a powerful tear gas. Liquid irritates and burns skin and causes severe burns of eyes. Ingestion causes severe irritation of mouth and stomach. 53 Treatment for Exposure: Get medical attention following all exposures to this compound. INHALATION: remove from exposure, support respiration. EYES: flush with copious quantities of water for at least 15 min. SKIN: wash with water for 15 min. INGESTION: do NOT induce vomiting, give large amounts of water. 54 Toxicity by Inhalation (Threshold Limit Value): 0.1 ppm 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Grade 3, oral LD ₅₀ = 250 mg/kg (rats) 57 Late Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritations of eyes and throat and can cause eye or lung injury. They cannot be tolerated even at low concentrations. 59 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes. 60 Odor Threshold: 1.1 ppm.				

6 FIRE HAZARDS

61 **Flash Point:** Not flammable
62 **Flammable Limits in Air:** Not flammable
63 **Fire Extinguishing Agents:** Cool exposed containers with water
64 **Fire Extinguishing Agents Not to be Used:** Not pertinent
65 **Special Hazards of Combustion Products:** Not pertinent
66 **Behavior in Fire:** Compound forms a powerful tear gas when heated. Heated material may detonate under fire conditions
67 **Ignition Temperature:** Not pertinent
68 **Electrical Hazard:** Not pertinent
69 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

71 **Reactivity with Water:** No reaction
72 **Reactivity with Common Materials:** No reaction
73 **Stability During Transport:** Stable
74 **Neutralizing Agents for Acids and Caustics:** Not pertinent
75 **Polymerization:** Not pertinent
76 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

81 **Aquatic Toxicity:** Data not available
82 **Waterfowl Toxicity:** Data not available
83 **Biological Oxygen Demand (BOD):** Data not available
84 **Food Chain Concentration Potential:** Data not available

9. SELECTED MANUFACTURERS

1 Great Lakes Chemical Corporation
P.O. Box 2200
West Lafayette, Ind 47996
2 Dow Chemical Co
Midland, Mich 48640
3 Sobin Chemicals, Inc
Sobin Park
Boston, Mass 02210

10. SHIPPING INFORMATION

101 **Grade or Purity:** 99%
102 **Storage Temperature:** Ambient
103 **Inert Atmosphere:** No requirement
104 **Venting:** Pressure/vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 448-3)

A X

12 HAZARD CLASSIFICATIONS

121 **Code of Federal Regulations:** Poisonous, Class B
122 **HAZARD Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	4
Reactivities	
Other Chemicals	1
Water	0
Self Reaction	0

123 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	3

13. PHYSICAL AND CHEMICAL PROPERTIES

131 **Physical State at 15°C and 1 atm:** Liquid
132 **Molecular Weight:** 164.4
133 **Boiling Point at 1 atm:** 234°F = 112°C = 385°K
134 **Freezing Point:** -83°F = -64°C = 209°K
135 **Critical Temperature:** Not pertinent
136 **Critical Pressure:** Not pertinent
137 **Specific Gravity:** 1.64 at 25°C (liquid)
138 **Liquid Surface Tension:** 32.3 dynes/cm = 0.0323 N/m at 20°C
139 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C
1310 **Vapor (Gas) Specific Gravity:** 5.7
1311 **Ratio of Specific Heats of Vapor (Gas):** 1.0991
1312 **Latent Heat of Vaporization:** 10³ Btu/lb = 57.3 cal/g = 2.4 x 10⁵ J/kg
1313 **Heat of Combustion:** Not pertinent
1314 **Heat of Decomposition:** Not pertinent
1315 **Heat of Solution:** Not pertinent
1316 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

CSA

CHLOROSULFONIC ACID

Common Synonyms Chlorosulfonic acid	Liquid Colorless to light yellow Sharp, choking odor
AVOID CONTACT WITH SOLID AND VAPOR. Keep splash away from face and eyes. Use proper ventilation and absorbent clothing. Do not breathe vapors. Small leaks: Plug with inert material or use proper ventilation.	
Fire	May cause fire on contact with combustibles. Flammable, explosive gases may be formed on contact with metals and moisture. DO NOT USE WATER. Use dry chemical or carbon dioxide. Wear goggles, self-contained breathing apparatus, and protective clothing.
Exposure	CALL FOR MEDICAL AID. VAPOR: Irritating to eyes, nose, and throat. Harmful if inhaled. Move to fresh air. If eye, throat, or respiratory tract are affected, respiration may be difficult. Seek medical attention. LIQUID: Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, get person to SNIFFER. Do not induce vomiting. DO NOT INDUCE VOMITING.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Do not allow effluents to enter water bodies. Do not permit discharge into water bodies.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning of air contaminant. Restrict access. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Chlorosulfonic acid 3.2 Coast Guard Compatibility Classification: Inorganic acids 3.3 Chemical Formula: ClSO_3H 3.4 IMCO/United Nations Numerical Designation: 1501/15	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Sharp acid penetrating pungent
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Acid proof goggles or a rubber hood; long rubber gloves; rubber shoes; long rubber apron; shirt and trousers of wool or acrylic fiber and a flu with a trim. For emergency use involving considerable exposure, a complete rubber suit with hood, gloves and boots of rubber should be used. In case of fire use self contained breathing apparatus. 5.2 Symptoms Following Exposure: INHALATION: Vapor extremely irritating to lungs and mucous membranes. Vapor has such a sharp and penetrating odor that inhalation of severely toxic quantities is unlikely unless it is impossible to escape the fumes. CONTACT WITH EYES OR SKIN: liquid acid will severely burn body tissue. 5.3 Treatment for Exposure: Call a physician in all cases. INHALATION: remove victim to fresh air if he is not breathing; apply artificial respiration; give oxygen if breathing is difficult; do NOT induce vomiting. SKIN: flush with plenty of water for at least 15 min. while removing contaminated clothing and shoes. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm 5.5 Short-Term Inhalation Limits: 5 ppm for 5 min.; 30 ppm for 10 min.; 30 ppm for 60 min. 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Severe eye and throat irritant. Can cause eye or lung injury and cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact. Very injurious to the eyes. 5.10 Odor Threshold: 1.5 ppm	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Water. 6.5 Special Hazards of Combustion Products: Decomposes into irritating and toxic gases. 6.6 Behavior in Fire: Although nonflammable it may ignite other combustibles. Contact with water AND metal produces explosive hydrogen gas. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not flammable.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 282 ppm/96 hr. mosquito fish; 11 µm. fresh water; 100-300 ppm/48 hr. shrimp; 1 CC. salt water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently with water forming hydrochloric acid (vapor) and sulfuric acid. 7.2 Reactivity with Common Materials: Hydrogen is highly flammable and explosive gas is generated by the action of the acid on most metals. May cause reaction by contact with combustible materials. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Although the acid reacts violently with water, flooding from a distance must be carried out before neutralizing with lime water or sodium bicarbonate solution. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Cities Service Co., Inc. Industrial Chemicals Division 60 Wall St. New York, N.Y. 10005 2. I. I. du Pont de Nemours & Co., Inc. Industrial & Biochemicals Dept. Wilmington, D.E. 19898 3. Monsanto Co. Monsanto Industrial Chemicals Co. 500 North Lindbergh Blvd. St. Louis, Mo. 63166																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) VO	10. SHIPPING INFORMATION 10.1 Grades or Purities: Technical. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure vac. um.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive material. 12.2 HAS Hazard Rating for Bulk Water Transportation: <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>0</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>4</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td> Poisons</td><td>4</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>2</td></tr> <tr> <td> Aquatic Toxicity</td><td>3</td></tr> <tr> <td> Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>4</td></tr> <tr> <td> Water</td><td>4</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	0	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	4	Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	4	Water	4	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 116.53. 13.3 Boiling Point at 1 atm: 112°F = 45°C = 423°K. 13.4 Freezing Point: -112°F = -80°C = 193°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.75 at 20°C (liquid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization* (cal): 198 Btu/lb = 110 cal/g = 4.6×10^3 J/kg. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	0																												
Health																													
Vapor Irritant	4																												
Liquid or Solid Irritant	4																												
Poisons	4																												
Water Pollution																													
Human Toxicity	2																												
Aquatic Toxicity	3																												
Aesthetic Effect	2																												
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Other Chemicals	4																												
Water	4																												
Self Reaction	0																												
12.3 NFPA Hazard Classifications: <table> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	2	NOTES Continued on page 2 and 3																				
Category	Classification																												
Health Hazard (Blue)	3																												
Flammability (Red)	0																												
Reactivity (Yellow)	2																												

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4-CHLORO-o-TOLUIDINE

Common Synonyms: 2-Amino-5-chlorotoluene 5-Chloro-2-aminotoluene 4-Chloro-2-methylaniline Fast Red TR base Red TR base		Solid Gray to white Weak fishy odor
AVOID CONTACT WITH SKIN AND EYES. KEEP HOLD AWAY Wear goggles to protect eyes from splashes and fumes. Wear clothing to protect skin from splashes. Call fire department. Wash exposed skin with soap and water. Flush and irrigate with large amounts of water. Notify local health and police authorities.		
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with water. Do not use foam or carbon dioxide. Get exposed area wet with water.	
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If inhaled, get fresh air and give oxygen. SOLID POISONOUS IF SWALLOWED Remove contaminated clothing and shoes. If inhaled, get fresh air and give oxygen. If in EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water. If SWALLOWED and victim is UNCONSCIOUS, DO NOT GIVE. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CON- VULSIONS, do not check expirations with	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and police authorities. Notify police and health water works.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning: poison water contaminant Restrict access Should be removed Chemical and physical treatment		2. LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: 2-Amino-5-chlorotoluene 5-Chloro-2-aminotoluene 4-Chloro-2-methylaniline Fast Red TR base Red TR base 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: $2\text{C}_7\text{H}_4\text{ClClNH}_2$ 34 IMCO/United Nations Numerical Designation: 611579		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: Grayish white 43 Odor: Weak fishy
5. HEALTH HAZARDS 51 Personal Protective Equipment: Dust respirator, goggles, rubber gloves, protective clothing 52 Symptoms Following Exposure: Inhalation, ingestion, or skin contact causes bluish tint in fingernails, lips and ears. Headache, drowsiness, and nausea also occur. Contact with eyes causes irritation. 53 Treatment for Exposure: INHALATION: remove victim to fresh air, give oxygen if needed, get medical attention. EYES: flush with water for at least 15 min. SKIN: wash immediately with soap and water. INGESTION: induce vomiting, get medical attention. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade 3, oral LD_{50} = 464 mg/kg (rat) 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: Data not available		

6 FIRE HAZARDS 61 Flash Point: Combustible solid 62 Flammable Limits in Air: Not pertinent 63 Fire Extinguishing Agents: Water, dry chemical 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Toxic oxides of nitrogen and hydrochloric acid fumes may form 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Data not available 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not pertinent	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterway Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Bases: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Pfister Chemical Inc Linden Avenue Ridgefield, N.J. 07657 2 E. I. duPont de Nemours & Co Dyes and Chemicals Division Wilmington Del 19898 3 Blackman Uhler Chemical Co P.O. Box 5627 Spartanburg, S.C. 29301
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444, 2) II	10. SHIPPING INFORMATION 101 Grades or Purity: 99% 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Pressure-vacuum
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Poisonous, Class B 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NIHA Hazard Classification: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 141.6 133 Boiling Point at 1 atm: 466°F = 241°C = 514°K 134 Freezing Point: 77°F = 25°C = 298°K 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: (est.) > 1.1 at 20°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent

CMA

CHROMIC ANHYDRIDE

Common Synonyms Chromic oxide Chromium trioxide Chromic acid	Solid flakes or powder Dark red Odorless Sinks and mixes with water
Avoid contact with solid and dust. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overalls (including gloves). Stay upwind and use water spray to knock down dust. Isolate and remove discolored material. Notify local health and pollution control agencies.	
Fire	Not flammable May cause fire on contact with combustibles Containers may explode when heated in a fire Extinguish with water Cool exposed containers with water
Exposure	CALL FOR MEDICAL AID SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Chromic acid Chromic oxide Chromium trioxide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CrO ₃ 3.4 IMCO United Nations Numerical Designation: 5.1/1463	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Dark red 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles and respirator (special chromic acid filters are available for respirators to prevent inhalation of dust or mist). 5.2 Symptoms Following Exposure: Very irritating to eyes and respiratory tract. Ingest on causes severe gastrointestinal symptoms. Contact with eyes or skin causes burns; prolonged contact produces dermatitis (chromic sores). 5.3 Treatment for Exposure: INGESTION: call a physician. DO NOT induce vomiting. SKIN OR EYES: Wash eyes thoroughly for at least 15 min. Flush contact skin areas with water; remove contaminated clothing and wash before reuse. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade III D ₅₀ to 500 mg/kg. 5.7 Late Toxicity: Lung cancer. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact; very injurious to the eyes. 5.10 Odor Threshold: Not pertinent.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Lim'ts in Air: Not flammable 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Containers may explode 6.7 Ignition Temperature: May ignite organic materials on contact 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.01 ppm/48 hr: daphnia 11 m 52 ppm/96 hr: goldfish died 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None								
9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Industrial Chemicals Division Morristown, N. J. 07960 2. Diamond Shamrock Corp. Soda Products Division Castle Hayne, N. C. 28429 3. Essex Chemical Corp. Chemicals Division Kearny, N. J. 07032									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May react with organic materials rapidly enough to generate sufficient heat to cause ignition. Prolonged contact, particularly on wood flours, may produce a fire hazard. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flood with water; rinse with sodium bicarbonate solution. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	10. SHIPPING INFORMATION 10.1 Grades or Purity: 4+ technical Flake 99.75% 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Data not available 10.4 Venting: Data not available								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3: SS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 100.01 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.70 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table border="1" data-bbox="949 1455 1201 1541"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>3</td> </tr> <tr> <td>Flammability (Red)</td> <td>0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>1</td> </tr> </tbody> </table>		Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	1
Category	Classification								
Health Hazard (Blue)	3								
Flammability (Red)	0								
Reactivity (Yellow)	1								
NOTES (Continued on pages 2 and 3)									

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CIT

CITRIC ACID

Common Synonyms beta Hydroxy-tricarboxylic acid 2-Hydroxy-1,2,3-propane-tricarboxylic acid beta Hydroxy-tricarballic acid	Solid White Odorless Sinks and mixes with water
Synonyms: 2-Hydroxy-1,2,3-propane-tricarboxylic acid 2-Hydroxy-1,2,3-propane-tricarballic acid 2-Hydroxy-1,2,3-propane-tricarboxylic acid 2-Hydroxy-1,2,3-propane-tricarballic acid 2-Hydroxy-1,2,3-propane-tricarboxylic acid 2-Hydroxy-1,2,3-propane-tricarballic acid	
Fire	Combustible Flammable (solid)
Exposure	ALL FORMS OF ACID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If swallowed will cause irritation of the mouth and throat SOLID Irritating to skin and eyes Harmful if swallowed If swallowed will cause irritation of the mouth and throat If inhaled will cause coughing or difficult breathing If in contact with skin will cause irritation
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Hydroxy-1,2,3-propane-tricarboxylic acid; beta Hydroxy-tricarballic acid; beta Hydroxy-tricarboxylic acid 3.2 Coast Guard Competibility Classification: Not listed 3.3 Chemical Formula: $\text{HOOC}(\text{CH}_2\text{CO}_2\text{H})_3$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. EYES: flush immediately with physiological saline or water; get medical care if irritation persists. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1 oral LD ₅₀ = 1.1 g/kg (rats) 5.7 Late Toxicity: Chronic effects in humans are unknown 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Odorless	

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammability Limit, in Air: 0.28-2.29 kg/m ³ (dust) 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: Melts and decomposes. The reaction is not hazardous. 6.7 Ignition Temperature: 1,850°F (powder) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 594 ppm/4 hr/goldfish; killed/fresh water; 166 ppm/48 hr/shore crab/11 m salt water 8.2 Waterford Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 40% 5 days; 60% 10-20 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Will corrode copper, zinc, aluminum and their alloys 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Pfizer Chemicals Division 2351 42nd St. New York, N.Y. 10017 2. Allied Chemical Corp. Specialty Chemicals Div. P.O. Box 1087R Morristown, N.J. 07960 3. Mallinckrodt Chemical Works 223 Westside Avenue P.O. Box 384 Jersey City, N.J. 07303
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NN	10. SHIPPING INFORMATION 10.1 Grades or Purity: USP Reagent, Monohydrate grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 192.1 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 30°F = 15°C = 426°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.64 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 4,006 Btu/lb = 7,226 cal/g = 93.0 J/g 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

CBA

COBALT ACETATE

Common Synonyms Cobalt acetate tetrahydrate Cobaltous acetate Cobaltous acetate		Solid Pink Vinegar like odor
Sinks and mixes with water		
Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus.	
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If swallowed, give plenty of water. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF EYES ARE IRRITATED, keep flushing with plenty of water. IF SWALLOWED, do not induce vomiting. Have plenty of water on hand. IF SWALLOWED, do not induce vomiting. Have plenty of water on hand. IF SWALLOWED, do not induce vomiting. Have plenty of water on hand.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify pollution control agency.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3) Issue warning - water contaminant. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cobalt (II) acetate, Cobalt acetate tetrahydrate, Cobaltous acetate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{Co}(\text{C}_2\text{H}_3\text{O}_2)_4 \cdot 4\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Pink 4.3 Odor: Slight acetic acid odor, vinegar like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator, rubber gloves, goggles or face shield, protective clothing 5.2 Symptoms Following Exposure: Inhalation causes shortness of breath and coughing; permanent disabilities may occur. Ingestion causes pain and vomiting. Contact with eyes causes irritation. Contact with skin may cause dermatitis. 5.3 Treatment for Exposure: INHALATION: move to fresh air; if breathing has stopped, begin artificial respiration. INGESTION: give large amounts of water; induce vomiting. EYES: flush with water for at least 15 min. SKIN: wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m (as cobalt) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 50-100 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic cobalt oxide fumes may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Bioconcentration of 200-1000 fold only under constant exposure. Not significant in spill conditions.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Mooney Chemicals, Inc. 2301 Scranton Road Cleveland, Ohio 44113 2. The Harshaw Chemical Co. 1945 E. 97th St. Cleveland, Ohio 44106 3. Mallinckrodt Chemical Works 223 Westside Avenue P.O. Box 384 Jersey City, N.J. 07303
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 NS		10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical Reagent 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 249.1 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 24.2°C = 75.6°F = 413°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.71 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES		

(continued on page 1 and 2)

CBC

COBALT CHLORIDE

Common Synonyms Cobaltous chloride hexahydrate Cobaltous chloride Cobaltous chloride dihydrate		Solid	Pink to red	Slight sharp odor
Sinks and mixes with water				
Not to be discharged if possible. Keep as pure as possible. Avoid contact with skin and clothing. If contact occurs, remove by large amount of water. Notify manufacturer and local health authorities.				
Fire		Not flammable		
Exposure		CAUTION MEDICAL USE DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in contact with skin, wash with large amount of water. If swallowed, give large amount of water. Notify manufacturer and local health authorities. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Notify manufacturer and local health authorities. POISONING If in contact with skin, wash with large amount of water. If swallowed, give large amount of water. Notify manufacturer and local health authorities. If SWALLOWED, DO NOT INDUCE VOMITING. ONLY HAVE EMERGENCY PERSONNEL ADVISED.		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify manufacturer and local health authorities.		
1. RESPONSE TO DISCHARGE (See Resource Methods Handbook, CG 446-4.) Issue warning: water contains name. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cobalt(II) chloride Cobaltous chloride Cobaltous chloride dihydrate Cobaltous chloride hexahydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: CoCl_2 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Pink to red 4.3 Odor: Very slight acid		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, side shield goggles, full face respirator, protective clothing. 5.2 Symptoms Following Exposure: Inhalation causes respiratory disease, shortness of breath, and coughing; permanent disability may occur. Ingestion causes pain, vomiting, and diarrhea. Contact causes irritation of eyes and may cause skin rash. 5.3 Treatment for Exposure: INHALATION: move victim to fresh air; if breathing has stopped, begin artificial respiration and call a doctor. INGESTION: give large amount of water; induce vomiting. EYES: flush with water at least 15 min.; consult physician if irritation persists. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m (as cobalt) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade III Dose 50-500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic cobalt oxide fumes may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 1000 ppm 30-120 hr goldfish killed (fresh (hard) water) 10 ppm 168 hr goldfish killed (fresh (soft) water) 200 ppm * mummichogs no effect (sea water) * Time period not specified 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None <i>(Continued on page 4.)</i>
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Mooney Chemicals, Inc. 2301 Scranton Rd. Cleveland, OH 44113 2. The Harshaw Chemical Co. 1945 East 97th St. Cleveland, Ohio 44106 3. Allied Chemical Corp. Specialty Chemicals Div. P. O. Box 1087 P. Morristown, N. J. 07960
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Anhydrous 100.1% May also be shipped as dihydrate 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3.) SS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 237.9 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 18 °F = 36 °C = 350 °K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.924 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 22 Btu/lb = 12 cal/g = 0.50 x 10³ J/kg 13.16 Heat of Polymerization: Not pertinent <i>(Continued on pages 4 and 5.)</i>
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
8. WATER POLLUTION (Cont'd.) 8.4 Food Chain Concentration Potential: Bioconcentration of 200-1000 fold only under constant exposure. Not significant in spill conditions.	

CON

COBALT NITRATE

Common Synonyms Cobaltous nitrate Cobalt(II) nitrate Cobaltous nitrate hexahydrate		Subl	Red	Odorless
		Sinks and mixes with water		
NO HAZARD LABEL REQUIRED BY CODE OF FEDERAL REGULATIONS				
Fire		Not flammable Will increase the intensity of a fire POISONOUS GASES MAY BE PRODUCED IN FIRE		
Exposure		DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters sewer intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cobalt(II) nitrate, Cobaltous nitrate, Cobaltous nitrate hexahydrate 3.2 Coast/Gastro Compatibility Classification: Not listed 3.3 Chemical Formula: $(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Red 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Bu. Mines approved respirator, rubber gloves, safety goggles, protective clothing 5.2 Symptoms Following Exposure: Inhalation causes shortness of breath and coughing; permanent disability may occur. Ingestion causes pain and vomiting. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air; if breathing has stopped, begin artificial respiration and call a doctor. INGESTION: give large amount of water, induce vomiting, call a doctor. EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1 LD₅₀ = 400 mg/kg (rabbits) 5.7 Late Toxicity: Causes malignant tumors in rabbits 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable
 6.2 **Flammable Limits in Air:** Not flammable
 6.3 **Fire Extinguishing Agents:** Not pertinent
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
 6.5 **Special Hazards of Combustible Products:**
 Toxic oxides of nitrogen may be produced
 6.6 **Behavior in Fire:** May increase the intensity of fire
 6.7 **Ignition Temperature:** Not pertinent
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:**
 Corrosive with wood and paper may cause fire
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:**
 10 ppm* stickleback test, 96 hr, time, fresh water
 10 ppm* 48 hr, stickleback test, survival time, fresh water
 10 ppm* 96 hr, stickleback test, survival time, fresh water
 *available
 8.2 **Waterfowl Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** None

(Continued on page 4)

9 SELECTED MANUFACTURERS

1. Mooney Chemicals, Inc.
 2401 Stanton Road
 Cleveland, Ohio 44113
 2. The Harshaw Chemical Co.
 1945 E. 97th St.
 Cleveland, Ohio 44106
 3. Allied Chemical Corp.
 Specialty Chemicals Div.
 P. O. Box 4067R
 Morristown, N. J. 07960

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Technical hexahydrate. May be shipped as anhydrous salt.
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard & Assessment Handbook, CG 446-3)

SS

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed
 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
 12.3 **MFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	0 1
Flammability (Red)	0 0
Reactivity (Yellow)	0 0

003 003

*First column refers to nonfire situation

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid
 13.2 **Molecular Weight:** 291.04
 13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
 13.4 **Freezing Point:** 13.1°C = 55°C = 32°F
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 1.54 at 20°C (solid)
 13.8 **Liquid Surface Tension:** Not pertinent
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 13.12 **Latent Heat of Vaporization:** Not pertinent
 13.13 **Heat of Combustion:** Not pertinent
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** 31 Btu/lb = 17 cal/g = 0.71 × 10³ J/kg
 13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

8. WATER POLLUTION (Cont'd)

8.4 **Food Chain Concentration Potential:**
 Bioconcentration of 200 - 1000 fold only under constant exposure. Not significant in spill condition.

CBS	COBALT SULFATE
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CBS	COBALT SULFATE
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Common Synonyms Cobaltous sulfate heptahydrate Cobalt ^{II} sulfate Bieberryte		Solid Sinks and mixes with water	Rose pink Odorless
Fire			
Not flammable POISONOUS GASES MAY BE PRODUCED IN FIRE			
Exposure			
DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting			
Water Pollution			
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods, Amendment CG 448-4) Issue warning: water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 31 Synonyms: Bieberryte, Cobalt(II) sulfate Cobaltous sulfate heptahydrate 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: $\text{CoSO}_4 \cdot 7\text{H}_2\text{O}$ 34 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: Rose pink 43 Odor: None	
HEALTH HAZARDS			
51 Personal Protective Equipment: By NIOSH-approved respirator, goggles, protective gloves 52 Symptoms Following Exposure: Inhalation causes shortness of breath and coughing; permanent disability may occur. Ingestion causes pain and vomiting. Contact with eyes or skin causes irritation. 53 Treatment for Exposure: INHALATION: move to fresh air; if breathing has stopped, begin artificial respiration and call a doctor. INGESTION: give large amount of water, induce vomiting, call a doctor. EYES: flush with water for at least 15 min.; consult a physician if irritation persists. SKIN: flush with water. 54 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ (as cobalt) 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade 3 LD ₅₀ 500 mg/kg 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: Data not available			

6 FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Toxic cobalt oxide fumes may form in fire 66 Behavior in Fire: 67 Ignition Temperature: Not pertinent 68 Electrical Hazards: Not pertinent 69 Jumping Rate: Not pertinent	8 WATER POLLUTION 81 Aquatic Toxicity: 10 ppm*** stickleback lethal fresh water *As cobalt **Time period not specified 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): None 84 Food Chain Concentration Potential: Bioconcentration of 200 - 1000 fold only under constant exposure. Not significant in spill conditions
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Mooney Chemicals, Inc. 2301 Scranton Road Cleveland, Ohio 44111 2 The Harshaw Chemical Co. 1945 E. 97th St. Cleveland, Ohio 44106 3 Mallinckrodt Chemical Works 223 Westside Ave. P.O. Box 384 Jersey City, N.J. 07303
	10 SHIPPING INFORMATION 101 Grades or Purity: Technical reagent, may also be shipped as a monohydrate or hexahydrate 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 445-3 NN	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 266 133 Boiling Point at 1 atm: Not pertinent (decomposes) 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.845 at 20°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: 23 Btu/lb with 1 g water at 10°C 1316 Heat of Polymerization: Not pertinent

Continued on page 7 and 8

NOTES

CLD

COLLODION

Common Synonyms Cellulose nitrate solution Nitrocellulose solution Pyroxylin solution Box tree gum Nitrocellulose gum		Thick liquid Flash on water. Flammable, irritating vapor is produced. Boiling point is around 949°F.	Colorless Ether-like odor
See the entries under each of the departmental Safety, Health, and Environment Division and the corresponding National Health and Pollution Agency entries.			
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extensive hydrolysis may occur in the presence of water. Containers may rupture with heat.		
Exposure	LIQUID Not harmful VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, difficult breathing, or loss of consciousness. May cause respiratory irritation. Extensive hydrolysis may occur in the presence of water.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. Not flammable in water.		
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 445.4 Toxic warning: Not flammable. Response: Mechanical containment. Should be avoided. Chemical and physical treatment.		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cellulose nitrate solution Nitrocellulose solution Pyroxylin solution Box tree gum Nitrocellulose gum 3.2 Const Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: Not pertinent. 3.4 IMCO/United Nations Numerical Designation: 1.1, 2.1, 3.1, 4.1, 5.1, 6.1, 7.1, 8.1, 9.1, 10.1, 11.1, 12.1, 13.1, 14.1, 15.1, 16.1, 17.1, 18.1, 19.1, 20.1, 21.1, 22.1, 23.1, 24.1, 25.1, 26.1, 27.1, 28.1, 29.1, 30.1, 31.1, 32.1, 33.1, 34.1, 35.1, 36.1, 37.1, 38.1, 39.1, 40.1, 41.1, 42.1, 43.1, 44.1, 45.1, 46.1, 47.1, 48.1, 49.1, 50.1, 51.1, 52.1, 53.1, 54.1, 55.1, 56.1, 57.1, 58.1, 59.1, 60.1, 61.1, 62.1, 63.1, 64.1, 65.1, 66.1, 67.1, 68.1, 69.1, 70.1, 71.1, 72.1, 73.1, 74.1, 75.1, 76.1, 77.1, 78.1, 79.1, 80.1, 81.1, 82.1, 83.1, 84.1, 85.1, 86.1, 87.1, 88.1, 89.1, 90.1, 91.1, 92.1, 93.1, 94.1, 95.1, 96.1, 97.1, 98.1, 99.1, 100.1, 101.1, 102.1, 103.1, 104.1, 105.1, 106.1, 107.1, 108.1, 109.1, 110.1, 111.1, 112.1, 113.1, 114.1, 115.1, 116.1, 117.1, 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547.1, 548.1, 549.1, 550.1, 551.1, 552.1, 553.1, 554.1, 555.1, 556.1, 557.1, 558.1, 559.1, 560.1, 561.1, 562.1, 563.1, 564.1, 565.1, 566.1, 567.1, 568.1, 569.1, 570.1, 571.1, 572.1, 573.1, 574.1, 575.1, 576.1, 577.1, 578.1, 579.1, 580.1, 581.1, 582.1, 583.1, 584.1, 585.1, 586.1, 587.1, 588.1, 589.1, 590.1, 591.1, 592.1, 593.1, 594.1, 595.1, 596.1, 597.1, 598.1, 599.1, 600.1, 601.1, 602.1, 603.1, 604.1, 605.1, 606.1, 607.1, 608.1, 609.1, 610.1, 611.1, 612.1, 613.1, 614.1, 615.1, 616.1, 617.1, 618.1, 619.1, 620.1, 621.1, 622.1, 623.1, 624.1, 625.1, 626.1, 627.1, 628.1, 629.1, 630.1, 631.1, 632.1, 633.1, 634.1, 635.1, 636.1, 637.1, 638.1, 639.1, 640.1, 641.1, 642.1, 643.1, 644.1, 645.1, 646.1, 647.1, 648.1, 649.1, 650.1, 651.1, 652.1, 653.1, 654.1, 655.1, 656.1, 657.1, 658.1, 659.1, 660.1, 661.1, 662.1, 663.1, 664.1, 665.1, 666.1, 667.1, 668.1, 669.1, 670.1, 671.1, 672.1, 673.1, 674.1, 675.1, 676.1, 677.1, 678.1, 679.1, 680.1, 681.1, 682.1, 683.1, 684.1, 685.1, 686.1, 687.1, 688.1, 689.1, 690.1, 691.1, 692.1, 693.1, 694.1, 695.1, 696.1, 697.1, 698.1, 699.1, 700.1, 701.1, 702.1, 703.1, 704.1, 705.1, 706.1, 707.1, 708.1, 709.1, 710.1, 711.1, 712.1, 713.1, 714.1, 715.1, 716.1, 717.1, 718.1, 719.1, 720.1, 721.1, 722.1, 723.1, 724.1, 725.1, 726.1, 727.1, 728.1, 729.1, 730.1, 731.1, 732.1, 733.1, 734.1, 735.1, 736.1, 737.1, 738.1, 739.1, 740.1, 741.1, 742.1, 743.1, 744.1, 745.1, 746.1, 747.1, 748.1, 749.1, 750.1, 751.1, 752.1, 753.1, 754.1, 755.1, 756.1, 757.1, 758.1, 759.1, 760.1, 761.1, 762.1, 763.1, 764.1, 765.1, 766.1, 767.1, 768.1, 769.1, 770.1, 771.1, 772.1, 773.1, 774.1, 775.1, 776.1, 777.1, 778.1, 779.1, 780.1, 781.1, 782.1, 783.1, 784.1, 785.1, 786.1, 787.1, 788.1, 789.1, 790.1, 791.1, 792.1, 793.1, 794.1, 795.1, 796.1, 797.1, 798.1, 799.1, 800.1, 801.1, 802.1, 803.1, 804.1, 805.1, 806.1, 807.1, 808.1, 809.1, 810.1, 811.1, 812.1, 813.1, 814.1, 815.1, 816.1, 817.1, 818.1, 819.1, 820.1, 821.1, 822.1, 823.1, 824.1, 825.1, 826.1, 827.1, 828.1, 829.1, 830.1, 831.1, 832.1, 833.1, 834.1, 835.1, 836.1, 837.1, 838.1, 839.1, 840.1, 841.1, 842.1, 843.1, 844.1, 845.1, 846.1, 847.1, 848.1, 849.1, 850.1, 851.1, 852.1, 853.1, 854.1, 855.1, 856.1, 857.1, 858.1, 859.1, 860.1, 861.1, 862.1, 863.1, 864.1, 865.1, 866.1, 867.1, 868.1, 869.1, 870.1, 871.1, 872.1, 873.1, 874.1, 875.1, 876.1, 877.1, 878.1, 879.1, 880.1, 881.1, 882.1, 883.1, 884.1, 885.1, 886.1, 887.1, 888.1, 889.1, 890.1, 891.1, 892.1, 893.1, 894.1, 895.1, 896.1, 897.1, 898.1, 899.1, 900.1, 901.1, 902.1, 903.1, 904.1, 905.1, 906.1, 907.1, 908.1, 909.1, 910.1, 911.1, 912.1, 913.1, 914.1, 915.1, 916.1, 917.1, 918.1, 919.1, 920.1, 921.1, 922.1, 923.1, 924.1, 925.1, 926.1, 927.1, 928.1, 929.1, 930.1, 931.1, 932.1, 933.1, 934.1, 935.1, 936.1, 937.1, 938.1, 939.1, 940.1, 941.1, 942.1, 943.1, 944.1, 945.1, 946.1, 947.1, 948.1, 949.1, 950.1, 951.1, 952.1, 953.1, 954.1, 955.1, 956.1, 957.1, 958.1, 959.1, 960.1, 961.1, 962.1, 963.1, 964.1, 965.1, 966.1, 967.1, 968.1, 969.1, 970.1, 971.1, 972.1, 973.1, 974.1, 975.1, 976.1, 977.1, 978.1, 979.1, 980.1, 981.1, 982.1, 983.1, 984.1, 985.1, 986.1, 987.1, 988.1, 989.1, 990.1, 991.1, 992.1, 993.1, 994.1, 995.1, 996.1, 997.1, 998.1, 999.1, 1000.1, 1001.1, 1002.1, 1003.1, 1004.1, 1005.1, 1006.1, 1007.1, 1008.1, 1009.1, 1010.1, 1011.1, 1012.1, 1013.1, 1014.1, 1015.1, 1016.1, 1017.1, 1018.1, 1019.1, 1020.1, 1021.1, 1022.1, 1023.1, 1024.1, 1025.1, 1026.1, 1027.1, 1028.1, 1029.1, 1030.1, 1031.1, 1032.1, 1033.1, 1034.1, 1035.1, 1036.1, 1037.1, 1038.1, 1039.1, 1040.1, 1041.1, 1042.1, 1043.1, 1044.1, 1045.1, 1046.1, 1047.1, 1048.1, 1049.1, 1050.1, 1051.1, 1052.1, 1053.1, 1054.1, 1055.1,			

COP

COPPER ACETATE

Common Synonyms Acetic acid cupric salt Crystallized verdigris Neutral verdigris Cupric acetate monohydrate		Solid Bluish-green Odorless Mixes with water
Fire		Not flammable Irritating gases may be produced when heated
Exposure		DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Will burn eyes. Irritating to eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Handbook: CG 448.4 Issue warning - water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetic acid cupric salt, Crystallized verdigris, Cupric acetate monohydrate, Neutral verdigris 3.2 Corrosion Compatibility Classification: Not listed 3.3 Chemical Formula: $Cu(C_2H_3O_2)_2 \cdot H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Bluish green 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of throat and lungs. Ingestion of large amounts causes violent vomiting and purging, intense pain, collapse, coma, convulsions, and paralysis. Contact with solutions irritates eyes; contact with solid causes severe eye surface injury and irritation of skin. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min., get medical attention if injury was caused by solid. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 (LD ₅₀ 5.5 g/kg rat) 5.7 Late Toxicity: Causes degeneration of liver in dogs 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable
 6.2 **Flammable Limits in Air:** Not flammable
 6.3 **Fire Extinguishing Agents:** Not pertinent
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
 6.5 **Special Hazards of Combustion Products:** Irritating vapors of acetic acid may form in fires.
 6.6 **Behavior in Fire:**
 6.7 **Ignition Temperature:** Not pertinent
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:**
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterway Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish. Hazard to humans unknown.

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp.
 General Chemical Div.
 40 Rector St.
 New York, N.Y. 10007
 2. Union Carbide Corp.
 Chemicals and Plastics Div.
 270 Park Ave.
 New York, N.Y. 10017
 3. J. T. Baker Chemical Co.
 Phillipsburg, N.J. 08865

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** Technical 99.99%
 Reagent 99%
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook: CG 448-3)
 SS

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed
 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
 12.3 **IFPA Hazard Classification:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid
 13.2 **Molecular Weight:** 199.65
 13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
 13.4 **Freezing Point:** 210°F = 100°C = 373°K
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 1.9 at 20°C (solid)
 13.8 **Liquid Surface Tension:** Not pertinent
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 13.12 **Latent Heat of Vaporization:** Not pertinent
 13.13 **Heat of Combustion:** Not pertinent
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** Not pertinent
 13.16 **Heat of Polymerization:** Not pertinent

(continued on page 1 and 2)

NOTES

CAA

COPPER ACETOARSENITE

Common Synonyms Schwebel's green Imperial green Paris green Emerald green New green	Solid Powder Green Odorless Sinks and mixes slowly with water
1. HAZARD STATEMENTS 2. HAZARD IDENTIFICATION	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
 Exposure	DUST POISONOUS IF INHALED Irritating to eyes, nose and throat SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 445-4 Injure washing with water Contaminant Restrict access Should be removed Chemical and physical treatment	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Imperial green, New green, Vienna green, Meadow green, Paris green, Mint green, Kings green, Parrot green 3.2 Coast Guard Competibility Classification: Not applicable 3.3 Chemical Formula: $Cu(CH_3COO)_2 \cdot 3H_2O$ 3.4 HMCO/United Nations Numerical Designation: 2.1.1.5	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Emerald green 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator, eye protection, gloves, face shield 5.2 Symptoms Following Exposure: Dizziness, eye irritation, ingestion causes gastro-intestinal symptoms, muscular cramps and nervous system effects may lead to death 5.3 Treatment for Exposure: Following ingestion, induce severe emesis, do not get medical attention. Administer 100 cc of 1% sodium bicarbonate solution with water. If inhaled, wash thoroughly with soap and water. INGESTION: Give copious fluids, water and induce repeated vomiting. Give 100 cc of 1% sodium bicarbonate 5.4 Toxicity by Inhalation (Threshold Limit Value): Not determined 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 oral LD ₅₀ = 22 mg/kg rats 5.7 Late Toxicity: Arsenic poisoning 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: If heated, toxic fumes and gases may be formed in fire 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Not applicable 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Los Angeles Chemical Company 4545 Arden Street New Orleans, LA 70124 2. Chempar Chemical Co., Inc. 260 Madison Avenue New York, N.Y. 10016
11. HAZARD ASSESSMENT CODE See HAZARD ASSESSMENT HANDBOOK, CG 445-3 H 11.1	10. SHIPPING INFORMATION 10.1 Grades or Purities: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous (Class B) 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 382.1 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: Not pertinent 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

CPA

COPPER ARSENITE

Common Synonyms Cupric arsenite Svedsh green Cupra green Copper orthoarsenite		Solid	Green	Odorless
Sinks in water				
AVOID CONTACT WITH SOLID AND DUST WITH YOUR FACE STEEL: Avoid contact with steel. It will cause staining. It will also cause corrosion. TOXIC: Avoid contact with food and drink. NODATA: Avoid contact with children.				
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED C. Exposed and will burn			
	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Irritating to eyes, nose and throat May cause respiratory irritation Breathing dust may irritate and inflame the lining of the nose If breathing is difficult, seek medical aid SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes Remove contaminated clothing Flush affected area with plenty of water IF IN EYES: hold eyelids open and flush with water for 15 min IF SWALLOWED: do not induce vomiting. Give plenty of water to dilute. Do not take any food or drink IF SWALLOWED: do not induce vomiting. Give plenty of water to dilute. Do not take any food or drink			
Exposure				
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water courses Not biodegradable and soluble in acid Not persistent in the environment			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-1) Issue warning: poison water contain in situ Restrict access Should be removed Chemical and physical treatment		2 LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cupric arsenite, Swedish green, Scheele's green, Cupra green, Copper orthoarsenite 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CuHAsO ₃ 3.4 IMCO/United Nations Numerical Designation: 6.1, 1586		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Green, yellowish green 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator, rubber gloves, goggles or face shield 5.2 Symptoms Following Exposure: Dust: irritates eyes. Ingestion causes gastric disturbances, tremors, muscular cramps, and nervous collapse that may cause death 5.3 Treatment for Exposure: Following ingestion or unusually severe exposure, get medical attention. Alert doctor to possibility of arsenic poisoning. If in eyes, flush with water for 15 min. SKIN: wash with soap and water. INGESTION: give large amounts of water, induce vomiting, give cathartic, such as 22 oz. of Epsom salt in water 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m ³ (as arsenic) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 5 to 500 mg/kg 5.7 Late Toxicity: Arsenic poisoning 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Poisonous volatile arsenic oxides may be formed in fires 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Gallard Schlegel Chemical Manufacturing Co. 584 Mineral Avenue Carle Place, N.Y. 11514 2. Cerchem Inc. 3140 West Silver Spring Rd. Menomonee Falls, Wis. 53051
	10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) II	17 PHYSICAL AND CHEMICAL PROPERTIES 17.1 Physical State at 15°C and 1 atm: Solid 17.2 Molecular Weight: 277.4 17.3 Boiling Point at 1 atm: Decomposes 17.4 Freezing Point: Not pertinent 17.5 Critical Temperature: Not pertinent 17.6 Critical Pressure: Not pertinent 17.7 Specific Gravity (solid): > 1.1 at 20°C (solid) 17.8 Liquid Surface Tension: Not pertinent 17.9 Liquid-Water Interfacial Tension: Not pertinent 17.10 Vapor (Gas) Specific Gravity: Not pertinent 17.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 17.12 Latent Heat of Vaporization: Not pertinent 17.13 Heat of Combustion: Not pertinent 17.14 Heat of Decomposition: Not pertinent 17.15 Heat of Solution: Not pertinent 17.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	

NOTES

(Continued on pages 5 and 6)

COPPER BROMIDE

Common Synonyms Cupric bromide anhydrous		Solid	Black	Odorless
		Sinks and mixes with water		
Stop discharge if possible. Keep people away. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Not flammable Irritating gases may be produced when heated			
Exposure	CALL FOR MEDICAL AID POUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If in eyes, hold eyelids open and flush with plenty of water If breathing has stopped, give artificial respiration If breathing is difficult, give oxygen SOLID Will burn eyes Irritating to skin Remove contaminated clothing and shoes Flush affected areas with plenty of water If IN EYES, nose, mouth open and flush with plenty of water If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and use victim induce vomiting If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes. Notify local health and welfare officials Notify operators of nearby water intakes			
1. RESPONSE TO DISCHARGE (See Response Memorandum Handbook CG 444-4) Issue warning: water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cupric Bromide anhydrous 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: CuBr ₂ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Black 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of throat and lungs. Ingestion of large amounts causes violent vomiting and purging, intense pain, collapse, coma, convulsions, and paralysis. Contact with solutions causes eye irritation, contact with solid causes severe eye surface injury and skin irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min; get medical attention if injury was caused by solid. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3, LD ₅₀ 500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating hydrogen bromide gas may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Copper known to be accumulated by shellfish. Hazard to humans unknown
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. American Hoechst Corp. Chemicals and Plastics Div. Rt. 202, 206 North Somerville, N. J. 08876 2. Mallinckrodt Chemical Works 223 Westside Ave. P. O. Box 384 Jersey City, N. J. 07303 3. J. T. Baker Chemical Co. Phillipsburg, N. J. 08865
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Pure, 99.9% Reagent 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 444-3) SS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 223.35 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 928°F = 498°C = 771°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 4.77 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -70.9 Btu/lb = -39.4 cal/g = -1.65 × 10³ J/kg 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
(Continued on pages 5 and 6)	
NOTES	

CPC

COPPER CHLORIDE

Common Synonyms: Cupric chloride dihydrate Eriochlorite (anhydrous)	Solid Blue-green Odorless Sinks and mixes with water
Storage: Store in a cool, dry place. Avoid contact with solid and liquid. Isolate from any discharge to water. Notify local health and pollution control agencies.	
Fire	Not flammable
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If on skin, wash thoroughly with plenty of water. If inhaled, move to fresh air and give artificial respiration if breathing is difficult. SOLID Will burn eyes. Irritating to eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, do not induce vomiting. CONSUME plenty of water and have victim drink water. IF SWALLOWED, do not induce vomiting. CONSUME plenty of water and have victim drink water.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify local water utility water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant. Disperse and flush.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cupric chloride dihydrate, Eriochlorite (anhydrous). 3.2 Coast Guard Competibility Classification: Not listed. 3.3 Chemical Formula: $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ 3.4 (MCO/United Nations Numerical Designation): Not listed.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Green, blue green, blue. 4.3 Odor: None.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Buy Mines approved respirator, rubber gloves, safety goggles. 5.2 Symptoms Following Exposure: Inhalation causes coughing and sneezing. Ingestion causes pain and vomiting. Contact with solutions irritates eyes, contact with solid causes severe eye surface injury and skin irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amounts of water, induce vomiting, get medical attention. EYES: flush with water for 15 min. consult a physician if injury was caused by solid. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 500 mg/kg. 5.7 Lethal Toxicity: Causes liver damage in rabbits. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride gas may form in fire. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.009 ppm (as Cu), *goldfish/rapid death - fresh water. 0.1 - 0.5 ppm *crayfish/toxic/salt water. 0.55 ppm/12 hr/mussel/killed/salt water. *Time period not specified. 8.2 Waterway Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: Copper known to be accumulated by shellfish. Hazard to humans unknown.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: In presence of moisture may corrode metals; the reaction is not hazardous. 7.3 Stability during Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Inc. Harshaw Chemical Co. 1945 E. 97th St. Cleveland, Ohio 44106. 2. J. T. Baker Chemical Co. Phillipsburg, N. J. 08865. 3. Diamond Shamrock Chemical Co. Chemicals Division 711 Putnam Road Baltimore, Md. 21226.								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	10. SHIPPING INFORMATION 10.1 Grade or Purity: Reagent Grade Technical. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: ORM-B. 12.2 NAF Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table data-bbox="966 1441 1218 1528"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>0</td> </tr> <tr> <td>Flammability (Red)</td> <td>0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	0	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 170.48 (dihydrate). 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.54 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	0								
Reactivity (Yellow)	0								
NOTES (Continued on pages 5 and 6)									

CCY

COPPER CYANIDE

Common Synonyms Cuprous cyanide Cupricum	Solid powder White Sinks in water
ALL INFORMATION HEREON IS UNCLASSIFIED EXCEPT WHERE SHOWN OTHERWISE	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
 Exposure	CAUTION: FOR MEDICAL USE DUST: Irritating to eyes, nose and throat If inhaled will cause dizziness or loss of consciousness If swallowed will cause dizziness and loss of consciousness SOLID: POISONOUS IF SWALLOWED Irritating to skin and eyes If swallowed will cause dizziness and loss of consciousness If SWALLOWED and vomit, DO NOT INDUCE VOMITING. Rinse mouth with water. If SWALLOWED and vomit, DO NOT INDUCE VOMITING. Rinse mouth with water. If SWALLOWED and vomit, DO NOT INDUCE VOMITING. Rinse mouth with water.
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not compatible with most biological life forms Not persistent in the environment
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning: poison water contaminant Restrict access Should be removed Chemical and physical treatment	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Cuprous Cyanide 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $CuCN$ 3.4 IMCO/United Nations Numerical Designation: 6.1/1587	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Powder 4.2 Color: White 4.3 Odor: Data not available
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator, protective goggles, face mask, protective clothing 5.2 Symptoms Following Exposure: Following severe exposure to dust, symptoms of cyanide poisoning may develop (see ingestion). Ingestion causes anxiety, confusion, dizziness, sudden loss of consciousness, odor of bitter almonds on breath or in vomitus, rapid weak pulse, convulsions, and paralysis. Contact with eyes causes irritation. 5.3 Treatment for Exposure: <i>Get medical attention after all exposures to this substance.</i> (INHALATION: remove victim to fresh air. INGESTION: if breathing has stopped begin artificial respiration immediately, administer by inhalation amyl nitrite pearls for 15-30 seconds of every minute, while a sodium nitrite solution is being prepared; discontinue amyl nitrite and immediately inject intravenously 10 ml of a 2% soln. of sodium nitrite (monsterile if necessary) over a period of 2 to 4 min. do not remove needle, through same needle infuse 50 ml of a 2.5% aqueous soln. of sodium thiosulfate. injection should take about 10 min. (Concentrations of 15-50% are permissible if total dose is approx. 12 grams.) Oxygen therapy may be of value in combination with the above. If symptoms recur, repeat injections of nitrite and thiosulfate at half the above doses. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 mg/m (as cyanides) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4.1 Dose < 50 mg/kg 5.7 Late Toxicity: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic hydrogen cyanide gas may form in fires 6.6 Behavior in Fire 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Copper known to be accumulated by shellfish. Hazard to humans unknown
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable in presence of moisture, toxic hydrogen cyanide gas may collect in enclosed spaces 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 J. I. Baker Chemical Co. Phillipsburg, N. J. 08865 2 Gallard Schlesinger Chemical Mfg. Co. 584 Mineola Ave. Carle Place, N. Y. 11514 3 Pfaltz and Bauer, Inc. 126-04 Northern Blvd. Flushing, N. Y. 11368
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) 11	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical C.P. 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Closed container
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous solid, Class B 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 89.56 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.92 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
5 HEALTH HAZARDS (Cont'd) 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

(cont. next page 4 and 5)

CPF

COPPER FLUOROBORATE

Common Synonyms Cupric fluoroborate solution Copper borofluoride solution Copper(II) fluoroborate solution		Liquid	Dark blue	Odorless
		Sinks and mixes with water		
Not flammable Irritating gases may be produced when heated				
Fire				
Exposure		ALL FORMS ARE IRRITANT VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If swallowed will cause nausea and vomiting LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting If in contact with skin, wash immediately with water If swallowed, induce vomiting and seek medical attention If in contact with skin, wash immediately with water If swallowed, induce vomiting and seek medical attention		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Do not discharge into waterways		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Copper borofluoride solution; Copper(II) fluoroborate solution; Cupric fluoroborate solution 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: Cu(BF ₄) · H ₂ O 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Clear dark blue 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield; rubber apron and gloves 5.2 Symptoms Following Exposure: Inhalation of mist irritates nose and throat. Ingestion causes pain and vomiting. Contact causes severe irritation of eyes and irritation of skin 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amounts of water and induce vomiting if required. EYES: flush with water for at least 15 min. get medical attention if irritation persists. SKIN: flush with water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1 LD ₅₀ 500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating hydrogen fluoride gas may form in fires 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Copper known to be accumulated by shellfish. Hazard to humans unknown								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May corrode some metals 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. American Hoechst Corp. Chemicals and Plastics Div. Rt. 202, 206 North Somerville, N.J. 08876 2. Allied Chemical Corp. P.O. Box 1087R Morristown, N.J. 07960 3. The Harshaw Chemical Co. 1945 E. 97 St. Cleveland, Ohio 44166								
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical } 45-50% solutions in water C.P. 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 237.16 (molecular ions) 13.3 Boiling Point at 1 atm: (approx.) 212°F = 100°C = 373°K 13.4 Freezing Point: Data not available 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.54 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>0</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	0	Reactivity (Yellow)	0	
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	0								
Reactivity (Yellow)	0								
(continued on pages 5 and 6)									
NOTES									

CNN

COPPER NAPHTHENATE

Common Synonyms Paint drier		Liquid Dark green Gasoline-like odor May float or sink in water
Shut off ignition sources. Call fire department. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective. Do not use. Cool exposed containers with water.	
Exposure	Call for medical aid. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove person from area. Flush and shower. First affected areas with plenty of water. IF IN EYES: hold lids open and flush with plenty of water. IF SWALLOWED: do not induce vomiting. Have victim drink water. Do NOT induce vomiting.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant. Mechanical containment. Should be removed. Chemical and physical treatment.		2. LABELS No label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Paint drier. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: Mixture. 3.4 IMCO/United Nations Numerical Designation: 3.3/1168.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Dark green. 4.3 Odor: Like gasoline, slight aromatic.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, plastic gloves (as for gasoline). 5.2 Symptoms Following Exposure: Vapor causes mild irritation of eyes and mild irritation of respiratory tract if inhaled. Ingestion causes irritation of stomach. Aspiration causes severe lung irritation and rapidly developing pulmonary edema, central nervous system excitement followed by depression. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air. EYES: wash with copious amounts of water for at least 15 min. SKIN: wipe off and wash with soap and water. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. ASPIRATION: enforce bed rest; give oxygen; call doctor. 5.4 Toxicity by Inhalation (Threshold Limit Value): 500 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade I, oral rat LD ₅₀ = 4.6 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS 6.1 Flash Point: 100°F (38°C) (typical). 6.2 Flammable Limits in Air: 0.8% - 5.0% (mineral spirits). 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 540°F (mineral spirits). 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 4 cm/min.		8. WATER POLLUTION 8.1 Aquatic Toxicity: 2.0 ppm 72 hr. blue-green algae; 100% kill fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 8% 5 days. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Witco Chemical Corporation Organics Division 277 Park Avenue New York, N.Y. 10017 2. Cincinnati Milacron Chemicals Inc. 400 Jersey Ave. New Brunswick, N.J. 08901 3. Ferro Corporation 7090 Krick Rd. Bedford, Ohio 44146.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A L U N Y		10. SHIPPING INFORMATION 10.1 Grade or Purity: 8% in mineral spirits or mineral oil; 5% in mineral spirits. May float instead of sink if water. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not required. 10.4 Venting: Pressure vacuum or open (flame arrester).
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 MFPA Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: Mixture. 13.3 Boiling Point at 1 atm: 310 - 305°F = 154 - 152°C = 427 - 425°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.93 - 1.05 at 25°C (liquid). 13.8 Liquid Surface Tension: 20 dynes/cm = 0.020 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 45 dynes/cm = 0.045 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: test 1 = 47,600 Btu/lb = -9,800 cal/g = -410 × 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES (continued on pages 2 and 3)		

CNI

COPPER NITRATE

Common Synonyms: Cupric nitrate trihydrate Gerhardite		Solid Blue Odorless Sinks and mixes with water
Not flammable Will increase the intensity of a fire Irritating gases may be produced when heated		
DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing		
SOLID Will burn eyes If swallowed will cause nausea, vomiting or loss of consciousness		
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Issue warning: water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cupric nitrate trihydrate, Gerhardite 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $Cu(NO_3)_2 \cdot 3H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Blue 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation causes irritation of throat and lungs. Ingestion of large amounts causes violent vomiting and purging, intense pain, collapse, coma, convulsions, and paralysis. Solutions irritate eyes. Contact with solid causes severe eye surface injury and irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amounts of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min., get medical attention if injury was caused by solid. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD₅₀ 5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable
- 6.2 **Flammable Limits in Air:** Not flammable
- 6.3 **Fire Extinguishing Agents:** Not pertinent
- 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
- 6.5 **Special Hazards of Combustion Products:** Toxic and irritating oxides of nitrogen may form in fire
- 6.6 **Behavior in Fire:** Can increase intensity of fire if in contact with combustible material
- 6.7 **Ignition Temperature:** Not pertinent
- 6.8 **Electrical Hazard:** Not pertinent
- 6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
- 7.2 **Reactivity with Common Materials:** Mixtures with wood, paper, and other combustibles may catch fire
- 7.3 **Stability During Transport:** Stable
- 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 7.5 **Polymerization:** Not pertinent
- 7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 5 ppm 11 hr rainbow trout killed fresh water
0.22 10 ppm 48 240 hr barnacles & related species killed salt water
19 ppm 96 hr oyster TL₅₀ salt water
- 8.2 **Waterfowl Toxicity:** Data not available
- 8.3 **Biological Oxygen Demand (BOD):** None
- 8.4 **Food Chain Concentration Potential:** Copper known to be accumulated by shellfish. Can be concentrated by food chain. Hazard to humans unknown.

9. SELECTED MANUFACTURERS

- 1. American Hoechst Corp.
Chemicals and Plastics Div.
Rt 202 206 North
Somerville N.J. 08876
- 2. Allied Chemical Corp.
Specialty Chemicals Div.
P. O. Box 1087R
Morristown N. J. 07960
- 3. J. T. Baker Chemical Co.
Phillipsburg N. J. 08465

10. SHIPPING INFORMATION

- 10.1 **Grades or Purities:** Pure 100% Technical Reagent. May also be shipped as anhydrous grade.
- 10.2 **Storage Temperature:** Ambient
- 10.3 **Inert Atmosphere:** No requirement
- 10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See HAZARD ASSESSMENT HANDBOOK, CG 446-3)
SS

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed
- 12.2 **HAAS Hazard Rating for Bulk Water Transportation:** Not listed
- 12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	0 1
Flammability (Red)	0 0
Reactivity (Yellow)	0 0

*First column refers to shipping situation.

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid
- 13.2 **Molecular Weight:** 241.66
- 13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 13.4 **Freezing Point:** 238.1°F = 114.5°C = 387.7°K
- 13.5 **Critical Temperature:** Not pertinent
- 13.6 **Critical Pressure:** Not pertinent
- 13.7 **Specific Gravity:** 2.32 at 20°C (solid)
- 13.8 **Liquid Surface Tension:** Not pertinent
- 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
- 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 13.11 **Ratio of Specific Heats of Vapor (Cp/Cv):** Not pertinent
- 13.12 **Latent Heat of Vaporization:** Not pertinent
- 13.13 **Heat of Combustion:** Not pertinent
- 13.14 **Heat of Decomposition:** Not pertinent
- 13.15 **Heat of Solution:** Not pertinent
- 13.16 **Heat of Polymerization:** Not pertinent

Continued on page 208

NOTES

COL

COPPER OXALATE

Common Synonyms Copper oxalate hemihydrate		Solid	Bluish white	Odorless
Sinks in water				
Fire		Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED		
Exposure		DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Copper oxalate hemihydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $CuC_2O_4 \cdot H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Bluish white 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion of very large amounts may produce symptoms of oxalate poisoning: watch for edema of the glottis and delayed constriction of esophagus. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION: remove to fresh air; if exposure has been prolonged watch for symptoms of oxalate poisoning (nausea, shock, collapse, and convulsions). INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic carbon monoxide gas may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Copper known to be accumulated by shellfish. Hazard to humans unknown
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Gallard Schlesinger Chemical Mfg. Co. 564 Mineola Ave. Carle Place N. Y. 11514 2. Platts and Bauer, Inc. 126-04 Northern Blvd. Flushing N. Y. 11356
	10. SHIPPING INFORMATION 10.1 Grade or Purity: 98 + % 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No equipment 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See HAZARD ASSESSMENT HANDBOOK, CG 446-3) II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 160.6 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: > 1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	

Continued on pages 3 and 4

NGES

CSF

COPPER SULFATE

Common Synonyms Blue Vitrol Sulfate of copper Copper sulfate pentahydrate Copper sulfate	Solid-granules or crystals White to blue Odorless Sinks and mixes with water
Irritate and may be dehydrated on skin. Not a toxic health and pollution hazard.	
Fire	Not flammable
Exposure	CALL FOR MEDICAL AID SOLID If swallowed, will cause nausea, vomiting or loss of consciousness. If SWALLOWED and victim is ALIVE, DO NOT have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, DO NOT induce vomiting or keep victim warm.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. No fish, shellfish and wildlife effects. No deleterious effects on vegetation.
1 RESPONSE TO DISCHARGE <i>(See Response Methods No. 10000, CG 446-4)</i> Issue warning - water contaminant. Disperse and flush.	2. LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Blue vitrol Copper sulfate pentahydrate Copper sulfate Sulfate of copper 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ 3.4 IMCO United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Blue 4.3 Odor: None
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Filtering masks to minimize inhalation of dust. 5.2 Symptoms Following Exposure: INGESTION: Copper sulfate may induce severe gastroenteritis, distress, vomiting, gastroenteric pain, and local corrosion and hemorrhages, prostration, anuria, hematuria, anemia, increase in white blood cells, and a coma, recovery is difficult and circulatory failure. 5.3 Treatment for Exposure: INGESTION: induce vomiting and administer gastric lavage, then a saline cathartic, fluid therapy, and transfusions if required. Gastric decontamination (GDS) has been found to be directly effective. SKIN AND EYES: wash affected areas with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 1 LD ₅₀ 500 mg/kg rats. 5.7 Late Toxicity: Causes liver, kidney and testicular damage in rats. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure. 5.10 Odor Threshold: Not pertinent.	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Risk: Not flammable.	8 WATER POLLUTION 8.1 Aquatic Toxicity: 1.8 ppm/24 hr rainbow trout; 11 ppm/fresh water; 0.14 ppm/48 hr. prawn; 1.0 ppm/salt water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Anala Co. Great Falls, Mass. 01401 2. C. I. Neill Co. Inc. Industrial Chemicals Division 60 Wall St. New York, N.Y. 10005 3. Mallinckrodt Chemical Works Industrial Chemicals Division St. Louis, Mo. 63102
11 HAZARD ASSESSMENT CODE <i>(See Hazard Assessment Information, CG 446-3)</i> NN	10 SHIPPING INFORMATION 10.1 Grades or Purity: Data not available. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Data not available.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 249.7. 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.28 at 15°C solids. 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES <i>(Continued on pages 3 and 4)</i>	

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CSY

CORN SYRUP

Common Synonyms		Thick liquid	Colorless	Odorless
		Mixes and mazes with water		
No significant hazard to life or health from dermal contact with this material. No significant hazard to life or health from ingestion of this material.				
Fire		Not flammable		
Exposure		Not harmful		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water bodies. No significant hazard to life or health from ingestion of this material.		
1. RESPONSE TO DISCHARGE: See Response Materials Handbook, CG 446.3 Dispense and flush		2. LABELS No hazard label required by Codes - Federal regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Suspensions water solutions 3.3 Chemical Formula: Not pertinent 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: None 5.2 Symptoms Following Exposure: Not toxic 5.3 Treatment for Exposure: None 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: None 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable		8. WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterway Toxicity: None 8.3 Biological Oxygen Demand (BOD): 50% 5 days 99% (theoretical) 8.4 Food Chain Concentration Potential: None	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. CPC International, Inc. Ago, Ill 60602 2. A. L. Staley Mfg. Co. Decatur, Ill 62521 3. Standard Brands, Inc. Clinton Corn Processing Co. Division Clinton, Iowa 52732	
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3 A P		10. SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Data not available	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm.: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.4 at 17°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
NOTES			

REVISED 1978

COU

COUMAPHOS

Common Synonyms COURAL O,O-Dimethyl 2-oxo-2-(4-methyl-2-oxo-2H-1-benzopyran-7-yl)phosphorothioate	Solid White Weak sulfurous odor Solid sinks in water
Fire	Combustible
Exposure	CALL FOR MEDICAL AID SOLID OR DUST Irritating to skin and eyes Harmful if swallowed or inhaled
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning - water contaminant Restrict access Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: COURAL; O,O-Dimethyl 2-oxo-2-(4-methyl-2-oxo-2H-1-benzopyran-7-yl)phosphorothioate 3.2 Code: Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₁₁ H ₁₂ O ₃ PS 3.4 IMCO/United Nations Numerical Designation: N/A (1991)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Slight odor of sulfur compounds
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor respirator; rubber gloves; goggles 5.2 Symptoms Following Exposure: Irritation on ingestion causes some dizziness in chest sweating, constricted pupils of eyes, stomach pains, vomiting, and diarrhea. Pulmonary edema may develop as late as 12 hours after acute exposures. Contact with eyes causes irritation; conjunctivae may cause some symptoms as late as 12 hours. 5.3 Treatment for Exposure: <i>First medical attention after all exposures to this substance is to remove the patient and 2 P-4 M are available.</i> INHALATION: remove to fresh air; support respiration. Keep patient quiet until medical help arrives; otherwise, the development of pulmonary edema may occur after 12 hours. INGESTION: induce vomiting; give water and again induce vomiting; give again. In cases of medical care, EYES: flush with water for at least 10 min. SKIN: wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 oral LD ₅₀ (30 mg/kg) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: 0.02 ppm	

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not pertinent (combustible solid)
- 6.2 **Flammable Limits in Air:** Not pertinent
- 6.3 **Fire Extinguishing Agents:** Water, foam, carbon dioxide dry chemical
- 6.4 **Fire Extinguishing Agents Not to be Used:**
- 6.5 **Special Hazards of Combustion Products:** Toxic and irritating solid sulfur and phosphorus may form in fires
- 6.6 **Behavior in Fire:**
- 6.7 **Ignition Temperature:** Data not available
- 6.8 **Electrical Hazard:** Not pertinent
- 6.9 **Burning Rate:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 100 ppm 96 hr. Bluegill; 11 ppm 96 hr. Carp; 400 ppm 96 hr. Fathead minnow; 11 ppm 96 hr. Water
- 8.2 **Waterfowl Toxicity:** 1.5 g/g + 5 g/g 21 days
- 8.3 **Biological Oxygen Demand (BOD):** Data not available
- 8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

Bayer Corporation
 Box 999
 Shawnee Mission, Kan. 66204

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Not reactive
- 7.2 **Reactivity with Common Materials:**
- 7.3 **Stability During Transport:** Stable
- 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 7.5 **Polymerization:** Not pertinent
- 7.6 **Inhibitor of Polymerization:** Not pertinent

10 SHIPPING INFORMATION

- 10.1 **Grade or Purity:** 95% active ingredient; the balance being inert, which
- 10.2 **Storage Temperature:** Ambient
- 10.3 **Inert Atmosphere:** Not required
- 10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 444-3)
 II

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed
- 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
- 12.3 **IFPA Hazard Classification:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid
- 13.2 **Molecular Weight:** 262.3
- 13.3 **Boiling Point at 1 atm:** Not pertinent
- 13.4 **Freezing Point:** 100°C (212°F) at 1 atm
- 13.5 **Critical Temperature:** Not pertinent
- 13.6 **Critical Pressure:** Not pertinent
- 13.7 **Specific Gravity:** 1.474 at 20°C (solid)
- 13.8 **Liquid Surface Tension:** Not pertinent
- 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
- 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 13.12 **Latent Heat of Vaporization:** Not pertinent
- 13.13 **Heat of Combustion:** Not pertinent
- 13.14 **Heat of Decomposition:** Not pertinent
- 13.15 **Heat of Solution:** Not pertinent
- 13.16 **Heat of Polymerization:** Not pertinent

NOTES

CCT

CREOSOTE, COAL TAR

Common Synonyms Creosote oil Dead oil		Liquid Yellow to black Tarry odors May float or sink in water
Fire		Combustible
Exposure		LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE <i>See Response Methods Manual: 4 CG 445.4</i> Issue warning: water contaminant Mechanical containment Should be removed Chemical and physical treatment		2. LABELS <i>See Hazard Assessment Manual: 4 CG 445.4</i> Number required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Creosote oil Dead oil 3.2 Coast Guard Competibility Classification: Hazard 3.3 Chemical Formula: Mixture 3.4 IMCO/United Nations Numerical Designation: 9.022		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow to brown/black 4.3 Odor: Characteristic tarry odors
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: All service users must wear appropriate chemical safety goggles and a face shield, especially in emergency and in hot environments. 5.2 Symptoms Following Exposure: Vapors cause moderate irritation to nose and throat. Liquid causes severe burns to eyes and reddening and itching to skin. Poisoning is mixed with skin irritation. Ingestion causes salivation, vomiting, diarrhea, and difficulty breathing. Respiratory distress, severe headache, loss of pupillary reflexes, hypothermia, cyanosis, and convulsions. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air. Do not inhaling gas. If facial respiration is preferably with mouth. Breathing is difficult, give oxygen. Use artificial respiration. EYES: Flush immediately with plenty of water for at least 15 min and call a physician. SKIN: If in contact with vegetable oil, it may be then washed with soap and water. INGESTION: Have victim drink water. Do not induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 LD 50 5.1 g/kg. 5.7 Late Toxicity: Repeated exposures may cause cancer. Skin. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such as persistent cough and high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Liquid is severe skin irritant. May cause pain and severe degree burns after a few minutes contact. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS

- 6.1 Flash Point: 110 to 114°C
- 6.2 Flammable Limits in Air: Not pertinent
- 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide or foam
- 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
- 6.5 Special Hazards of Combustion Products: Data not available
- 6.6 Behavior in Fire: Heavy, irritating black smoke is formed
- 6.7 Ignition Temperature: 477°C
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Data not available

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

- 1. Waco Chemical Corporation
Purcell Division
275 Park Avenue
New York, N.Y. 10017
- 2. Koppers Company, Inc.
Organic Materials Division
Koppers Building
Pittsburgh, Pa. 15219
- 3. Allied Chemical Corporation
Somerby Division
London, Ont. Plant
1130 South Third Street
Toledo, Ohio 43603

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials: No reaction
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purities: Mixture composed of various fractions, depending on heating point. All have similar properties
- 10.2 Storage Temperature: Ambient
- 10.3 In 1 Atmosphere: No requirement
- 10.4 Venting: Open flame arrevers

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Manual: 4 CG 445.3)

A T T A X

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
- 13.2 Molecular Weight: Mixture
- 13.3 Boiling Point at 1 atm: 150 to 250°C (300 to 480°F)
- 13.4 Freezing Point: Not pertinent
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.05 to 1.25 (liquid)
- 13.8 Liquid Surface Tension: 35 to 45 dynes/cm at 20°C
- 13.9 Liquid-Water Interfacial Tension: 10 to 20 dynes/cm at 20°C
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Rate of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: 25,000 to 30,000 Btu/lb (100,000 to 120,000 kJ/kg)
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Combustible Liquid
- 12.2 NFPA Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	2
Archery Effect	4
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

- 12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

Continued on pages 2 and 3

NOTES

6 FIRE HAZARDS 6.1 Flash Point: 150 °F (55 °C) 6.2 Flammable Limits in Air: 1.1% (Lower), 8.0% (Upper) 6.3 Fire Extinguishing Agents: Water, dry chemical, carbon dioxide, and foam 6.4 Fire Extinguishing Agents Not to Be Used: None 6.5 Special Hazards of Combustion Products: Toxic, corrosive, and irritating 6.6 Behavior in Fire: Stable, non-oxidizing, and non-flammable 6.7 Ignition Temperature: 1000 °F (538 °C) 6.8 Electrical Hazard: Non-conductive 6.9 Burning Rate: Moderate	8 WATER POLLUTION 8.1 Aquatic Toxicity: LD50 (fish) 100 mg/L (96 hr) 8.2 Waterloot Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 100 mg/L (5 days) 8.4 Food Chain Concentration Potential: None																																				
9 SELECTED MANUFACTURERS Acetylene Chemicals Co. Air Products and Chemicals, Inc. Airco Chemicals, Inc. Carbide & Carbon Chemicals, Inc. Carbide & Carbon Chemicals, Inc. Carbide & Carbon Chemicals, Inc. Carbide & Carbon Chemicals, Inc. Carbide & Carbon Chemicals, Inc. Carbide & Carbon Chemicals, Inc. Carbide & Carbon Chemicals, Inc. Carbide & Carbon Chemicals, Inc.																																					
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Non-reactive 7.2 Reactivity with Common Materials: Non-reactive 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: Not applicable 7.5 Polymerization: None 7.6 Inhibitor of Polymerization: None	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.9% (minimum) 10.2 Physical State: Gas 10.3 Boiling Point at 1 atm: 100 °F (37.8 °C) 10.4 Freezing Point: -109 °F (-78.3 °C) 10.5 Critical Temperature: 31.1 °F (-0.5 °C) 10.6 Critical Pressure: 73.8 atm 10.7 Specific Gravity: 1.26 (liquid at 60 °F) 10.8 Liquid Surface Tension: 22.3 dyne/cm (60 °F) 10.9 Water-Air Interfacial Tension: 1.5 dyne/cm (60 °F) 10.10 Vapor (Gas) Specific Gravity: 1.52 (air = 1) 10.11 Rate of Specific Heats of Vapor (Gas): 1000 Btu/lb (212 °F) 10.12 Latent Heat of Vaporization: 1000 Btu/lb (212 °F) 10.13 Heat of Combustion: 1000 Btu/lb (212 °F) 10.14 Heat of Decomposition: None 10.15 Heat of Solution: None 10.16 Heat of Polymerization: None																																				
11 HAZARD ASSESSMENT CODE See Material Safety Data Sheet (MSDS) for details. A 000000																																					
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: 29 CFR 1910.101 (Class B) 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td>2</td> </tr> <tr> <td>Vapor Hazard</td> <td>2</td> </tr> <tr> <td>Liquid Surface Tension</td> <td>2</td> </tr> <tr> <td>Freezing</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td>2</td> </tr> <tr> <td>Human Toxicity</td> <td>2</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Acute Toxicity</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>2</td> </tr> <tr> <td>Other Hazards</td> <td>2</td> </tr> <tr> <td>Water</td> <td>2</td> </tr> <tr> <td>Self-Heating</td> <td>2</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classification: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (H)</td> <td>2</td> </tr> <tr> <td>Flammability (F)</td> <td>2</td> </tr> <tr> <td>Reactivity (R)</td> <td>2</td> </tr> </tbody> </table>	Category	Rating	Fire	1	Health	2	Vapor Hazard	2	Liquid Surface Tension	2	Freezing	2	Water Pollution	2	Human Toxicity	2	Aquatic Toxicity	2	Acute Toxicity	2	Reactivity	2	Other Hazards	2	Water	2	Self-Heating	2	Category	Classification	Health Hazard (H)	2	Flammability (F)	2	Reactivity (R)	2	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 26.04 13.3 Boiling Point at 1 atm: 100 °F (37.8 °C) 13.4 Freezing Point: -109 °F (-78.3 °C) 13.5 Critical Temperature: 31.1 °F (-0.5 °C) 13.6 Critical Pressure: 73.8 atm 13.7 Specific Gravity: 1.26 (liquid at 60 °F) 13.8 Liquid Surface Tension: 22.3 dyne/cm (60 °F) 13.9 Water-Air Interfacial Tension: 1.5 dyne/cm (60 °F) 13.10 Vapor (Gas) Specific Gravity: 1.52 (air = 1) 13.11 Rate of Specific Heats of Vapor (Gas): 1000 Btu/lb (212 °F) 13.12 Latent Heat of Vaporization: 1000 Btu/lb (212 °F) 13.13 Heat of Combustion: 1000 Btu/lb (212 °F) 13.14 Heat of Decomposition: None 13.15 Heat of Solution: None 13.16 Heat of Polymerization: None
Category	Rating																																				
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Health Hazard (H)	2																																				
Flammability (F)	2																																				
Reactivity (R)	2																																				
10 SHIPPING INFORMATION (Cont'd.) 10.1 Storage Temperature: Ambient 10.2 Inert Atmosphere: Nitrogen 10.3 Venting: None																																					

CGE

CRESYL GLYCIDYL ETHER

Common Synonyms	
Solid	White
Sinks and mixes with water	
Stop use, if possible. Keep people away. Shut off ignition sources. Call fire department. Avoid contact with solid and dust. Flush and remove contaminated material. Notify local health and pollution control agencies.	
Fire	Combustible Extinguish with dry chemical, foam or other suitable agent. Water may be effective on fire. Decomposed in fire with water.
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. Painful if inhaled. If in eyes, flush eyes with water for 15 min. If in nose, blow nose and flush with water. If in mouth, spit out and flush with water. SOLID Irritating to skin and eyes. Harmful if swallowed. If on skin, remove contaminated clothing and wash skin with soap and water. If in eyes, flush eyes with water for 15 min. If swallowed, do not induce vomiting. Call poison control center. If swallowed and victim is unconscious or having convulsions, do not give anything by mouth.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operator of local water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3) Issue warning: water contaminant. Should be removed. Chemical and physical treatment.	
2. LABELS No hazard labels required by Code of Federal Regulations.	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Cresyl epoxypropyl ether, Tolyl epoxypropyl ether, Tolyl glycidyl ether. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: $C_{10}H_{12}O_2$, $C_{11}H_{14}O_2$, $C_{12}H_{16}O_2$. 3.4 IMCO/United Nations Numerical Designation: Not listed.	
4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Data not available.	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic canister mask or air pack, rubber gloves, goggles or face shield, body covering clothing. 5.2 Symptoms Following Exposure: Contact with eyes causes irritation. Contact with skin causes primary irritation and allergic sensitization. 5.3 Treatment for Exposure: INHALATION: move to fresh air. IF YES, flush with water for at least 15 min. get medical attention. SKIN: immediately wash off with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 200°F (93°C). 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water, ineffective. 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Data not available.	
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: May attack some forms of plastics. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	
8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.	
9. SELECTED MANUFACTURERS Shell Chemicals Co. One Shell Plaza P.O. Box 2463 Houston, Texas 77001	
10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 100%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.	
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3). A T U N Y	
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	
13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 166. 13.3 Boiling Point at 1 atm: (approx.) 490°F = 259°C = 532°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.09 at 20°C (liquid). 13.8 Liquid Surface Tension: Data not available. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Data not available. 13.13 Heat of Combustion: (est.) -16,500 Btu/lb = -9,190 cal/g = -384 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.	
Continued on page 5 and 6.	
NOTES	

CTA	CROTONALDEHYDE
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Common Synonyms Crotonaldehyde beta-Methylcrotonaldehyde trans-2-Butenal	Water: liquid Color: Yellow Tar odor Floats and mixes slowly with water. Flammable irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. When ignited, it burns with a yellow flame and produces a black smoke. It is highly flammable and reacts violently with strong oxidizers. It is highly flammable and reacts violently with strong oxidizers. It is highly flammable and reacts violently with strong oxidizers.
Exposure	CAUTION FORMULA: AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause coughing, nausea, vomiting or loss of consciousness. May cause dizziness, headache, and irritation of the respiratory tract. It is highly flammable and reacts violently with strong oxidizers. LIQUID Will burn skin and eyes. Harmful if swallowed. It is highly flammable and reacts violently with strong oxidizers. SWALLOWED If swallowed, do not induce vomiting. If swallowed, do not induce vomiting. If swallowed, do not induce vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Polluting to shoreline. May be dangerous if it enters water intakes. It is highly flammable and reacts violently with strong oxidizers.
1 RESPONSE TO DISCHARGE (See Procedure Methods Handbook, CG 446-4) Issue warning - high flammability, water contaminant. Restrict access. Disperse and flush.	2 LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: beta-Methylcrotonaldehyde Crotonaldehyde Crotonaldehyde trans-2-Butenal 32 Coast Guard Compatibility Classification: Miscible 33 Chemical Formula: CH₃CH=CHCHO 34 IMCO/United Nations Numerical Designation: 11143	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Yellow 43 Odor: Tarry
J. HEALTH HAZARDS 51 Personal Protective Equipment: Air supplied mask for concentrations above 100 ppm. Use gloves, goggles, and safety shower. 52 Symptoms Following Exposure: INHALATION: Vapors are exceedingly irritating, causing coughing, chest pain, nausea, vomiting, and collapse. CONTACT WITH SKIN OR EYES: may cause burns and systemic illness. Contact of liquid or vapors with eyes causes burns. 53 Treatment for Exposure: INHALATION: remove victim to fresh air, give oxygen and breathing is difficult, call a physician. INGESTION: have victim drink water or milk, do NOT induce vomiting. SKIN OR EYES: immediately flush with plenty of water for at least 15 min. physician should see cases of eye irritation from vapors or liquid. 54 Toxicity by Inhalation (Threshold Limit Value): 7 ppm 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade 3 LD₅₀ 50 to 500 mg/kg 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 59 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant in a case of pain and second degree burns after a few minutes contact. 510 Odor Threshold: 0.13 ppm	

6 FIRE HAZARDS 61 Flash Point: 59°F (10°C) 62 Flammable Limits in Air: 2.1% - 15.5% 63 Fire Extinguishing Agents: Four dry chemical, carbon dioxide. 64 Fire Extinguishing Agents Not to be Used: Not pertinent. 65 Special Hazards of Combustion Products: Vapors are very irritating to nose, eyes and skin. 66 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 67 Ignition Temperature: 450°F 68 Electrical Hazard: Data not available 69 Burning Rate: 3.3 mm/min	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): 1.1 lb/l in 10 days 84 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: May polymerize 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: May polymerize or condense with evolution of heat in presence of alkalies, amines or acids. 76 Inhibitor of Polymerization: None used	9 SELECTED MANUFACTURERS 1. Celanese Corp. Celanese Chemical Division 245 Park Ave. New York, N.Y. 10017 2. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																																				
10 SHIPPING INFORMATION 101 Grades or Purity: 98.0 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Pressure/vacuum																																					
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P Q	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 70.09 13.3 Boiling Point at 1 atm: 216.0°F = 102.2°C = 375.4 K 13.4 Freezing Point: -100°F = -73°C = 198 K 13.5 Critical Temperature: 505°F = 263°C = 535 K 13.6 Critical Pressure: 630 psia = 43 atm = 4.4 MN/m² 13.7 Specific Gravity: 0.852 at 20°C (liquids) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gss): 1.104 13.12 Latent Heat of Vaporization: 241 Btu/lb = 11 cal/g = 4.65 x 10³ J/kg 13.13 Heat of Combustion: -14,000 Btu/lb = -7760 cal/g = -322 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td>3</td></tr> <tr> <td>Vapor Irritant</td><td>3</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>3</td></tr> <tr> <td>Poisons</td><td>3</td></tr> <tr> <td>Water Pollution</td><td>3</td></tr> <tr> <td>Human Toxicity</td><td>3</td></tr> <tr> <td>Aquatic Toxicity</td><td>3</td></tr> <tr> <td>Aesthetic Effect</td><td>3</td></tr> <tr> <td>Peculiarities</td><td>2</td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Rating	Fire	3	Health	3	Vapor Irritant	3	Liquid or Solid Irritant	3	Poisons	3	Water Pollution	3	Human Toxicity	3	Aquatic Toxicity	3	Aesthetic Effect	3	Peculiarities	2	Other Chemicals	2	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	3	Reactivity (Yellow)	2	NOTES
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Flammability (Red)	3																																				
Reactivity (Yellow)	2																																				

CUM

CUMENE

Common Synonyms Cumol Isopropylbenzene		Watery liquid	Colorless	Gasoline-like odor
Floats on water				
Not for use of possible keepers please Call for medical aid Avoid contact with eyes Avoid contact with skin Avoid contact with clothing Avoid contact with food and drink				
Fire	Combustible. Flammable liquid and vapor. Ignites on contact with water.			
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed Causes irritation and discomfort Causes shortness of breath Causes dizziness and headache Causes nausea and vomiting Causes diarrhea and abdominal pain Causes difficulty in swallowing Causes difficulty in breathing Causes difficulty in seeing Causes difficulty in hearing Causes difficulty in speaking Causes difficulty in walking Causes difficulty in standing Causes difficulty in sitting Causes difficulty in lying down Causes difficulty in sleeping Causes difficulty in eating Causes difficulty in drinking Causes difficulty in urinating Causes difficulty in defecating Causes difficulty in menstruating Causes difficulty in conceiving Causes difficulty in giving birth Causes difficulty in breastfeeding Causes difficulty in nursing Causes difficulty in growing Causes difficulty in aging Causes difficulty in dying			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Not recommended for use in water			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2 LABELS No label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Cumol Isopropylbenzene 3.2 Coast Guard Compatibility Classification: Aqueous solution 3.3 Chemical Formula: C_9H_{10} 3.4 IMCO/United Nations Numerical Designation: 1.1918		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Strong slightly irritant, fragrant aromatic		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: As necessary to avoid skin exposure. If concentration in air is greater than 1000 ppm, use self-contained breathing apparatus. 5.2 Symptoms Following Exposure: Narcotic action with long lasting effects; depressant to central nervous system. 5.3 Treatment for Exposure: INHALATION: move patient immediately to fresh air; administer artificial respiration or oxygen if necessary; seek medical attention. SKIN OR EYES: wash exposed skin surfaces thoroughly; flush eyes thoroughly with water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 50 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 50 to 500 mg/kg 5.7 Late Toxicity: None reported 5.8 Vapor (Gas) Irritant Characteristics: A serious eye, nose and throat smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 1.2 ppm				

6 FIRE HAZARDS 6.1 Flash Point: 111°F (44°C) 6.2 Flammable Limits in Air: 0.9 - 6.5% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 797°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 5.9 mm/min		8. WATER POLLUTION 8.1 Aquatic Toxicity: 110 ppm/24 hr/Brine Shrimp/TL ₅₀ 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 40% of theoretical in 5 days, fresh water 8.4 Food Chain Concentration Potential: Data not available																																					
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. Gulf Oil Corp. Gulf Oil Chemicals Co. Div. Cedar Bayou, Texas 77520 2. Monsanto Co. Monsanto Polymers & Petrochemicals Co. 800 North Lindbergh Blvd. St. Louis, Mo. 63166 3. Union Carbide Corp. Chemicals & Plastics Div. 270 Park Ave. New York, N.Y. 10017																																					
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-T-L		10 SHIPPING INFORMATION 10.1 Grades or Purity: Research grade, pure grade, technical grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arrester																																					
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>2</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poison</td><td>2</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>3</td></tr><tr><td>Aesthetic Effect</td><td>3</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table> 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>1st Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Rating	Fire	2	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poison	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	3	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	1 st Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 120.19 13.3 Boiling Point at 1 atm: 149.9°F = 65.5°C = 428.6°K 13.4 Freezing Point: -140.9°F = -96.1°C = 177.1°K 13.5 Critical Temperature: 676.2°F = 357.9°C = 631.1°K 13.6 Critical Pressure: 485.5 psi = 33.67 atm = 3.208 MN/m ² 13.7 Specific Gravity: 0.866 at 15°C (liquid) 13.8 Liquid Surface Tension: 28.2 dynes/cm = 0.0282 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 54.6 dynes/cm = 0.0546 N/m at 22.7° 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.09 13.12 Latent Heat of Vaporization: 134 Btu/lb = 31.6 cal/g = 3.16 x 10 ⁵ J/kg 13.13 Heat of Combustion: -17,710 Btu/lb = -8140 cal/g = -4120 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Rating																																						
Fire	2																																						
Health																																							
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NOTES																																							

(Continued on page 14 and 15)

REVISED 1978

CUMENE HYDROPEROXIDE

Common Synonyms alpha, alpha-Dimethylbenzene hydroperoxide Dimethylbenzyl hydroperoxide CHP Isopropylbenzene hydroperoxide Cumyl hydroperoxide		Liquid Sinks in water	Colorless to light yellow Sharp, irritating odor
Strong oxidizing agent. Keep peroxide away from heat, sparks, flames, and other sources of ignition. Do not mix with organic materials. Do not use in the absence of proper ventilation.			
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire Fight fires with foam, water, or dry chemical. Water may be effective on small fires. Do not use water on large fires.		
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause headache or coughing May cause dizziness or nausea LIQUID Irritating to skin and eyes Harmful if swallowed May cause dizziness or nausea If in eyes, flush with water for 15 min. If on skin, wash with soap and water. If swallowed, do not induce vomiting. Seek medical attention immediately.		
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Do not discharge into water bodies.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Issue warning: oxidizing material, water contaminant Mechanical containment should be removed Chemical and physical treatment		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: alpha, alpha-Dimethylbenzene hydroperoxide Dimethylbenzyl hydroperoxide Isopropylbenzene hydroperoxide Cumyl hydroperoxide, CHP 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₉ H ₁₂ (OOH)C ₉ H ₁₂ C ₉ H ₁₂ (C ₉ H ₁₁ O ₂) (mixture)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Sharp, irritant, aromatic	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained or airline breathing apparatus, solvent-resistant rubber gloves, chemical splash goggles, rubber apron, rubber or PVC clothing, full face shield. 5.2 Symptoms Following Exposure: Inhalation of vapor causes headache and burning throat. Liquid causes severe irritation of eyes on skin causes burning, throbbing sensation, irritation and blisters. Ingestion causes irritation of mouth and stomach. 5.3 Treatment for Exposure: Get medical attention after all exposures to this compound. INHALATION: remove victim and administer artificial respiration and oxygen if necessary. EYES: flush with water for 15 min. SKIN: wash several times with soap and water. treat as burn. INGESTION: induce vomiting and follow with gastric lavage. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 5 oral LD ₅₀ = 382 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			

6. FIRE HAZARDS 6.1 Flash Point: 147°F (64°C) 120°F (50°C) 6.2 Flammable Limits in Air: 0.9% - 6.5% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Toxic phenol vapors may form from hot material 6.6 Behavior in Fire: May decompose violently when heated. Burn rate becomes more rapid as fire burns. 6.7 Ignition Temperature: Decomposes violently at temperatures above 300°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Decomposition is catalyzed by metals such as aluminum, copper, brass, zinc, and lead. The reaction is not hazardous unless hot. 7.3 Stability During Transport: Stable if kept below 125°F and out of direct sunlight 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Hercules Incorporated Organics Department Wilmington, Del. 19899 2. Reichhold Chemicals, Inc. Specialty Chemicals Division P. O. Box 9405 Austin, Texas 78766 3. Allied Chemical Corporation Plastics Division P. O. Box 2365R Morristown, N. J. 07960								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T C X Y 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Organic Peroxide 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>4</td></tr> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	4	10. SHIPPING INFORMATION 10.1 Grades or Purity: ~85% the balance being cumene hydrocarbon 10.2 Storage Temperature: Below 125°F 10.3 Inert Atmosphere: No requirement 10.4 Venting: Containers must be stored in well ventilated area 13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Mixture 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: 16°F = -9°C = 264 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.03 at 25°C (liquids) 13.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C 13.9 Water-Water Interfacial Tension: (est.) 30 dynes/cm = 0.030 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (est.) -13,400 Btu/lb = -7,400 cal/g = -310 x 10 ³ J/kg 13.14 Heat of Decomposition: -655 Btu/lb = -425 cal/g = -19.9 x 10 ³ J/kg 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	2								
Reactivity (Yellow)	4								
3. CHEMICAL DESIGNATIONS (Cont'd) 3.4 UNCO/United Nations Numerical Designation: 5.2/1524									

CES

CUPRIETHYLENEDIAMINE SOLUTION

Common Synonyms		Liquid	Blue to dark purple	Fishy odor
		Sinks and mixes with water. Irritating vapor is produced.		
AVOID CONTACT WITH LIQUID. KEEP OFFICE AWAY FROM LIQUID. If you must work with this liquid, wear protective clothing. Do not breathe the vapor. Do not get liquid on your skin or clothes. If you get liquid on your skin or clothes, wash immediately with plenty of water.				
Fire	Not flammable. Irritating gases may be produced when heated.			
	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. If inhaled, move to fresh air. If in eyes, flush with water for at least 15 minutes. If swallowed, do not induce vomiting. Call physician. If swallowed, give large amounts of water. If swallowed, give large amounts of water. If swallowed, give large amounts of water.			
Exposure				
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Do not discharge into water.			
1. RESPONSE TO DISCHARGE (See Response Method Handbook, CG 446-4) Issue warning: corrosive water contaminant Restrict access Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cupriethylenediamine hydroxide solution 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $\text{Cu}(\text{OH})_2 \cdot \text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2 \cdot \text{H}_2\text{O}$ 3.4 MCO/United Nations Numerical Designation: 8-1761		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Blue or dark purple (May contain red or blue sediment) 4.3 Odor: Like ammonia, fishy		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, organic canister mask, rubber gloves, protective clothing 5.2 Symptoms Following Exposure: Inhalation of vapor irritates mucous membrane and may cause asthma. Liquid causes severe irritation of eyes and possible corneal injury. Contact with skin causes irritation. Ingestion causes irritation of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: remove from exposure, support respiration, call physician. EYES: irrigate with large quantities of water for at least 15 min., call physician. SKIN: wash with large amounts of water. INGESTION: give large amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation LC ₅₀ : Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Non flammable solution 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Irritating vapors of ethylenediamine may be produced when heated 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None									
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Dissolves cotton, wood and other cellulosic materials. Corrosive to copper, aluminum, zinc, and tin 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS Olin Corporation Lucas Paper Division Pough Forest, N.C. 28126									
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P Q		10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Nitrogen 10.4 Venting: Pressure/vacuum									
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>4</td></tr><tr><td>Flammability (Red)</td><td>4</td></tr><tr><td>Reactivity (Yellow)</td><td>2</td></tr></tbody></table>		Category	Classification	Health Hazard (Blue)	4	Flammability (Red)	4	Reactivity (Yellow)	2	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Mixture 13.3 Boiling Point at 1 atm (approx): 212°F = 100°C = 373°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity (est.) > 1.1 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Classification										
Health Hazard (Blue)	4										
Flammability (Red)	4										
Reactivity (Yellow)	2										
NOTES (Continued on p. 935 and 936)											

CYA

CYANOACETIC ACID

Common Synonyms Cyanacetic acid Malonic mononitrile		Liquid	Yellowish brown	Unpleasant odor
Sinks and mixes with water				
No significant data available for this chemical.				
Fire		Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE		
Exposure		VAPOR Irritating to eyes, nose and throat Harmful if inhaled LIQUID Irritating to skin and eyes Harmful if swallowed		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intake		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant Disperse and flush		2. LABELS No hazard label required by code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 31 Synonyms: Cyanacetic acid Malonic mononitrile 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: <chem>CNCH2COOH</chem> 34 IMCO/United Nations Numerical Designation: "Not listed"		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: White 43 Odor: Data not available		
5. HEALTH HAZARDS 51 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves 52 Symptoms Following Exposure: Contact irritates eyes and may irritate skin 53 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amounts of water, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Data not available 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam dry chemical carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen and toxic and flammable acetonitrile vapors may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1 Kay Eries Chemicals, Inc. 360 Lexington Ave. New York, N. Y. 10017 2 Eastman Organic Chemicals Rochester, N. Y. 14650 3 Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233									
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS		10. SHIPPING INFORMATION 10.1 Grades or Purity: 98+ % 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification*</th></tr><tr><td>Health Hazard (Blue)</td><td>0 3</td></tr><tr><td>Flammability (Red)</td><td>1 1</td></tr><tr><td>Reactivity (Yellow)</td><td>0 0</td></tr></table> *First column refers to nonfire situation		Category	Classification*	Health Hazard (Blue)	0 3	Flammability (Red)	1 1	Reactivity (Yellow)	0 0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 85.06 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 151°F = 66°C = 319°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: > 1.1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -5,400 Btu/lb = -1,500 cal/g = -146 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent	
Category	Classification*										
Health Hazard (Blue)	0 3										
Flammability (Red)	1 1										
Reactivity (Yellow)	0 0										
NOTES											

Continued on pages 2 and 3

CYG

CYANOGEN

Common Synonyms Ethane dinitrile Dicyan Oxalic acid dinitrile Oxalodinitrile Dicyanogen	Liquefied gas Colorless Almond Odor Floats and boils on water. Poisonous, flammable, visible vapor cloud is produced.
Fire	FLAMMABLE, POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
 Exposure	VAPOR POISONOUS IF INHALED. Irritating to eyes. LIQUID POISONOUS IF SWALLOWED. Will cause frostbite.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-2) Issue warning: poison, high flammability, air contaminant, water contaminant. Restrict access. Evacuate area.	2 LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethanedinitrile, Dicyan, Oxalic acid dinitrile, Oxalodinitrile, Dicyanogen. 3.2 Coast Guard Competitibility Classification: Not applicable. 3.3 Chemical Formula: (CN) ₂ . 3.4 IMO/United Nations Numerical Designation: 2/1026.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied, compressed gas. 4.2 Color: Colorless. 4.3 Odor: Characteristic almond-like, pungent, penetrating; may not be sufficiently strong to provide an adequate warning.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, rubber gloves, rubber protective clothing, rubber-soled shoes. 5.2 Symptoms Following Exposure: Vapor irritates eyes and causes giddiness, headache, fatigue, and nausea if inhaled. 5.3 Treatment for Exposure: In general, treatment is similar to that used following exposure to hydrogen cyanide. INHALATION: move victim to fresh air and have him lie down; do not permit him to exert himself; remove contaminated clothing but keep patient covered and comfortably warm; summon a physician; break an amyl nitrite pearl in a cloth and hold it tightly under the victim's nose for 15 seconds; repeat five times at about 15 sec. intervals; use artificial respiration if breathing has stopped. EYES: flush with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm. 5.5 Short-Term Inhalation Limits: 5 mg./m. for 30 min. (as cyanide). 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: Flammable gas. 6.2 Flammable Limits in Air: 6.6% - 43%. 6.3 Fire Extinguishing Agents: For fire burn, shut off flow of gas; cool exposed areas with water. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Unburned vapors are highly toxic. 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode in fire, releasing the highly toxic gas. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Watercourse Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction, but water provides heat to vaporize liquid cyanogen. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Matheson Gas Products, P. O. Box 85, East Rutherford, N. J. 07073. 2. Air Products and Chemicals, Inc., Specialty Gas Dept., P. O. Box 518, Allentown, Pa. 18105. 3. Union Carbide Corp., Linde Division, 270 Park Avenue, New York, N. Y. 10017.								
11 HAZARD ASSESSMENT CODE (See Hazardous Materials Handbook, CG 444-2) A B C D E M N	10. SHIPPING INFORMATION 10.1 Grade or Purity: 98.5%. 10.2 Storage Temperature: Cool ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Store containers in well-ventilated area.								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous, Class A. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table data-bbox="974 1496 1201 1583"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>4</td> </tr> <tr> <td>Flammability (Red)</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	4	Flammability (Red)	4	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas. 13.2 Molecular Weight: 52.0. 13.3 Boiling Point at 1 atm: -6.1°F = -21.1°C = 252.1°K. 13.4 Freezing Point: -18.2°F = -27.0°C = 246.3°K. 13.5 Critical Temperature: 259.9°F = 126.6°C = 399.8°K. 13.6 Critical Pressure: 557 psia = 56.2 atm = 5.91 MN/m. 13.7 Specific Gravity: 0.954 at -21°C (liq. rd). 13.8 Liquid Surface Tension: 22 dynes/cm = 0.022 N/m at -21°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 1.8. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.205 at 25°C. 13.12 Latent Heat of Vaporization: 200 Btu/lb = 111 cal/g = 4.65 × 10 ³ J/kg. 13.13 Heat of Combustion: -9.059 Btu/lb = -5.031 cal/g = -210.6 × 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 2.520 Btu/lb = 1.400 cal/g = 58.5 × 10 ³ J/kg. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	4								
Flammability (Red)	4								
Reactivity (Yellow)	2								
NOTES (Cont. read on pages 5 and 6)									

CBR

CYANOGEN BROMIDE

Common Synonyms	Solid crystals	Colorless	Penetrating odor
Sinks and mixes with water			
AVOID CONTACT WITH SOLID: Keep people away. Wear heavy protective suit with hood, gloves and respiratory apparatus. Wash exposed skin with soap and water. Notify authorities if exposed.			
Fire	Not flammable POISONOUS GASES ARE PRODUCED WHEN HEATED Wear heavy protective suit with hood, gloves and respiratory apparatus. Notify authorities if exposed.		
	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED Irritating to eyes Mildly Irritant Exposure to dusts may cause irritation to eyes. Exposure to dusts may cause irritation to skin. SOLIDS POISONOUS IF SWALLOWED Will burn skin and eyes Refractory to acids and alkalis Exposure to dusts may cause irritation to eyes. Exposure to dusts may cause irritation to skin. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Notify authorities if exposed. DO NOT INDUCE VOMITING		
Exposure			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Notify authorities if exposed. Notify people if exposed.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning - poison Restrict access Disperse and flush		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: BrCN 3.4 IMCO/United Nations Numerical Designation: 6.1 1889		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Colorless 4.3 Odor: Penetrating	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical cartridge respirator, goggles, protective clothing, rubber gloves 5.2 Symptoms Following Exposure: Same symptoms as hydrogen cyanide. Because it irritates the eyes, throat, and lungs severely, it is unlikely that anyone would voluntarily remain in areas with a high enough concentration to cause a cyanide effect. 5.3 Treatment for Exposure: Call a physician. INHALATION: remove victim's fresh air. If not breathing, give artificial respiration, preferably mouth to mouth. If symptoms of cyanide poisoning are observed, administer amyl nitrite as instructed for HCN. INGESTION: have victim drink water or milk, do NOT induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 ppm (suggested) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Workers exposed to solutions may develop dermatitis 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact, very injurious to the eyes. 5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Poison gases are produced in fire

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Strong bleaching powder solution let stand 24 hr

7.5 **Polymerization:** Does not occur

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterlow Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

- Apache Chemicals
Rockford, Ill. 61105
- Columbia Organic Chemicals, Inc.
912 Drake St.
Columbia, S.C. 29205
- Eastman Organic Chemicals Division
Rockwell, N.Y. 14609

10 SHIPPING INFORMATION

10.1 **Grade or Purity:** Data not available

10.2 **Storage Temperature:** Data not available

10.3 **Inert Atmosphere:** Data not available

10.4 **Venting:** Data not available

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-2)

11

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Poisonous liquid or solid, Class B

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	4
Liquid or Solid Irritant	4
Poison	4
Water Pollution	
Human Toxicity	4
Aquatic Toxicity	3
Aesthetic Effect	3
Reactivity	
Other Chemicals	1
Water	1
Self Reaction	1

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 93.97

13.3 **Boiling Point at 1 atm:** Not pertinent

13.4 **Freezing Point:** 120 to 124°C = 49 to 51°C = 122 to 124 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.01 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 1.6

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

Continued on page 50-24

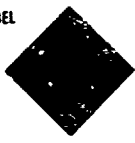
NOTES

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6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Overheated containers can explode 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8 WATER POLLUTION 8.1 Aquatic Toxicity: 608 ppm, 96 hr, killed fresh water. Duration not specified 8.2 Waterford Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Very slow reaction 7.2 Reactivity with Common Materials: Slow, not immediately hazardous 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Gallard Schwegler Chemical Manufacturing Corp. American Chemical Co. Division 284 Minnesota Ave. Quebec Place N.Y. 10114 2. Nisk Chemicals Inc. 5640 Moulton Road Memphis Tenn 38127
11 HAZARD ASSESSMENT CODE See HAZARD ASSESSMENT HANDBOOK, CG 446-3 A C 11 X 12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous gas or liquid, Class A 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	10 SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Data not available 10.4 Venting: Data not available 13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 64.05 13.3 Boiling Point at 1 atm: 55.1°C (131.2°F) 13.4 Freezing Point: 20°F = -6.7°C = 269.3°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.225 at 15°C (60°F) 13.8 Liquid Surface Tension: 24.6 dynes/cm = 0.0246 N/m at 10°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: 2.1 13.11 Ratio of Specific Heats of Vapor (Gas): 1.225 13.12 Latent Heat of Vaporization: 191.5 Btu/lb = 46.0 kcal/kg = 4.6 x 10⁵ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

CHX

CYCLOHEXANE

Common Synonyms Hexahydrobenzene	Physical State Liquid Color Colorless Odor Gasoline-like odor Boiling Point 98.4°C (209°F) Freezing Point -95.3°C (-140°F) Density 0.78 g/cm³ (49.1 lb/gal) Specific Gravity 0.78 (water = 1.0) Refractive Index 1.426 (20°C) Viscosity 0.10 cP (20°C)
Fire Flash Point -11°C (11°F) Flammable Limits in Air 1.1% - 8.4% Fire Extinguishing Agents Foam, carbon dioxide, dry chemical Fire Extinguishing Agents Not to be Used Not pertinent Special Hazards of Combustion Products Not pertinent Behavior in Fire Not pertinent Ignition Temperature 253°C (487°F) Electrical Hazard Data not available Burning Rate 4.9 mm/min	8 WATER POLLUTION 1 Aquatic Toxicity 15,000 ppm 24 hr. mosquito fish 11 m. fresh water 2 Waterfowl Toxicity Data not available 3 Biological Oxygen Demand (BOD) Data not available 4 Food Chain Concentration Potential None
Exposure FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area VAPOR Irritating to eyes, nose and throat If inhaled, will cause dizziness, nausea, vomiting or loss of consciousness LIQUID Irritating to skin and eyes Harmful if swallowed	9 SELECTED MANUFACTURERS 1. East Chemical Co. Houston, Texas 77001 2. Phillips Petroleum Co. Bartlesville, Okla. 74006 3. Texaco Inc. 135 East 42nd St. New York, N.Y. 10017
Water Pollution Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes	10 SHIPPING INFORMATION 10.1 Grades or Purity: Research grades 99.9% - 99.99% Commercial 99.9% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arresters or pressure vacuum)
1 RESPONSE TO DISCHARGE See Response Methods Handbook CG 446-4 Issue warning - High flammability Evaluate area Disperse and flush	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Hexahydrobenzen Hexamethylene Hexamaphilene 3.2 Coast Guard Compatibility Classification Paraffin 3.3 Chemical Formula: C ₆ H ₁₂ 3.4 IMCO United Nations Numerical Designation: 3.1 1145	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Resembling benzene mild, sweet, resembling chloroform
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Hydrocarbon vapor cartridge supplied air or line mask, hydrocarbon resistant rubber or plastic gloves, chemical goggles, face splash shield, hydrocarbon impervious rubber or plastic cap 5.2 Symptoms Following Exposure: Dizziness, headache and sore throat. If inhaled, vapor may cause unconsciousness and collapse 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air or breathing apparatus, apply artificial respiration and administer oxygen. SKIN OR EYE CONTACT: Remove contaminated clothing and gently flush affected areas with water for 15 minutes at a minimum 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limit: 400 ppm for 60 min 5.6 Toxicity by Ingestion: Grade 3, LD ₅₀ 5 to 6 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system at very high concentrations. The effect is temporary 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause smothering and reddening of the skin 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: -11°C (11°F) 6.2 Flammable Limits in Air: 1.1% - 8.4% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 253°C (487°F) 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 4.9 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity 15,000 ppm 24 hr. mosquito fish 11 m. fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. East Chemical Co. Houston, Texas 77001 2. Phillips Petroleum Co. Bartlesville, Okla. 74006 3. Texaco Inc. 135 East 42nd St. New York, N.Y. 10017																																				
11. HAZARD ASSESSMENT CODE See Material Safety Data Book CG 446-3 A-T-C-A-W	10 SHIPPING INFORMATION 10.1 Grades or Purity: Research grades 99.9% - 99.99% Commercial 99.9% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arresters or pressure vacuum)																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="892 1465 1127 1738"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>4</td></tr> <tr> <td>Health</td><td>1</td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td>1</td></tr> <tr> <td>Human Toxicity</td><td>1</td></tr> <tr> <td>Acute Toxicity</td><td>2</td></tr> <tr> <td>Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td>0</td></tr> <tr> <td>Other Chemicals</td><td>0</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="892 1749 1127 1847"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	4	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution	1	Human Toxicity	1	Acute Toxicity	2	Aesthetic Effect	2	Reactivity	0	Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 98.15 13.3 Boiling Point at 1 atm: 98.4°C (209.1°F) 13.4 Freezing Point: -95.3°C (-140.5°F) 13.5 Critical Temperature: 254.1°C (487.4°F) 13.6 Critical Pressure: 40.0 atm (2980 mm Hg) 13.7 Specific Gravity: 0.78 (water = 1.0) 13.8 Liquid Surface Tension: 24.1 dyne/cm (20°C) 13.9 Liquid-Water Interfacial Tension: 50 dyne/cm (20°C) 13.10 Vapor (Gas) Specific Gravity: 2.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1 13.12 Latent Heat of Vaporization: 35.5 kJ/mol (8.4 kcal/mol) 13.13 Heat of Combustion: -3944 kJ/mol (944.5 kcal/mol) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	4																																				
Health	1																																				
Vapor Irritant	1																																				
Liquid or Solid Irritant	1																																				
Poisons	2																																				
Water Pollution	1																																				
Human Toxicity	1																																				
Acute Toxicity	2																																				
Aesthetic Effect	2																																				
Reactivity	0																																				
Other Chemicals	0																																				
Water	0																																				
Self Reaction	0																																				
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Flammability (Red)	3																																				
Reactivity (Yellow)	0																																				
NOTES																																					

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CYCLOHEXANOL

Common Synonyms Hexanol Hexylalcohol Cyclohexyl alcohol Hydroxycyclohexane	Only liquid Colorless to light yellow Alcohol odor Floats and mixes slowly with water. May solidify. Freezing point is 75°F.
Fire	Combustible
Exposure	LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4. Disperse and flush.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Adronal Anol Cyclohexyl alcohol Hexanol Hexylalcohol Hydroxycyclohexane 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: $C_6H_{12}O$ 3.4 IPCO-United Nations Numerical Designation: Not listed.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as received): Solid or liquid 4.2 Color: Colorless to faintly yellow 4.3 Odor: Like camphor
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield. 5.2 Symptoms Following Exposure: Nausea, depression of the central nervous system, tending to produce sleep or unconsciousness. 5.3 Treatment for Exposure: Eye contact is more hazardous than inhalation; skin irritation on ingestion. Flush eyes with water and remove clothing. Wash skin with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not specified. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2. LD ₅₀ 0.5 to 1 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes on respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes some temporary skin and first degree burns on short exposure and may cause severe burns on long exposure. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 100°F (38°C) (154°F) (CC) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide or dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 572°F. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 3.9 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 0.08 lb/lb 5 days. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Specialty Chemicals Division Hempstead, Va. 23060. 2. Monsanto Co. Monsanto Industrial Chemicals Co. St. Louis, Mo. 63166. 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017.																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.5. APQTU	10. SHIPPING INFORMATION 10.1 Grade or Purity: Technical pure. 10.2 Storage Temperature: Data not available. 10.3 Inert Atmosphere: Data not available. 10.4 Var. Temp.: Data not available.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="985 1487 1224 1749"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>1</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td> Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>1</td></tr> <tr> <td> Aquatic Toxicity</td><td>1</td></tr> <tr> <td> Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>2</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="985 1760 1224 1847"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 98.16. 13.3 Boiling Point at 1 atm: 172.1°F (78.4°C) (434°F). 13.4 Freezing Point: 75.0°F (23.9°C) (295.1°F). 13.5 Critical Temperature: 466.1°F (241.2°C) (455.4°F). 13.6 Critical Pressure: 540 psia = 37 atm = 4.755 MN/m ² . 13.7 Specific Gravity: 0.967 at 20°C (liquids). 13.8 Liquid Surface Tension: 34.2 dynes/cm = 0.0442 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 3.5 dynes/cm = 0.0039 N/m at 25°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.071. 13.12 Latent Heat of Vaporization: 106 Btu/lb (109 cal/g) = 4.56 x 10 ³ J/kg. 13.13 Heat of Combustion: 16,000 Btu/lb 5910 cal/g = 373 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	1																																				
Liquid or Solid Irritant	2																																				
Poisons	1																																				
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Aquatic Toxicity	1																																				
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Reactivity (Yellow)	0																																				
NOTES																																					

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CYCLOHEXANONE

Common Synonyms Cyclohexyl ketone		Watery liquid	Colorless to light yellow	Sweet, peppermint odor
		Floats and mixes slowly with water		
As a solvent, cyclohexanone is used in the manufacture of plastics, dyes, and pharmaceuticals. It is also used in the production of synthetic rubber and in the treatment of wood preservatives.				
Fire		Combustible		
Exposure		LIQUID Will burn skin and eyes Harmful if swallowed May be dangerous if it enters water intakes		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		

1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-4 Disperse and flush	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: None Cyclohexyl ketone Hydrol O Naloxone Pemoloxone Naloxone Ketone 3.2 Coast Guard Compatibility Classification: Ketone 3.3 Chemical Formula: $C_6H_{10}O$ 3.4 IMCO United Nations Numerical Designation: 11, 1915	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light yellow 4.3 Odor: Sweet, peppermint and acetone

5. HEALTH HAZARDS	
5.1 Personal Protective Equipment: Chemical goggles 5.2 Symptoms Following Exposure: Irritation of vapors from the mouth of canisters. Asthma. The liquid may cause dermatitis. 5.3 Treatment for Exposure: Immediately flush eyes with plenty of water, call a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 50 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion, Grade 2 LD ₅₀ : 5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will usually tolerate moderate to high vapor concentrations. 5.9 Liquid or Solid Characteristics: A colorless, slightly oily and non-flammable liquid with a sweet, peppermint and acetone odor. 5.10 Odor Threshold: 0.22 ppm	

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: 129°F (54°C) (TCC)	8.1	Aquatic Toxicity: Data not available
6.2	Flammable Limits in Air: 1.1-11.1	8.2	Waterfowl Toxicity: Data not available
6.3	Fire Extinguishing Agents: Use dry chemical or carbon dioxide	8.3	Biological Oxygen Demand (BOD): Data not available
6.4	Fire Extinguishing Agents Not to be Used: Not pertinent	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: Not pertinent		
6.6	Behavior in Fire: Not pertinent	9 SELECTED MANUFACTURERS	
6.7	Ignition Temperature: 740°F	Allied Chemical Corp. Specialty Chemicals Dept. Hupont Avenue Wilmington, Delaware 19880	
6.8	Electrical Hazard: Data not available	2	E. I. du Pont de Nemours & Co. Industrial & Biochemical Dept. Wilmington, Delaware 19880
6.9	Burning Rate: 4.2 mm/min	3	Monsanto Co. Monsanto Industrial Chemicals 800 North Lindbergh Blvd. St. Louis, Missouri 63106
7 CHEMICAL REACTIVITY			
7.1	Reactivity with Water: No reaction		
7.2	Reactivity with Common Materials: No reaction		
7.3	Stability During Transport: Stable		
7.4	Neutralizing Agents for Acids and Bases: Not pertinent		
7.5	Polymerization: Not pertinent		
7.6	Inhibitor of Polymerization: Not pertinent		
		10 SHIPPING INFORMATION	
		10.1	Grades or Purity: Technical, 99%
		10.2	Storage Temperature: Data not available
		10.3	Inert Atmosphere: Data not available
		10.4	Venting: Data not available
11. HAZARD ASSESSMENT CODE		13 PHYSICAL AND CHEMICAL PROPERTIES	
See Hazard Assessment Handbook, CG 444-3		13.1 Physical State at 15°C and 1 atm: Liquid	
APQT1		13.2 Molecular Weight: 98.15	
		13.3 Boiling Point at 1 atm: 129.24°C = 266.63°F = 299.39°K	
		13.4 Freezing Point: -24.21°C = -11.18°F = 249.04°K	
		13.5 Critical Temperature: 273.1°C = 521.58°F = 299.39°K	
		13.6 Critical Pressure: 50.00 atm = 5.06 MPa = 72.91 kg/cm ²	
		13.7 Specific Gravity: 0.945 at 20°C (water)	
		13.8 Liquid Surface Tension: 24.0 dyne/cm = 0.024 N/m at 20°C	
		13.9 Liquid-Water Interfacial Tension: 90 dyne/cm = 0.090 N/m at 22.7°C	
		13.10 Vapor (Gas) Specific Gravity: Not listed	
		13.11 Ratio of Specific Heats of Vapor (Gas): 1.04	
		13.12 Latent Heat of Vaporization: 61.0 kJ/mol = 14.5 kcal/mol	
		13.13 Heat of Combustion: -15.4 kJ/mol = -3.65 kcal/mol	
		13.14 Heat of Decomposition: Not pertinent	
		13.15 Heat of Solution: Not pertinent	
		13.16 Heat of Polymerization: Not pertinent	
		6. Continued on page 10-2	
12. HAZARD CLASSIFICATIONS			
12.1	Code of Federal Regulations: Combustible Liquid		
12.2	NAS Hazard Rating for Bulk Water Transportation:		
	Category	Rating	
	Fire	2	
	Health		
	Vapor Irritant	3	
	Liquid or Solid Irritant	2	
	Poison	1	
	Water Pollution		
	Human Toxicity	1	
	Aquatic Toxicity	1	
	Aesthetic Effect	2	
	Reactivity		
	Other Chemicals	2	
	Water	0	
	Self Reaction	0	
12.3	NFPA Hazard Classifications: Not listed		
NOTES			

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CYCLOHEXANONE PEROXIDE

Common Synonyms 1-Hydroperoxycyclohexyl 1-hydroperoxycyclohexyl peroxide Hydroperoxycyclohexyl hydroperoxycyclohexyl peroxide Dicyclohexanone diperoxide		Thick liquid	White	Odorless
		Sinks in water		
Fire		Combustible Containers may explode in fire		
Exposure		LIQUID Irritating to skin and eyes Harmful if swallowed		
Water Pollution		Effect of low concentrations on aquatic life is unknown Foaming to shoreline May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - oxidizing material water contamination Mechanical treatment Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Hydroperoxycyclohexyl hydroperoxycyclohexyl peroxide; Hydro- peroxycyclohexyl hydroperoxycyclohexyl peroxide; Cadot HDP; Lupercol JDB- 50-T; Dicyclohexanone diperoxide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: <chem>C12H20O3</chem> ; <chem>C12H20O3</chem> ; dioxetane <i>(Continued on page 4)</i>		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid or paste 4.2 Color: Colorless to white 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield; rubber gloves; protect ventilation 5.2 Symptoms Following Exposure: Irritates eyes and skin on contact; ingestion causes irritation in mouth and stomach 5.3 Treatment for Exposure: If eyes flushed with water for at least 15 min.; per medical attention; SKIN wiper flush and wash with soap and water; per medical attention; if swallowed, DO NOT INDUCE VOMITING; per medical attention 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limit: Not pertinent 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ = 1.5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapo (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS

- 6.1 Flash Point: Combustible vapor
155°F (57°C) (distillate)
6.2 Flammable Limits in Air: Not pertinent
6.3 Fire Extinguishing Agents: Water foam
Dry chemical; carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used:
Not pertinent
6.5 Special Hazards of Combustion Products:
Not pertinent
6.6 Behavior in Fire: May explode
6.7 Ignition Temperature: 700°F (371°C)
perhalate
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Data not available

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials:
No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and
Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization:
Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
8.2 Waterford Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD):
Data not available
8.4 Food Chain Concentration Potential:
None

9. SELECTED MANUFACTURERS

- Pennwalt Corporation
Lewiston Division
P.O. Box 1045
Buffalo, N.Y. 14241
Dun Industries Inc.
Aries Chemical Division
555 Garden Street
Lima, Ohio 43035
Norton Chemical Corp.
480 Agard Road
Merriden, Conn. 06445

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: 25% pure with
distillate
10.2 Storage Temperature: Not pertinent
10.3 Inert Atmosphere: Not pertinent
10.4 Venting: Open to atmosphere

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A1 (X)

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations:
Organic Peroxide
12.2 HAS Hazard Rating for Bulk Water
Transportation: Not listed
12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
or liquid
13.2 Molecular Weight: Mixture
13.3 Boiling Point at 1 atm: 180°C (approx)
13.4 Freezing Point: Not pertinent
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 1.05 at 20°C (approx)
13.8 Liquid Surface Tension: 28 dyne/cm at 20°C
13.9 Liquid-Water Interfacial Tension: 18 dyne/cm at 20°C
13.10 Vapor (Gas) Specific Gravity:
Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas)
Not pertinent
13.12 Latent Heat of Vaporization:
Not pertinent
13.13 Heat of Combustion: 10,000 Btu/lb (approx)
13.14 Heat of Decomposition:
Data not available
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

3 CHEMICAL DESIGNATIONS (Cont'd)

- 3.4 IMCO/United Nations Numerical Designation: 1001 (1) 709; 5.2 (525) (1) 709

CHT

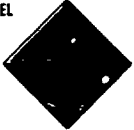
CYCLOHEXYLTRICHLOROSILANE

Chemical Synonyms Liquid Colorless Sharp irritating odor Reacts with water. Poisonous gas is produced on contact with water.	
Fire Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Irritating to eyes, nose and throat	
 Exposure GAS PRODUCED IN REACTION WITH WATER POISONOUS IF INHALED Irritating to eyes, nose and throat LIQUID: Will burn skin, and eyes. Harmful if swallowed	
Water Pollution Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods, Handbook, CG 688-4.) Evacuate area. CONTAINMENT. Reentry allowed. Dispense and flush with care.	2. LABEL  CORROSIVE
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $C_6H_{11}Cl_3Si$ 3.4 IMCO/United Nations Numerical Designation: 1.1762	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sharp hydrochloric acid like pungent and irritating
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Avoid exposure to respiratory tract; gloves, apron, goggles, other protective equipment as needed to protect skin and eyes. 5.2 Symptoms Following Exposure: Inhalation causes irritation of mucous membranes. Contact with eyes or skin causes severe burns. Ingestion causes severe irritation of mouth and stomach. 5.3 Treatment for Exposure: Get medical attention immediately following all exposures. If this compound INHALED, remove from exposure, support respiration. EYES: Flush with water for 15 min. SKIN: Flush with water. INGESTION: Give large amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 2,850 mg/kg rats. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: $> 200^\circ F (93^\circ C)$ 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Irritating to eyes, nose and throat; hydrochloric acid. 6.6 Behavior in Fire: Decomposes to form hydrogen chloride, carbon monoxide, carbon dioxide, and water. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterlow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: Not pertinent.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently with water to produce hydrogen chloride and silane. 7.2 Reactivity with Common Materials: Does not react with acids, bases, or oxidizing agents. Reacts with water to produce hydrogen chloride and silane. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water. Neutralize with weak acid. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Data not available. Data not available. Data not available.
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 688-3. A 0	10. SHIPPING INFORMATION 10.1 Grades or Purities: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not required. 10.4 Venting: Pressure vessel.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not pertinent. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not pertinent. 12.3 NFPA Hazard Classifications: Not rated.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at $15^\circ C$ and 1 atm: Liquid. 13.2 Molecular Weight: 215.6. 13.3 Boiling Point at 1 atm: $> 300^\circ F (> 149^\circ C) > 422^\circ F$. 13.4 Freezing Point: $< 177^\circ F (< 75^\circ C) < 328^\circ F$. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.6 at $20^\circ C$ (liquid). 13.8 Liquid Surface Tension: < 25 dynes/cm at $20^\circ C$. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: < 75 Btu/lb. < 31 cal/gm. $< 3.1 \times 10^3$ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.
NOTES Data continued on pages 3 and 4.	

CHA

CYCLOHEXYLAMINE

Common Synonyms Aminocyclohexane Hexahydroaniline	Liquid Colorless Strong fishy odor Floats and mixes with water
Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Flashback may occur if ignited in an enclosed area Vapor may explode if ignited in an enclosed area
Exposure	LIQUID Will burn if in eyes Harmful if swallowed Harmful if inhaled Harmful if absorbed through skin Harmful if in contact with water Harmful if in contact with acids Harmful if in contact with alkalis Harmful if in contact with oxidizing agents Harmful if in contact with reducing agents Harmful if in contact with strong acids Harmful if in contact with strong alkalis Harmful if in contact with strong oxidizing agents Harmful if in contact with strong reducing agents
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not a pollutant Not a pollutant
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms Aminocyclohexane Hexahydroaniline 3.2 Coast Guard Compatibility Classification Aliphatic amine 3.3 Chemical Formula: $C_6H_{11}N$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Strong fishy
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, chemical goggles, approved Bureau of Mines respirator for organic vapors 5.2 Symptoms Following Exposure: Cyclohexylamine is strongly caustic. Inhalation of vapors and contact of liquid with skin and eyes causes severe burns 5.3 Treatment for Exposure: INGESTION: do NOT induce vomiting. EYES: flush with water for at least 15 min. and obtain immediate medical attention. SKIN: immediately remove contaminated clothing and flush skin with large amounts of water 5.4 Toxicity by Inhalation (Threshold Limit Value): 300 mg/m ³ 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 50 to 500 mg/kg 5.7 Late Toxicity: Produced cancer of the bladder in the rat 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant (causes second and third degree burns on short contact; very injurious to the eyes) 5.10 Odor Threshold: Data not available	

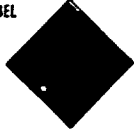
6. FIRE HAZARDS 6.1 Flash Point: 90°F (3°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 560°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 5.0 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Abbott Laboratories Chemical Division Wichita, Kansas 67200 2. Monsanto Co. Monsanto Industrial Chemicals Co. 800 North Lindbergh Blvd. St. Louis, Mo. 63166 3. Virginia Chemicals Inc. 3340 West Norfolk Rd. Portsmouth, Virginia 23703								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A-P-Q	10. SHIPPING INFORMATION 10.1 Grade or Purity: Data not available 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Data not available 10.4 Venting: Data not available								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table data-bbox="971 1448 1219 1526"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 99.18 13.3 Boiling Point at 1 atm: 274.1°F = 134.5°C = 407.7°K 13.4 Freezing Point: 0.1°F = -17.7°C = 255.5°K 13.5 Critical Temperature: 648°F = 342°C = 615°K 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.865 at 20°C (liquids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 158 Btu/lb = 87.6 cal/g = 3.67 × 10 ³ J/kg 13.13 Heat of Combustion: (est.) 4 Btu/lb = -10,000 cal/g = -420 × 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: (est.) 4 Btu/lb = -2 cal/g = -0.1 × 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	3								
Reactivity (Yellow)	0								
NOTES									

Continued on pages 5 and 6

REVISED 1978

CYP

CYCLOPENTANE

Common Synonyms Pentamethylene	Colorless Mild, sweet odor Floats on water. Flammable, irritating vapor is produced.
Physical State Vapor Boiling point: 49.3°C (120.7°F) Freezing point: -130.0°C (-192.0°F) Density: 0.62 g/cm³ (37.5 lb/cu ft) Vapor density: 2.0 (air = 1) Solubility: Insoluble in water	Flammability Flash point: -20°C (-4°F) Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Extinguish with dry chemical, carbon dioxide, or foam Water may be ineffective
Fire	FLAMMABLE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Extinguish with dry chemical, carbon dioxide, or foam Water may be ineffective
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause dizziness, nausea, vomiting, difficult breathing or loss of consciousness Remove to fresh air If in eyes, flush with water for 15 min If in mouth, do not induce vomiting If SWALLOWED, do not induce vomiting LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing Flush affected areas with plenty of water If IN EYES, hold eye closed and pour water over eye If SWALLOWED, do not induce vomiting DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes Not readily biodegradable Not biodegradable in the water column
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-3) Issue warning - high flammability Evacuate area Disperse and flush	2. LABEL 
3 CHEMICAL DESIGNATIONS 31 Synonyms: Pentamethylene 32 Coast Guard Compatibility Classification: Saturated hydrocarbon 33 Chemical Formula: C ₅ H ₁₀ 34 IMCO/United Nations Numerical Designation: 311146	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Like gasoline, mild, sweet
5 HEALTH HAZARDS 51 Personal Protective Equipment: Hydrocarbon canister, supplied air, or hose mask, rubber or plastic gloves, chemical goggles or face shield 52 Symptoms Following Exposure: Inhalation causes dizziness, nausea, and vomiting; concentrated vapor may cause unconsciousness and collapse. Vapor causes slight stinging of eyes. Contact with liquid causes irritation of eyes and may irritate skin if allowed to remain. Ingestion causes irritation of stomach. Aspiration produces severe lung irritation and rapidly developing pulmonary edema, central nervous system excitement followed by depression. 53 Treatment for Exposure: INHALATION: remove to fresh air; if breathing stops, apply artificial respiration and administer oxygen. EYES: flush with water for at least 15 min; call a physician. SKIN: flush well with water; then wash with soap and water. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. ASPIRATION: induce rest; give oxygen; get medical attention. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: 300 ppm for 60 min 56 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 to 5 g/kg 57 Lets Toxicity: None 58 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 59 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 510 Odor Threshold: Data not available	

6 FIRE HAZARDS 61 Flash Point: <20°C (-4°F) 62 Flammable Limits in Air: (approx.) 1.1% - 8.7% 63 Fire Extinguishing Agents: Dry chemical foam, carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Containers may explode 67 Ignition Temperature: 716°C 68 Electrical Hazard: Not pertinent 69 Burning Rate: 7.9 mm/min	8. WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterway Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Phillips Petroleum Company Chemical Department Special Products Division Bartlesville, Okla. 74004 2 Aldrich Chemical Co. 940 West St. Paul Avenue Milwaukee, Wis. 53233 3 Platts & Bauer, Inc. 126-04 Northern Boulevard Flushing, N. Y. 11368																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-3) A T U-V-W	10 SHIPPING INFORMATION 101 Grades or Purities: Commercial 99% (remainder consists of hydrocarbons of similar boiling points). Research 99+ 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Pressure-vacuum																																				
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable liquid 122 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="892 1444 1139 1724"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>1</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>1</td></tr> <tr><td>Liquid or Solid Irritant</td><td>1</td></tr> <tr><td>Poisons</td><td>1</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>2</td></tr> <tr><td>Aquatic Toxicity</td><td>1</td></tr> <tr><td>Aesthetic Effect</td><td>0</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>2</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self Reaction</td><td>0</td></tr> </tbody> </table> 123 NFPA Hazard Classifications: <table data-bbox="892 1735 1139 1821"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>1</td></tr> <tr><td>Flammability (Red)</td><td>3</td></tr> <tr><td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	2	Aquatic Toxicity	1	Aesthetic Effect	0	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: 70.1 133 Boiling Point at 1 atm: 120.7°F = 49.3°C = 322.5°K 134 Freezing Point: -130.0°F = -93.9°C = -179.3°K 135 Critical Temperature: 461.5°F = 238.6°C = 511.8°K 136 Critical Pressure: 654 psia = 44.4 atm = 4.51 MN/cm² 137 Specific Gravity: 0.74 at 20°C (liquid) 138 Liquid Surface Tension: 23 dynes/cm = 0.023 N/m at 20°C 139 Liquid-Water Interfacial Tension (est): 28 dynes/cm = 0.028 N/m at 20°C 1310 Vapor (Gas) Specific Gravity: 2.4 1311 Ratio of Specific Heats of Vapor (Gas): 1.1217 1312 Latent Heat of Vaporization: 170 Btu/lb = 94 cal/g = 3.9 x 10³ J/kg 1313 Heat of Combustion: -19,900 Btu/lb = -11,110 cal/g = -465 x 10³ J/kg 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	1																																				
Liquid or Solid Irritant	1																																				
Poisons	1																																				
Water Pollution																																					
Human Toxicity	2																																				
Aquatic Toxicity	1																																				
Aesthetic Effect	0																																				
Reactivity																																					
Other Chemicals	2																																				
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NOTES (Continued on pages 6 and 8)																																					

CPR

CYCLOPROPANE

Common Synonyms Trimethylene		Liquefied gas	Colorless	Mild sweet odor
		Floats and boils on water. Flammable visible vapor cloud is produced		
NEVER use cyclopropane in a confined space. It is extremely flammable and can explode. It is also a simple asphyxiant. It can displace oxygen in the air and cause suffocation. It is also a potent anesthetic and can cause unconsciousness. It is also a potent irritant and can cause severe burns. It is also a potent carcinogen and can cause cancer. It is also a potent mutagen and can cause mutations. It is also a potent teratogen and can cause birth defects. It is also a potent embryotoxin and can cause embryonic death. It is also a potent fetotoxicant and can cause fetal death. It is also a potent reproductive toxicant and can cause reproductive failure. It is also a potent developmental toxicant and can cause developmental abnormalities. It is also a potent immunotoxicant and can cause immunosuppression. It is also a potent neurotoxicant and can cause neurological damage. It is also a potent hepatotoxicant and can cause liver damage. It is also a potent nephrotoxicant and can cause kidney damage. It is also a potent cardiotoxicant and can cause heart damage. It is also a potent hematotoxicant and can cause blood damage.				
Fire	FLAMMABLE Containers may explode in fire. Flashback also vapor trail may occur. Vapor may explode if ignited in an enclosed area.			
Exposure	VAPOR If inhaled will cause difficult breathing. LIQUID Will cause frostbite.			
Water Pollution	Not harmful to aquatic life.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability. Restrict access. Evacuate area.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Trimethylene 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₃ H ₆ 3.4 IMCO/United Nations Numerical Designation: 1027		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied gas 4.2 Color: Colorless 4.3 Odor: Sweet, slightly pungent, not irritating characteristic odor, like light petroleum solvent.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus for high concentrations of vapor; safety goggles or face shield. 5.2 Symptoms Following Exposure: Inhalation causes some analgesia, anesthesia, pupil dilation, shallow depth of respirations, decreasing muscle tone. Contact with liquid may cause frostbite. 5.3 Treatment for Exposure: INHALATION: remove promptly to fresh air; if symptoms of asphyxiation persist, administer artificial respiration and oxygen; treat symptomatically thereafter. SKIN: if frostbite has occurred, apply warm water; treat burn. 5.4 Toxicity by Inhalation (Threshold Limit Value): 400 ppm (suggested) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZPROS 6.1 Flash Point: Flammable gas 6.2 Flammable Limits in Air: 2.4 to 10.1% 6.3 Fire Extinguishing Agents: Shut off flow of gas 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Containers may explode 6.7 Ignition Temperature: 532°F 6.8 Electrical Hazard: Class I, Group C 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Airco, Inc. Ohio Medical Products Division 3040 Airco Drive Madison, Wis. 53701 2. Matheson Gas Products Co. East Rutherford, N.J. 07073 3. Air Products and Chemicals, Inc. Specialty Gas Department P.O. Box 538 Allentown, Pa. 18105									
		10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.5+%, USP 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief									
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-B-C-D-E-F-G		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 42.1 13.3 Boiling Point at 1 atm: -27.2°F = -32.9°C = 240.3°K 13.4 Freezing Point: -197.3°F = -127.4°C = 145.8°K 13.5 Critical Temperature: 246.5°F = 124.7°C = 397.9°K 13.6 Critical Pressure: 798 psia = 54.2 atm = 5.50 MN/m ² 13.7 Specific Gravity: 0.676 at -33°C (liquid) 13.8 Liquid Surface Tension: 22 dynes/cm = 0.022 N/m at -40°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.48 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1790 13.12 Latent Heat of Vaporization: 203 Btu/lb = 112 cal/g = 4.73 × 10 ³ J/kg 13.13 Heat of Combustion: -21,247 Btu/lb = -11,804 cal/g = -493.88 × 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>4</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	4	Reactivity (Yellow)	0		
Category	Classification										
Health Hazard (Blue)	1										
Flammability (Red)	4										
Reactivity (Yellow)	0										
NOTES											

CMP

p-CYMENE

Common Synonyms p-Isopropyltoluene 1-Methyl-4-isopropylbenzene Cymol Methylpropylbenzene Isopropyltoluol		Liquid Floats on water	Colorless Mild pleasant odor
Physical Properties Boiling Point: 151°C (324°F) Melting Point: -90°C (-130°F) Density: 0.852 g/cm³ (20°C) Vapor Pressure: 10 mm Hg at 20°C			
Fire	Combustible Flash point with closed cup: 117°F (42°C) Autoignition temperature: 500°F (260°C) Minimum ignition energy: 0.02 mJ		
Exposure	Irritating to skin and eyes LIQUID Irritating to skin and eyes Repeated contact with the eyes may cause severe irritation. If in eyes, flush with water for 15 min. If INGESTED, do not induce vomiting. Seek medical attention. If SWALLOWED, do not induce vomiting. Seek medical attention.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Not recommended for use in water treatment.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cymol, p-Isopropyltoluene, Isopropyltoluol, 1-Methyl-4-isopropylbenzene, Methylpropylbenzene 3.2 Coast Guard Compatibility Classification: Aromatic hydrocarbon 3.3 Chemical Formula: p-CH ₃ C ₆ H ₄ CH(CH ₃) ₂ 3.4 IMCO/United Nations Numerical Designation: 113, 204		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild pleasant aromatic solvent type	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self contained or air-line breathing apparatus, solvent resistant rubber gloves, chemical splash goggles 5.2 Symptoms Following Exposure: Inhalation causes impairment of coordination, headache. Contact with liquid causes mild irritation of eyes and skin. Ingestion causes irritation of mouth and stomach 5.3 Treatment for Exposure: INHALATION: remove victim from contaminated area, administer artificial respiration if necessary, call physician. EYES: flush with water for 15 min., call a physician. SKIN: wipe off liquid, wash well with soap and water. INGESTION: induce vomiting, get medical attention 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, oral rat LD ₅₀ = 4,750 mg/kg. Oral human TD ₅₀ (lowest toxic dose) = 56 mg/kg (affects central nervous system) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smothering or irritation to skin 5.10 Odor Threshold: Data not available			

6. FIRE HAZARDS

- 6.1 **Flash Point:** 140°F (60°C) 117°F (42°C)
- 6.2 **Flammable Limits in Air:** 0.7% - 6%
- 6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide
- 6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
- 6.5 **Special Hazards of Combustion Products:** Not pertinent
- 6.6 **Behavior in Fire:** Not pertinent
- 6.7 **Ignition Temperature:** 517°F
- 6.8 **Electrical Hazards:** Data not available
- 6.9 **Burning Rate:** 6.1 mm/min

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
- 8.2 **Waterflow Toxicity:** Data not available
- 8.3 **Biological Oxygen Demand (BOD):** Data not available
- 8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

- 1. Hercules Incorporated
Organics Department
Wilmington, Del. 19899
- 2. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N. Y. 14650
- 3. Aldrich Chemical Co.
940 West St. Paul Avenue
Milwaukee, Wis. 53233

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
- 7.2 **Reactivity with Common Materials:** No reaction
- 7.3 **Stability During Transport:** Stable
- 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 7.5 **Polymerization:** Not pertinent
- 7.6 **Inhibitor of Polymerization:** Not pertinent

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** 95+%
- 10.2 **Storage Temperature:** Ambient
- 10.3 **Inert Atmosphere:** No requirement
- 10.4 **Ventilating:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
A-T-L

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed
- 12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	0
Liquid or Solid Irritant	1
Poison	0
Water Pollution	
Human Toxicity	
Aquatic Toxicity	1
Acute Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 NFPA Hazard Classifications.

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid
- 13.2 **Molecular Weight:** 134.2
- 13.3 **Boiling Point at 1 atm:** 151°C = 324°F = 450°K
- 13.4 **Freezing Point:** -90.2°C = -67.9°F = 205°K
- 13.5 **Critical Temperature:** Not pertinent
- 13.6 **Critical Pressure:** Not pertinent
- 13.7 **Specific Gravity:** 0.852 at 20°C (liquid)
- 13.8 **Liquid Surface Tension:** 28.09 dynes/cm = 0.0289 N/m at 20°C
- 13.9 **Liquid-Water Interfacial Tension:** 36.41 dynes/cm = 0.03641 N/m at 20°C
- 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 13.11 **Refractive Index of Vapor (Gas):** Not pertinent
- 13.12 **Latent Heat of Vaporization:** 122 Btu/lb = 67.8 kcal/g = 2.84 × 10⁵ J/kg
- 13.13 **Heat of Combustion:** -18,800 Btu/lb = -10,470 cal/g = -43 × 10³ J/g
- 13.14 **Heat of Decomposition:** Not pertinent
- 13.15 **Heat of Solution:** Not pertinent
- 13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

DIP

DALAPON

Common Synonyms 2,2-Dichloropropionic acid 2,2-Dichloropropenoic acid		Liquid	Colorless	Acrid odor
Sinks and mixes with water				
AUGUST 1995 EDITION OF THE HAZARD IDENTIFICATION GUIDE This guide is for informational purposes only. It is not intended to be used as a substitute for the full text of the Material Safety Data Sheet (MSDS) or other regulatory documents. It is the user's responsibility to consult the full text of the MSDS for complete information on the hazards, handling, and use of the product.				
Fire	Combustible Flash point: 105°F (40°C) Flammable limits in air: 1.5% to 10.5% Fire extinguishing agents: Dry chemical, alcohol foam, carbon dioxide Fire extinguishing agents not to be used: Water may be ineffective			
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If in eyes: Flush with water for at least 15 minutes. If in nose: Inhale deeply and exhale slowly. LIQUID Will burn skin and eyes Harmful if swallowed If swallowed: Do not induce vomiting. If in eyes: Flush with water for at least 15 minutes. If in nose: Inhale deeply and exhale slowly. DO NOT INDUCE VOMITING			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Nontoxic to aquatic life in concentrations of 100 mg/L or less			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - corrosive Restrict access Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,2-Dichloropropionic acid, alpha, alpha-Dichloropropenoic acid, 2,2-Dichloropropenoic acid 3.2 Coast Guard Competibility Classification: Not listed 3.3 Chemical Formula: CHCl ₂ COOH 3.4 IMCO/United Nations Numerical Designation: 8 1760		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Acrid		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing, including goggles, gloves and boots, self-contained breathing apparatus 5.2 Symptoms Following Exposure: Inhalation causes severe irritation of nose, mouth and lungs. Ingestion causes severe irritation of mouth and stomach. Contact with eyes or skin causes irritation and burns. 5.3 Treatment for Exposure: INHALATION: move to fresh air; if patient is not breathing, give artificial respiration; keep patient quiet; get medical attention. INGESTION: give large amounts of water; get medical attention. EYES: flush with water for at least 15 minutes; get medical attention. SKIN: flush with water; get medical attention if irritation persists. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, oral LD ₅₀ = 1.65 g/kg (mouse), 1.57 g/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: 2500 mg/m ³				

6. FIRE HAZARDS

- 6.1 Flash Point: Data not available
6.2 Flammable Limits in Air: Data not available
6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: Irritating fumes of hydrochloric acid may form in fire
6.6 Behavior in Fire: Volatilizes with steam
6.7 Ignition Temperature: Data not available
6.8 Electrical Hazard: Data not available
6.9 Burning Rate: Data not available

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: 105 ppm/96 hr/bluegill/1 L/m³/fresh water, 1 ppm/48 hr/brown shrimp/1 L/m³ salt water
8.2 Waterlow Toxicity: > 5 000 ppm 1 C₅₀
8.3 Biological Oxygen Demand (BOD): 0.04 lb/lb 5 days unacclimated seed, 0.32 lb/lb 5 days acclimated seed
8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

Dow Chemical Co.
Midland, Mich 48640

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Reacts slowly to form hydrochloric and pyruvic acids. The reaction is not hazardous.
7.2 Reactivity with Common Materials: Very corrosive to aluminum and copper alloys. Flammable and explosive hydrogen gas may form in enclosed spaces.
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Flush with water; rinse with dilute sodium bicarbonate or soda ash solution.
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Technical grade, 90% solid formulations of sodium and magnesium salts are sometimes referred to as Dalapon and are much less corrosive.
10.2 Storage Temperature: 70-90°F
10.3 Inert Atmosphere: No requirement
10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Manual, CG 446-2
A P Q

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Corrosive liquid
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: 143
13.3 Boiling Point at 1 atm: 174°F = 190°C = 463°K
13.4 Freezing Point: 46°F = 5°C = 281°K
13.5 Critical Temperature: not available
13.6 Critical Pressure: Data not available
13.7 Specific Gravity: 1.39 at 23°C (liquid)
13.8 Liquid Surface Tension: Data not available
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: 4.9
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Data not available
13.13 Heat of Combustion: Data not available
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Data not available
13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

NOTES

DDD	DDD
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DDD	DDD
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Common Synonyms TDE 1,1-Dichloro-2,2-bis(p-chlorophenyl)ethane Dichlorodiphenyldichloroethane		Solid Sinks in water	White
Store in container to provide protection from light. Avoid contact with skin and clothing. In case of fire, use dry chemical or carbon dioxide extinguishers. See also MSDS for additional information.			
Fire	Combustible Irritating gases may be produced when heated. Water reacts violently with molten material. Fatigues with water vapor at elevated temperatures.		
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat Harmful if inhaled Irritates eyes; may irritate respiratory tract with particles of dust. Breathing apparatus should be worn during exposure. Irritation subsides after removal from exposure. SOLID Irritating to skin and eyes. Harmful if swallowed Reactions: none known. Incompatible materials with peroxide, acids, alkalis, amines, alcohols, ketones, esters, glycols, organic solvents, oils, greases, waxes, resins, pigments, dyes, etc. If SWALLOWED do NOT induce vomiting. Take small sips of water if able. If SWALLOWED do NOT take LAXATIVES OR INDUCE VOMITING UNLESS SO INSTRUCTED BY A PHYSICIAN.		
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Not biodegradable and will persist. No toxic effects are seen with fish.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 444-A) Issue warning - water contaminant Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 31 Synonyms: 1,1-Dichloro-2,2-bis-(p-chlorophenyl) ethane, Dichlorodiphenyldichloroethane, TDI 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: (4 C ₆ H ₄) CH ₂ Cl ₂ 34 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: White 43 Odor: Data not available	
5. HEALTH HAZARDS 51 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves 52 Symptoms Following Exposure: Ingestion causes vomiting and diarrhea symptoms similar to those caused by DDT. Contact with eyes causes irritation. 53 Treatment for Exposure: INGESTION: treatment should be given by a physician and is similar to that given following ingestion of DDT. EYES: flush with water. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 1.2 g/kg (mouse); 7.4 g/kg (rat) 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: Data not available			

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride fumes may form in fires 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: < 2.6 ppm/96 hr. catfish, 11 m $0.15 - 0.2$ ppm 48 hr. brown shrimp, 11 m salt water 0.0968 ppm 24 hr. brown shrimp, 100% salt water 8.2 Waterfowl Toxicity: $4 \times 100 - 5,200$ ppm 100% 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: High
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233 2. Pfaltz & Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 445-3) II 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	10. SHIPPING INFORMATION 10.1 Grade or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open 13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 320 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: $234^{\circ}\text{F} = 112^{\circ}\text{C} = 385^{\circ}\text{K}$ 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.476 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Sp. Heat to Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

(continued on pages 4 and 6)

NOTES

DBR

DECABORANE

Common Synonyms	Solid	White	Sharp odor
	Floats on water		
NOT FOR USE WITH MOLYBDENUM, CHROMIUM, AND VANADIUM			
<u>Fire</u>	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire		
 <u>Exposure</u>	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED		
<u>Water Pollution</u>	Effect of low concentrations on aquatic life is unknown. Fooling to shoreline May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1.) Issue warning: high flammability water contaminant: poison Restrict access Mechanical containment Should be removed Chemical and physical treatment		2. LABEL  	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $B_{10}H_{12}$ 3.4 IMCO/United Nations Numerical Designation: 4.1 JAM		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Pungent	
5. HEALTH HAZARDS			
5.1 Personal Protective Equipment: Self contained breathing apparatus or positive pressure hose mask, rubber boots or overshoes, clothing made of material resistant to decaborane, rubber gloves, chemical-type goggles or face shield			
5.2 Symptoms Following Exposure: (The onset of symptoms is frequently delayed until one or two days after exposure.) Inhalation or ingestion causes headache, nausea, light headedness, drowsiness, nervousness, lack of coordination, and tremor; muscle spasms and generalized convulsions may occur. Dust irritates eyes and skin and may give same systemic symptoms as for inhalation of left borane.			
5.3 Treatment for Exposure: Get medical attention after all exposures to this compound. Symptoms may be delayed for 48 hours. INHALATION: move patient to fresh air, keep him warm and quiet. EYES: flush with water for at least 15 min. SKIN: immediately wash with soap and plenty of water. INGESTION: if victim is conscious, give a tablespoonful of salt in a glass of warm water and repeat until vomit fluid is clear. Note to physician: Treat symptomatically; administration of methocarbamol or other muscle relaxant may be helpful immediately following exposure and in the absence of symptoms.			
5.4 Toxicity by Inhalation (Threshold Limit Value): 0.05 ppm			
5.5 Short-Term Inhalation Limits: Data not available			
5.6 Toxicity by Ingestion: Grade 4, oral LD ₅₀ = 40 mg/kg (mouse)			
5.7 Late Toxicity: Data not available			
5.8 Vapor (Gas) Irritant Characteristics: Data not available			

6. FIRE HAZARDS

- 6.1 Flash Point: (1) flammable solids
176°F C.C.
- 6.2 Flammable Limits in Air: Not pertinent
- 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, and carbon dioxide
- 6.4 Fire Extinguishing Agents Not to be Used: Halogenated extinguishing agents
- 6.5 Special Hazards of Combustion Products: May give toxic fumes of unburned material
- 6.6 Behavior in Fire: May explode when hot
Burns with a green-colored flame
- 6.7 Ignition Temperature: 400°F
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Reacts slowly to form flammable hydrogen gas, which can accumulate in closed area
- 7.2 Reactivity with Common Materials: Corrosive to natural rubber, some synthetic rubbers, some greases and some lubricants
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Flush with 1% aqueous ammonia solution, then with water. Methyl alcohol may also be used
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Water Pollutability: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

1. Callery Chemical Company
Callery, Pa. 16024
2. Stream Chemicals, Inc.
150 Andover St.
Danvers, Mass. 01924
3. K & K Laboratories, Inc.
121 Express Street
Plainville, N.Y. 11803

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Technical 95+%, High purity 99+%
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3.)

II R R

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable solid
- 12.2 MAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 3 |
| Flammability (Red) | 2 |
| Reactivity (Yellow) | 1 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
- 13.2 Molecular Weight: 122.3
- 13.3 Boiling Point at 1 atm: 415°F = 213°C = 486°K
- 13.4 Freezing Point: 210°F = 99°C = 372°K
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 0.94 at 25°C (solid)
- 13.8 Liquid Surface Tension: Not pertinent
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: -28,699 Btu/lb
= -15,944 cal/g = -667.10 × 10³ J/kg
- 13.14 Heat of Decomposition: -279 Btu/lb
= -155 cal/g = -649 × 10³ J/kg
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

5. HEALTH HAZARDS (Cont'd)

- 5.9 Liquid or Solid Irritant Characteristics: Data not available
- 5.10 Odor Threshold: 0.05 ppm

DHN

DECAHYDRONAPHTHALENE

Common Synonyms Bicyclo [4.4.0]decane Naphthalene Perhydronaphthalene Dec Decalin		Liquid Floats on water	Colorless	Turpentine-like odor
Fire		Combustible		
Exposure		LIQUID Irritating to skin and eyes If swallowed will cause headache, nausea, or vomiting Foul odor to shoreline May be dangerous if it enters water intakes		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Bicyclo [4.4.0]decane Naphthalene Perhydronaphthalene Dec Decalin De Kalin Naphthane cis- or trans Decahydronaphthalene 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₁₀ H ₁₈ 3.4 IASCO/United Nations Numerical Designation: 1.1.114"		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic like turpentine, mild characteristics		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Air mask or self-contained breathing apparatus if in enclosed tank; rubber gloves or protective cream; goggles or face shield				
5.2 Symptoms Following Exposure: Inhalation or ingestion irritates nose and throat; causes nausea, headache, vomiting; urine may become blue; irritates eyes; burns to fat skin and causes stinging and secondary infection, e.g., mammary gland up				
5.3 Treatment for Exposure: INHALATION: remove to fresh air; EYES: flush with water for at least 15 min; SKIN: wash with water and mild soap; INGESTION: give emetic such as warm salt water, followed by a mild cathartic; direct physician to examine liver and kidney function				
5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm (suggested)				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 4.170 mg/kg (rat)				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS

- 6.1 Flash Point: 132°F (0°C)
 6.2 Flammable Limits in Air: 0.7% - 8.4%
 6.3 Fire Extinguishing Agents: Water; foam; dry chemical; carbon dioxide
 6.4 Fire Extinguishing Agents Not to be Used: Water
 6.5 Special Hazards of Combustion Products: Not pertinent
 6.6 Behavior in Fire: Not pertinent
 6.7 Ignition Temperature: 482°F
 6.8 Electrical Hazard: Data not available
 6.9 Burning Rate: 5.9 mm/min

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
 7.2 Reactivity with Common Materials: No reaction
 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
 7.5 Polymerization: Not pertinent
 7.6 Inhibitor of Polymerization: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
 8.2 Waterfowl Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD): Data not available
 8.4 Food Chain Concentration Potential: Data not available

9. SELECTED MANUFACTURERS

1. Progil Inc.
409 Madison Avenue
New York, N.Y. 10022
 2. E. I. du Pont de Nemours & Co.
Organic Chemicals Department
Dyes and Chemicals Division
Wilmington, Del. 19880
 3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Technical mixture of cis- (35%) and trans- (65%) isomers. Properties of all such mixtures are very similar. Spectro grade.
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Open flame arresters

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3.)
A 11

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Combustible Liquid
 12.2 NAS Hazard Rating for Bulk Water Transportation: No listed
 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 0 2 |
| Flammability (Red) | 2 2 |
| Reactivity (Yellow) | 0 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 138.2
 13.3 Boiling Point at 1 atm: 181°F = 194°C = 468°K
 13.4 Freezing Point: -44°F = -42°C = 231°K
 13.5 Critical Temperature: Not pertinent
 13.6 Critical Pressure: Not pertinent
 13.7 Specific Gravity: 0.89 at 20°C (liquid)
 13.8 Liquid Surface Tension: 30 dynes/cm = 0.030 N/m at 20°C
 13.9 Liquid-Water Interfacial Tension: 51.5 dynes/cm = 0.0515 N/m at 20°C
 13.10 Vapor (Gas) Specific Gravity: Not pertinent
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
 13.12 Latent Heat of Vaporization: 130 Btu/lb = 77 cal/g = 3.0 x 10⁵ J/kg
 13.13 Heat of Combustion: -19,200 Btu/lb = -11,700 cal/g = -44 x 10³ J/kg
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

(continued on page 3 and 4)

NOTES

DAL

DECALDEHYDE

Common Synonyms Decanal C ₁₀ H ₁₈ O Capryl aldehyde		Liquid Colorless to light yellow Pleasant odor Floats on water. Freezing point is 64°F
Physical Properties Molecular Weight: 158.25 Boiling Point: 191-192°F Density: 0.825 g/cm ³ at 20°C Vapor Pressure: 0.001 mm Hg at 20°C		
Fire Combustible Flash point: 61°F (15°C)		
Exposure CAUTION: IRRITANT LIRKID Irritating to skin and eyes Acute toxicity: Irritation and burning on contact Eye irritation: Causes conjunctivitis Skin irritation: Causes dermatitis Inhalation: Causes irritation of the respiratory tract		
Water Pollution Effect of low concentrations on aquatic life is unknown Feeding to shoreline May be dangerous if it enters water intakes Not recommended for use in water bodies Not recommended for use in water bodies		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444.4 Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulation
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Aldehydes Capryl aldehyde Capryl aldehyde Decanal n-Decyl aldehyde 3.2 Coast Guard Competibility Classification: Aldehyde 3.3 Chemical Formula: C ₁₀ H ₁₈ O 3.4 IMCO United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Pleasant
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Protect to skin and chemical goggles 5.2 Symptoms Following Exposure: On contact with skin produce eye and skin irritation. Low general toxicity. 5.3 Treatment for Exposure: CONTAMINATED EYES AND SKIN: Wash with water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 0, LD ₅₀ 33.5 g/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (G's) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Skin effects thought to be minor 5.10 Odor Threshold: 0.165 ppm		

6 FIRE HAZARDS 6.1 Flash Point: 151°F (67°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Liquid dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available		7. WATER POLLUTION 7.1 Aquatic Toxicity: Data not available 7.2 Waterfowl Toxicity: Data not available 7.3 Biological Oxygen Demand (BOD): Data not available 7.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. Grindstad Corp. Aroma Chemical Division Clifton, N. J. 07014 2. International Flavors and Fragrances, Inc. 1000 Beach, N. J. 07718 3. E. I. du Pont de Nemours and Co. 900 Broadview Ave. Los Angeles, Calif. 90015
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444.3 A11		10 SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arresters
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 158.25 13.3 Boiling Point at 1 atm: 191-192°F (67-68°C) 13.4 Freezing Point: 64°F (18°C) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.825 at 20°C 13.8 Liquid Surface Tension: 28.0 dynes/cm = 0.0280 N/m at 24°C 13.9 Liquid-Water Interfacial Tension: 16.5 dynes/cm = 0.0165 N/m at 22°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Rate of Specific Heats of Vapor (Gas): None 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 10,110 Btu/lb = 10,110 kcal/kg = 42.5 x 10 ³ J/g 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES		

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DCE

1-DECENE

Common Synonyms alpha-Decene		Water: liquid Floats on water	Colorless	Pharm. odor
Not classified as a carcinogen by the National Cancer Institute. Not classified as a carcinogen by the International Agency for Research on Cancer.				
Fire		Combustible Flash point: 10°C (50°F)		
Exposure		CAUTION: IRRITANT LIQUID Irritating to skin and eyes. Prolonged contact may cause severe irritation. Inhalation of high concentrations may cause respiratory irritation. Ingestion of high concentrations may cause irritation of the digestive tract.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. Polluting to shoreline. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE See Response Worksheet (Worksheet 10-444-4) Mechanical contamination should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Federal Labeling Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: alpha-Decene 3.2 Coast Guard Competency Classification: OELH 3.3 Chemical Formula: CH ₃ (CH ₂) ₉ CH=CH ₂ 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild, pleasant		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Eye protection, if an unspilled mass; goggles or face shield. 5.2 Symptoms Following Exposure: Vapors may produce slight irritation of eye and respiratory tract if present in high concentration. May also cause irritation of skin at high concentration. 5.3 Treatment for Exposure: CONTACT WITH EYES OR SKIN: Irritation of the eye should be relieved by thorough flushing with water. Skin areas should be washed with soap and water. Contaminated clothing should be removed before reuse. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Slight irritation of eye and respiratory tract at high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Moderate hazard. If spilled, it is irritating and allowed to remain may cause skin irritation and reddening of the skin. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS		8. WATER POLLUTION	
6.1 Flash Point: 10°C (50°F)		8.1 Aquatic Toxicity: Data not available	
6.2 Flammable Limits in Air: Not pertinent		8.2 Waterway Toxicity: Data not available	
6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide		8.3 Biological Oxygen Demand (BOD): Data not available	
6.4 Fire Extinguishing Agents Not to be Used: None listed		8.4 Feed Chain Concentration Potential: None	
6.5 Special Hazards of Combustion Products: Not pertinent			
6.6 Behavior in Fire: Not pertinent			
6.7 Ignition Temperature: 455°C			
6.8 Electrical Hazard: Data not available			
6.9 Burning Rate: Normal			
7. CHEMICAL REACTIVITY		9. SELECTED MANUFACTURERS	
7.1 Reactivity with Water: No reaction		Gulf Oil Corp. Gulf Oil Chemicals Co. Petersburg, Texas 77560 Cedar Bayou, Texas 77520	
7.2 Reactivity with Common Oxidants: No reaction		2. The Humphrey Chemical Co. Deer Isle North Haven, Conn. 06423	
7.3 Stability During Transport: Stable		3. Phillips Petroleum Co. Bartlesville, Okla. 74004	
7.4 Neutralizing Agents for Acids and Corrosives: Not pertinent			
7.5 Polymerization: Not pertinent			
7.6 Inhibitor of Polymerization: None listed			
11. HAZARD ASSESSMENT CODE See Hazard Assessment Worksheet (Worksheet 10-444-5) A 1.1		10. SHIPPING INFORMATION	
		10.1 Grades or Purity: Technical 99%	
		10.2 Storage Temperature: Ambient	
		10.3 Inert Atmosphere: No requirement	
		10.4 Venting: Open flame arrester	
12. HAZARD CLASSIFICATIONS		13. PHYSICAL AND CHEMICAL PROPERTIES	
12.1 Code of Federal Regulations: Combustible Liquid		13.1 Physical State at 15°C and 1 atm: Liquid	
12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed		13.2 Molecular Weight: 140.2	
12.3 NFPA Hazard Classifications: Not listed		13.3 Boiling Point at 1 atm: 173.1°C (341.6°F)	
		13.4 Freezing Point: -9.7°C (15.1°F)	
		13.5 Critical Temperature: Not pertinent	
		13.6 Critical Pressure: Not pertinent	
		13.7 Specific Gravity: 0.74 at 20°C liquid	
		13.8 Liquid Surface Tension: 24 dynes/cm = 0.024 N/m at 20°C	
		13.9 Liquid-Water Interfacial Tension: 28 dynes/cm = 0.028 N/m at 22°C	
		13.10 Vapor (Gas) Specific Gravity: 1.4	
		13.11 Ratio of Specific Heats of Vapor (Gas): 1.1	
		13.12 Latent Heat of Vaporization: 415 cal/mole (1.73 kJ/mole) at 20°C	
		13.13 Heat of Combustion: -10,407 kcal/kg = -43,524 kJ/kg at 25°C	
		13.14 Heat of Decomposition: Not pertinent	
		13.15 Heat of Solution: Not pertinent	
		13.16 Heat of Polymerization: Not pertinent	
		Continued on next page	
NOTES			

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6 FIRE HAZARDS 6.1 Flash Point: 140°F (100°C) Data not available 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterborne Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 20.15 mg/L/day 8.4 Food Chain Concentration Potential: None																										
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerizations: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Acetylene Chemical 2. Acetylene Chemical 3. Acetylene Chemical 4. Acetylene Chemical 5. Acetylene Chemical 6. Acetylene Chemical 7. Acetylene Chemical 8. Acetylene Chemical 9. Acetylene Chemical 10. Acetylene Chemical																										
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, Vol. 1, p. 111	10 SHIPPING INFORMATION 10.1 Grades or Purities: 99.99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open flame or other																										
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Health</td> <td></td> </tr> <tr> <td> Vapor Irritant</td> <td>1</td> </tr> <tr> <td> Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td> Poison</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td> Human Toxicity</td> <td>1</td> </tr> <tr> <td> Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td> Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td> Other Chemical</td> <td>1</td> </tr> <tr> <td> Water</td> <td>1</td> </tr> <tr> <td> Self Reaction</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not used	Category	Rating	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poison	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemical	1	Water	1	Self Reaction	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 44.05 13.3 Boiling Point at 1 atm: 22.7°C (73°F) 13.4 Freezing Point: -82.1°C (-116°F) 13.5 Critical Temperature: 31.1°C (88°F) 13.6 Critical Pressure: 50.5 atm (51.1 bar) 13.7 Specific Gravity: 0.809 (at 15°C) 13.8 Liquid Surface Tension: 28.9 dynes/cm (0.0289 N/m) at 20°C 13.9 Liquid-Water Interfacial Tension: 15.0 mN/m (at 20°C) 13.10 Vapor (Gas) Specific Gravity: 1.52 (air = 1) 13.11 Ratio of Specific Heats of Vapor (Gas): 1.17 13.12 Latent Heat of Vaporization: 405.9 kJ/kg (100.0 Btu/lb) 13.13 Heat of Combustion: 13,010 Btu/lb (4440 cal/g) at 25°C 13.14 Heat of Decomposition: Not used 13.15 Heat of Solution: Not used 13.16 Heat of Polymerization: Not used
Category	Rating																										
Health																											
Vapor Irritant	1																										
Liquid or Solid Irritant	1																										
Poison	1																										
Water Pollution																											
Human Toxicity	1																										
Aquatic Toxicity	1																										
Aesthetic Effect	2																										
Reactivity																											
Other Chemical	1																										
Water	1																										
Self Reaction	1																										

NOTES

DBZ

n-DECYLBENZENE

Common Synonyms 1-Phenyldecane Decylbenzene	Liquid White Floats on water
Fire	Combustible Flash point 225°F (107°C) (closed cup) Boiling point 341°F (172°C) Autoignition temperature 500°F (260°C) Extinction coefficient 0.00015
Exposure	CAUTION: MEDICAL ADVICE VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If swallowed will cause nausea and vomiting LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting If in contact with skin, wash with soap and water If in contact with eyes, flush with water for 15 minutes DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Not recommended for use in water
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Decylbenzene, 1-Phenyldecane 3.2 Coast Guard Compatibility Classification: Aromatic hydrocarbons 3.3 Chemical Formula: $C_{11}H_{22}$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Data not available
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation of vapor causes slight irritation of nose and throat. Aspiration of liquid into lungs causes coughing, distress and pulmonary edema. Ingestion causes irritation of stomach. Contact with vapor or liquid causes irritation of eyes and mild irritation of skin. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: do NOT induce vomiting; call a doctor. EYES: flush with water. SKIN: wipe off; flush with water; wash with soap and water. ASPIRATION: enforce bed rest; administer oxygen; call a doctor. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 225°F (107°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 5.04 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (b ₅ D): Data not available 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. The Humphries Chemical Co. Devine Street North Haven, Conn. 06473 2. Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 154 13.3 Boiling Point at 1 atm: 341°F = 300°C = 573°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.855 at 20°C (liquid) 13.8 Liquid Surface Tension: 29.95 dynes/cm = 0.02995 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 11,800 Btu/lb = 57.67 cal/g = 2.413 x 10 ⁵ J/kg 13.13 Heat of Combustion: 18,400 Btu/lb = 10,200 cal/g = 42.7 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	1								
Reactivity (Yellow)	0								
NOTES									

(Continued on pages 5 and 6)

DEMETON

Common Synonyms O,O (Diethyl-O and S)-[2 (ethylthio)ethyl] phosphorothioates	Liquid Yellowish brown Unpleasant odor	Sinks in water
AVOID CONTACT WITH LIQUID AND VAPOR. STEEL PEOPLE AWAY Wear protective clothing and equipment. Avoid contact with skin and eyes. If contact occurs, wash immediately with plenty of water. If inhaled, move to fresh air. If swallowed, do not induce vomiting. Seek medical attention.		
Fire	Solution in a combustible solvent. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and suit when working with liquid. Do not breathe vapor.	
 Exposure	CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED If inhaled will cause headache or difficult breathing. If inhaled, move to fresh air. If possible, use self-rescue mask. LIQUID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Do not induce vomiting. If swallowed, drink plenty of water. IF IN EYES Flush with plenty of water for at least 15 minutes. IF SWALLOWED Do not induce vomiting. If conscious, drink plenty of water. IF SWALLOWED AND LOSS OF CONSCIOUSNESS OR LACRIMATION Do not induce vomiting. If conscious, drink plenty of water.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify health authorities, water supply and local government.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison, water contaminant, high flammability. Restrict access. Mechanical containment. Should be removed. Chemical and physical treatment.		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: O,O-Diethyl-O and S-[(2-ethylthio)ethyl] phosphorothioates. Mixture of O- and S-[(2-ethylthio)ethyl] phosphorothioic acid, O,O diethyl ester. Systox and its systox mixture. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: C ₈ H ₁₆ O ₂ PS ₂ C ₈ H ₁₆ mixture. 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Amber. 4.3 Odor: Offensive sulfur compound odor.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor respirator in confined areas; rubber or latex gloves, splash goggles, rubber boots. 5.2 Symptoms Following Exposure: Inhalation causes headache, vertigo, blurred vision, lacrimation, salivation, sweating, muscular weakness and ataxia, dyspnea, diarrhea, abdominal cramps, vomiting, coma, pulmonary edema, and death. Ingestion causes nausea, vomiting, muscle twitching, coma. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: Speed is essential. Call a physician after all overexposure to demeton. INHALATION: move to fresh air, if needed, begin artificial respiration. INGESTION: administer milk, water or salt-water and induce vomiting repeatedly. EYES: flush with water for at least 15 min. SKIN: flood and wash exposed skin areas thoroughly with water; remove contaminated clothing under a shower; wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ . 5.5 Short-Term Inhalation Limits: 0.5 mg/m ³ , 30 min. 5.6 Toxicity by Ingestion: Grade 4 oral LD ₅₀ = 1.7 mg/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS 6.1 Flash Point: 113°F (45°C). 6.2 Flammable Limits in Air: 1.0% - 5.5%. 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective on fire. 6.5 Special Hazards of Combustion Products: Irritating fumes of sulfur dioxide and phosphoric acid may form in fire. 6.6 Behavior in Fire: Compound may volatilize and form toxic fumes. Vapor of solvent is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 367°F (187°C) (xylene solvent). 6.8 Electrical Hazard: (xylene) Class I, Group D. 6.9 Burning Rate: 5.8 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.1 ppm/24 hr. biocyllic reduction of enzyme in brain, fresh water. 8.2 Waterfowl Toxicity: 15 mg/kg. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: May attack some forms of plastics. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Chemagro Division of Baychem Corp. Kansas City, Mo. 64120.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A X-1	10. SHIPPING INFORMATION 10.1 Grades or Purity: 25% 66% solution in xylene, which are combustible solvents. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arrester).
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poison, Class B. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NIHA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 258. 13.3 Boiling Point at 1 atm: > 264°F = > 140°C = > 413°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.1 at 20°C (liquid). 13.8 Liquid Surface Tension: Data not available. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Data not available. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on pages 5 and 6.)	

2.4-D ESTERS

Common Synonyms: Butyl 2,4-Dichlorophenoxyacetate Isopropyl 2,4-dichlorophenoxyacetate 2,4-Dichlorophenoxyacetic acid butyl ester 2,4-Dichlorophenoxyacetic acid isopropyl ester	Liquid	Yellowish brown	Fuel oil like odor
Sinks in water			
Stop discharge if possible. Stop pumping out. Stop if it enters a waterway. Call fire dept. if spilled. Avoid contact with fish. Evacuate area if necessary. Report spill to local authorities. Notify fire dept. if spill enters waterways.			
Fire	Combustible Irritating gases may be produced when heated When exposed to flame it emits thick black smoke. Extinguish with dry chemical or foam. Do not use water. Water may be used to cool containers. Do not use high pressure water to extinguish.		
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed Remedial action: Flush with water. If IN EYES, flush with plenty of water. If SWALLOWED, do not induce vomiting. If INHALED, get fresh air. If SEVERELY IRRITATED OR HAVING CONVULSIONS, call for medical aid.		
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and welfare officials. Notify pollution control authorities.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant. Should be removed. Chemical and physical treatment.		2 LABELS No hazard label required as Code of Federal Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Butoxyethyl 2,4-dichlorophenoxyacetate, Butyl 2,4-dichlorophenoxyacetate, 2,4-Dichlorophenoxyacetic acid butoxyethyl ester, 2,4-Dichlorophenoxyacetic acid butyl ester, 2,4-Dichlorophenoxyacetic acid isopropyl ester, Isopropyl 2,4-dichlorophenoxyacetate. 3.2 Coast Guard Competibility Classification: Not listed (Consult page 4.)		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Brown amber 4.3 Odor: May have odor of fuel oil	
5 HEALTH HAZARDS			
5.1 Personal Protective Equipment: Face shield or goggles, rubber gloves. 5.2 Symptoms Following Exposure: Contact with eyes may cause mild irritation. 5.3 Treatment for Exposure: INGESTION: If large amounts are swallowed, induce vomiting and get medical help. EYES: flush with plenty of water and see a doctor. SKIN: flush with water wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 or 3 LD ₅₀ 320 - 617 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.			

6 FIRE HAZARDS 6.1 Flash Point: >175°F (32°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride vapor may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: 150 ppm/24 hr/bass, bluegill/50% kill; fresh water 1.0-5.0 ppm/96 hr/cyprinid, 39% shill growth disease/salt water 8.2 Waterfowl Toxicity: LD₅₀ 2025.0 mg/kg 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Amchem Products, Inc. Brookside Ave. Ambler, Pa. 19002 2. Chipman Division of Rhodia, Inc. 21 Belmont Drive Somerville, N.J. 08873 3. The Dow Chemical Co. Midland, Mich. 48640
	10 SHIPPING INFORMATION 10.1 Grade or Purity: Technical 99% 64% in petroleum oil 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-A-1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 234.291 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.888-1.237 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	3 CHEMICAL DESIGNATIONS (Cont'd) 3.3 Chemical Formula: 2,4-Cl₂-H₂OX-H₂COOR, where R=CH₃, C₂H₅, or CH₂-H₂OX, H₂ 3.4 IMCO/United Nations Numerical Designation: Not listed

DTS

DEXTROSE SOLUTION

Common Synonyms: Glucose solution Corn sugar solution Grape sugar solution		Watery liquid	Colorless	Odorless
		Sinks and mixes with water		
See Hazardous Waste Identification Manual, Section 13.1, for information on the identification of hazardous waste.				
Fire		Not flammable		
Exposure		Not harmful		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. See Section 13.1 for information on the identification of hazardous waste.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Disperse and flush		2 LABELS No hazard labels required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Corn sugar solution Glucose solution Grape sugar solution 3.2 Coast Guard Compatibility Classification: Miscellaneous water solutions 3.3 Chemical Formula: C ₆ H ₁₂ O ₆ · H ₂ O 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Clear, colorless 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: None needed 5.2 Symptoms Following Exposure: No toxicity 5.3 Treatment for Exposure: None needed 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: None 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 5% 5 days, 99% (theoretical) 5 days 8.4 Food Chain Concentration Potential: None	
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. CPC International, Inc. Argo III 60502 2. A. F. Staley Mfg. Co. Dextar III 62529 3. Standard Brands, Inc. Clinton Corn Processing Division Clinton, Iowa 52732	
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3 A P		10 SHIPPING INFORMATION 10.1 Grades or Purity: 65-69% solids 10.2 Storage Temperature: 130° to 145° F 10.3 Inert Atmosphere: No requirement 10.4 Venting: Data not available	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: > 212°F = > 100°C = > 373 K 13.4 Freezing Point: < 32°F = < 0°C = < 273 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: (est.) 1.20 at 20°C (liquid) 13.8 Liquid Surface Tension: (est.) 60 dynes/cm = 0.06 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
(Continued on pages 5 and 6)			
NOTES			

DAA

DIACETONE ALCOHOL

Common Synonyms 4-Hydroxy-4-methyl-2-pentanone Diacetone	Watery liquid Colorless to light yellow Mild, pleasant odor Floats and mixes with water
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Do not use in confined spaces. Do not use near open flames or other sources of ignition.
Exposure	LIQUID Irritating to skin and eyes. Harmful if swallowed. Do not breathe vapors. Do not get in eyes, on skin, or on clothing. If swallowed, do not induce vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445-4) Disperse and flush.	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Diacetone 4-Hydroxy-4-methyl-2-pentanone Evanton 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: $\text{CH}_3\text{COCH}_2\text{CH}(\text{CH}_3)\text{COCH}_3$ 3.4 IMCO/United Nations Numerical Designation: 331148	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to yellow 4.3 Odor: Mild, pleasant
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air pack or organic canister, rubber gloves, goggles. 5.2 Symptoms Following Exposure: Vapor is irritating to the mucous membrane of the eye and respiratory tract. Inhalation can cause dizziness, nausea, some anesthesia. Very high concentrations have a narcotic effect. The liquid is not highly irritating to the skin but can cause dermatitis. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air. Give artificial respiration if breathing has stopped. CONTACT WITH EYES OR SKIN: Wash affected skin area with water. Flush eyes with water and get medical aid if discomfort persists. 5.4 Toxicity by Inhalation (Threshold Limit Value): 50 ppm 5.5 Short-Term Inhalation Limits: 150 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2 (LD ₅₀ 0.5 to 5 g/kg rat) 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smothering and reddening of the skin. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 142°F (60°C) 125°F (52°C) 6.2 Flammable Limits in Air: 1.8% - 6.9% 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 1118°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Celanese Corp. Celanese Chemical Co. Division 245 Park Ave. New York, N.Y. 10017 2. Shell Chemical Co. Industrial Chemicals Division Houston, Texas 77001 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017								
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 445-3) A P Q	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.0% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arrester).								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications <table data-bbox="991 1466 1239 1552"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 116.16. 13.3 Boiling Point at 1 atm: 136.6°F = 169.2°C = 442.4°K. 13.4 Freezing Point: -45.0°F = -42.8°C = 230.4°K. 13.5 Critical Temperature: 413°F = 334°C = 607°K. 13.6 Critical Pressure: 187 psia = 36 atm = 3.6 MN/m ² . 13.7 Specific Gravity: 0.938 at 50°C (liquids). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.052. 13.12 Latent Heat of Vaporization: 150 Btu/lb = 55 cal/g = 3.6 x 10 ⁴ J/kg. 13.13 Heat of Combustion: 13,000 Btu/lb = 2,500 cal/g = 303 x 10 ³ J/g. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	2								
Reactivity (Yellow)	0								
NOTES									

REVISED 1978

DAP

Di-n-AMYL PHTHALATE

Common Synonyms Phthalic acid dipentyl ester Diamyl phthalate Phthalic acid diamylester Dipentyl phthalate		Liquid	White	Odorless																				
		Floats on water																						
1. Synonyms: Diamyl phthalate, Dipentyl phthalate, Phthalic acid diamylester, Diamyl ester, Phthalic acid, dipentyl ester.																								
2. Physical State (as shipped): Liquid																								
3. Color: Colorless																								
4. Odor: None																								
5. Health Hazards: 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation: Vapors from very hot material may cause headache, drowsiness, and convulsions. Hot vapors may irritate eyes. 5.3 Treatment for Exposure: INHALATION: move to fresh air. EYES: flush with water. SKIN: wipe off, flush with water, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Causes birth defects in rats (skeletal and gross abnormal toes) 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available																								
6. Fire Hazards: 6.1 Flash Point: 245°F (C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available																								
7. Chemical Reactivity: 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent																								
8. Water Pollution: 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available																								
9. Selected Manufacturers: 1. Eastman Organic Chemicals, Rochester, N.Y. 14650 2. Pfaltz and Bauer, Inc., 375 Fairfield Ave., Stamford, Conn. 06902																								
10. Shipping Information: 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Ins. Atmosphere: No requirement 10.4 Venting: Open																								
11. Hazard Assessment Code: (See Hazard Assessment Handbook, CG 446-3) A-T-U																								
12. Hazard Classifications: <table><tr><th>Code of Federal Regulations</th><th>Hazard Rating for Bulk Water Transportation</th><th>NFPA Hazard Classifications</th><th>Category</th><th>Classification</th></tr><tr><td>12.1</td><td>Not listed</td><td></td><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>12.2</td><td>Not listed</td><td></td><td>Flammability (Red)</td><td>1</td></tr><tr><td>12.3</td><td>Not listed</td><td></td><td>Reactivity (Yellow)</td><td>0</td></tr></table>					Code of Federal Regulations	Hazard Rating for Bulk Water Transportation	NFPA Hazard Classifications	Category	Classification	12.1	Not listed		Health Hazard (Blue)	0	12.2	Not listed		Flammability (Red)	1	12.3	Not listed		Reactivity (Yellow)	0
Code of Federal Regulations	Hazard Rating for Bulk Water Transportation	NFPA Hazard Classifications	Category	Classification																				
12.1	Not listed		Health Hazard (Blue)	0																				
12.2	Not listed		Flammability (Red)	1																				
12.3	Not listed		Reactivity (Yellow)	0																				
13. Physical and Chemical Properties: 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 306 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.82 at 20°C (liquid) 13.8 Liquid Surface Tension: 31.5 dyne/cm = 0.0315 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 140 Btu/lb = 76 cal/g = 3.2 x 10 ⁵ J/kg 13.13 Heat of Combustion: -13,000 Btu/lb = -7,720 cal/g = -323 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																								

NOTES

DZN

DIAZINON

Common Synonyms: O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate O,O-Diethyl O-(2-isopropyl-6-methyl-6-pyrimidinyl) thiophosphorothioate Alkates Spectracide Series		Liquid	Light to dark brown
Not flammable if properly kept in low temperature storage. Do not heat. Do not use in closed spaces.		Sinks in water	
Fire		Not flammable POISONOUS GASES ARE PRODUCED WHEN HEATED	
		CAUTION MEDICAL AID LIQUID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed, induce vomiting and drink water. If in eyes, flush with water. If on skin, wash with soap and water. If inhaled, move to fresh air.	
Exposure			
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-1) Issue warning: poison, water contamination, high flammability (if solution) Restrict access Should be removed Chemical and physical treatment		2 LABELS No hazard label required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: O,O-Diethyl O-(2-isopropyl-6-methyl-4-pyrimidinyl) phosphorothioate; O,O-Diethyl O-(2-isopropyl-6-methyl-6-pyrimidinyl) thiophosphorothioate; Diethyl 2-isopropyl-4-methyl-6-pyrimidinylthiophosphorothioate; Alkates Spectracide Series 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₁₂ H ₁₈ N ₂ O ₂ PS 3.4 IMCO/United Nations Numerical Designation: 6.1 Toxic		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or liquid solution 4.2 Color: Amber to dark brown 4.3 Odor: Data not available	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves, protective clothing 5.2 Symptoms Following Exposure: Ingestion or prolonged inhalation of mist causes headache, dizziness, blurred vision, nervousness, weakness, cramps, diarrhea, discomfort in the chest, sweating, mucus tearing, salivation and other excessive respiratory tract secretion, vomiting, cyanosis, pupilledema, uncontrollable muscle twitches, convulsions, coma, loss of reflexes and loss of sphincter control. Liquid irritates eyes and skin. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, keep warm, get medical attention at once. EYES: flush with plenty of water for at least 15 min. and get medical attention. SKIN: wash with soap and water. INGESTION: get medical attention at once, give water slurs of charcoal. Do NOT give milk or alcohol. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 1 oral LD ₅₀ = 76 mg/kg (rat) 5.7 Late Toxicity: May be mucous 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS 6.1 Flash Point: 82-105°F (C) (solutions only, pure liquid difficult to burn) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: (for solutions) Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Oxides of sulfur and of phosphorus are generated in fires 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: (for solutions) 4 mm/min		8 WATER POLLUTION 8.1 Aquatic Toxicity: 0.025 ppm/96 hr, stonefly nymph/T ₁₀₀ /fresh water 30 µg/l/48 hr, bluegill/T ₁₀₀ /fresh water (becomes bound to soil when used according to directions) 8.2 Waterfowl Toxicity: LD ₅₀ = 3.54 mg/kg LC ₅₀ = 5 days, 90 ppm mallard duck LC ₅₀ = 7 days, 68 ppm quail 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS Ciba-Geigy Corporation Agricultural Division P.O. Box 11422 Greensboro, N.C. 27409	
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) A-N-Y		10 SHIPPING INFORMATION 10.1 Grades or Purities: Technical wettable powders, a variety of emulsifiable solutions in combustible solvents 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arresters)	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: ORM-A 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 304.4 13.3 Boiling Point at 1 atm: Very high, decomposes 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.117 at 20°C (liquid) 13.8 Liquid Surface Tension: (est.) 35 dynes/cm = 0.035 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (est.) 20 dynes/cm = 0.020 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (est.) -12,000 Btu/lb = -6,500 cal/g = -270 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
<i>(continued on pages 4 and 5)</i>			
NOTES			

DPO

DIBENZOYL PEROXIDE

Common Synonyms Benzoyl peroxide Benzoyl superoxide Lucidol Oxylite BPO BP	Solid powder or granules White Odorless Sinks in water
A white, crystalline powder that is stable under normal conditions. It is soluble in organic solvents and is used as a polymerization initiator.	
Fire	FLAMMABLE MAY EXPLODE IF SUBJECTED TO HEAT, SHOCK OR FRICTION May cause fire and explode on contact with combustibles
Exposure	ALL FORMS OF ALL SOLID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 44E-4 Issue warning: high flammability Should be removed Chemical and physical treatment	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Benzoyl peroxide BPO Benzoyl superoxide Lucidol BP Oxylite 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₁₄ H ₁₀ O ₄ or C ₁₄ H ₁₂ O ₄ 3.4 IMCO United Nations Numerical Designation: 5.2 1521	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety goggles, face shield, rubber gloves 5.2 Symptoms Following Exposure: CONTACT WITH EYES OR SKIN: irritates eyes. Prolonged contact may irritate skin. 5.3 Treatment for Exposure: INGESTION: administer an emetic to induce vomiting and call a physician. CONTACT WITH EYES OR SKIN: do not use oils or ointments; flush eyes with plenty of water and get medical attention; wash skin with plenty of soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 mg/m ³ 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 500 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: Highly flammable solid; explosion sensitive to shock, heat, and friction. 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Difficult to extinguish once ignited. Use water spray to cool surrounding area. 6.4 Fire Extinguishing Agents Not to be Used: Do not use hand extinguishers. 6.5 Special Hazards of Combustion Products: Sulfonating smoke evolved. 6.6 Behavior in Fire: May explode. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Special care must be taken to avoid contamination with combustible materials (wood, paper, etc.). Various inorganic and organic acids, alkalis, alcohols, amines, easily oxidizable materials such as ethers, or materials used as accelerators in polymerization reactions. 7.3 Stability During Transport: Extremely explosion sensitive to shock, impact, blows, heat, and friction. Has been reported to explode for apparently no specific reason. Self-reactive. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS Pennwalt Corp. Lucidol Division 1740 Military Rd. Buffalo, N.Y. 14240 Reshold Chemicals, Inc. Specialty Chemicals Division Austin, Texas 78712 Waco Chemical Corp. U.S. Green Division 450 Morton Ave. Richmond, Calif. 94804								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 44E-3 II	10 SHIPPING INFORMATION 10.1 Grade or Purity: 98% (dry) 70-75% (wet); various grades of dibenzoyl peroxide and liquid plasticizers such as cresyl phosphate, stearic acid. 10.2 Storage Temperature: 65-85°F 10.3 Inert Atmosphere: Data not available. 10.4 Venting: Data not available.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Organic Peroxide 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table data-bbox="908 1463 1156 1572"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>1</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	4	Reactivity (Yellow)	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 242.2 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: 217°F = 103°C = 376 K 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.442 (25°C/15°C) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	4								
Reactivity (Yellow)	1								
NOTES Continued on page 7 and 8									

REVISED 1978

DBA

Di-n-BUTYLAMINE

Common Synonyms Di-n-butylamine 1-Butylamine (N-butyl)	Liquid Colorless Weak ammonia fishy odor Floats and mixes with water
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause headache, coughing or difficult breathing LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning Inter contaminant Restrict access Disperse and flush	2. LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Butylamine, N-butyl Di-n-butylamine 3.2 Coast Guard Compatibility Classification: Aliphatic amine 3.3 Chemical Formula: $(C_4H_{11}N)_2$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weak ammonia fishy
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose, throat and lungs, coughing, nausea, headache. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Contact with skin causes irritation and dermatitis. 5.3 Treatment for Exposure: INHALATION: move from exposure, if breathing has stopped, start artificial respiration. INGESTION: give large amount of water. EYES: irrigate with water, for 15 min., get medical attention for possible eye damage. SKIN: wash with large amounts of water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 oral LD_{50} = 360 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact as it is very corrosive to the eyes. 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 125°F (O.C.) 6.2 Flammable Limits in Air: 1.1% (LFL) 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 5.4 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May corrode some metals and attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017 2 Penwalt Corporation Three Parkway Philadelphia, Pa. 19102 3 Virginia Chemicals, Inc. 340 West Norfolk Street Portsmouth, Va. 23703																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A 1 1	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="976 1440 1219 1705"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>2</td></tr> <tr><td>Health</td><td></td></tr> <tr><td> Vapor Irritant</td><td>2</td></tr> <tr><td> Liquid or Solid Irritant</td><td>4</td></tr> <tr><td> Poisons</td><td>2</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td> Human Toxicity</td><td>2</td></tr> <tr><td> Aquatic Toxicity</td><td>2</td></tr> <tr><td> Aesthetic Effect</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td> Other Chemicals</td><td>1</td></tr> <tr><td> Water</td><td>0</td></tr> <tr><td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="976 1742 1219 1806"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>1</td></tr> <tr><td>Flammability (Red)</td><td>2</td></tr> <tr><td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	2	Health		Vapor Irritant	2	Liquid or Solid Irritant	4	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 129.25 13.3 Boiling Point at 1 atm: 119.1°C = 149.6°F = 412.3°K 13.4 Freezing Point: -40.1°C = -40.2°F = 233.1°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.759 at 20°C (liquid) 13.8 Liquid Surface Tension: 24.76 dynes/cm = 0.02476 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 4.5 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 430 Btu/lb = 121 kcal/g = 1.01×10^5 J/kg 13.13 Heat of Combustion: -18,960 Btu/lb = -10,440 cal/g = -4.36×10^6 J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	2																																				
Health																																					
Vapor Irritant	2																																				
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NOTES																																					

Continued on pages 2 and 3

NOTES

DBK	Di-n-BUTYL KETONE
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DBK	Di-n-BUTYL KETONE
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Common Synonyms S-Norbornene		Liquid Floats on water Freezing point is 21°F	Colorless to light yellow
No physical or chemical hazards were identified for this chemical.			
Fire		Combustible Flammable liquid (F+) Flammable solid (F) Oxidizing (O)	
Exposure		VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing. LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. EYES Flush with water for at least 15 min. SWALLOWED Drink plenty of water. SKIN Wash with soap and water.	
Water Pollution		Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: S-Norbornene 3.2 Coast Guard Competibility Classification: Not listed 3.3 Chemical Formula: $\text{CH}_2\text{CH}_2\text{C}(\text{OCH}_2\text{CH}_3)_2$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: White to light yellow 4.3 Odor: Data not available	
5. HEALTH HAZARDS			
5.1 Personal Protective Equipment: Rubber gloves, goggles or face shield 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, administer artificial respiration if needed. EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			

6. FIRE HAZARDS 61 Flash Point: Data not available 62 Flammable Limits in Air: Data not available 63 Fire Extinguishing Agents: Foam dry chemical carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective 65 Special Hazards of Combustion Products: 66 Behavior in Fire: 67 Ignition Temperature: Data not available 68 Electrical Hazard: Data not available 69 Burning Rate: Data not available	8. WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterflow Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: May attack some forms of plastics 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Laidman Organic Chemicals 443 State Street Rochester, N. Y. 14640 2. Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233 3. Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902
11. HAZARD ASSESSMENT CODE (See HAZARD ASSESSMENT HANDBOOK, CG 446-3 A 1-1) 12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed	10. SHIPPING INFORMATION 101 Grades or Purity: 98+% 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open (flame arrester) 13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: 42 133 Boiling Point at 1 atm: 170°F = 77°C = 461°K 134 Freezing Point: 21°F = -6°C = 267°K 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 0.822 at 20°C (liquids) 138 Liquid Surface Tension: 26.60 dynes/cm = 0.0266 N/m at 21°C 139 Liquid-Water Interfacial Tension: Data not available 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: 16,000 Btu/lb = 8,000 cal/g = 3.35 × 10⁵ J/kg 1313 Heat of Combustion: 16,040 Btu/lb = 8,020 cal/g = 3.74 × 10⁵ J/kg 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent

(Continued on pages 4 and 5)

NOTES

DBT

DIBUTYLPHENOL

Common Synonyms 2,6-Di-tert-butylphenol		Solid or liquid Floats on water. Freezing point is 97°F	Colorless to light yellow	Odorless
Fire	Combustible			
Exposure	LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed			
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning - water contaminant. Mechanical containment. Should be removed. Chemical and physical treatment.		2. LABELS No label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,6-Di-tert-butylphenol 3.2 Coast Guard Compatibility Classification: Phenols (15) 3.3 Chemical Formula: 2,6-(C ₄ H ₉) ₂ C ₆ H ₃ OH 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or liquid 4.2 Color: colorless, light straw 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Irritates eyes and on prolonged contact skin. Ingestion causes irritation of mouth and stomach. 5.3 Treatment for Exposure: EYES: Flush with water for at least 15 min. SKIN: wipe off as well with soap and water. INGESTION: induce vomiting, get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ (2-butoxy-2-butylphenol) is 32 g/kg rat. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: $>200^\circ F (93^\circ C)$ 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazards: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Ethyl Corporation Industrial Chemicals Division Ethyl Tower 451 Loring Baton Rouge, La. 70801 2. Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14650 3. Aldrich Chemical Co. 949 West St. Paul Ave. Milwaukee, Wis. 53233
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient (solid); $100^\circ F$ (liquid) 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-3 A 1111	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at $15^\circ C$ and 1 atm: Solid 13.2 Molecular Weight: 206.3 13.3 Boiling Point at 1 atm: $457^\circ F = 237^\circ C = 459^\circ K$ 13.4 Freezing Point: $97^\circ F = 36^\circ C = 300^\circ K$ 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.914 at $20^\circ C$ (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: solid $-15,000 \text{ Btu/lb}$ $-6,800 \text{ cal/g}$; liquid $-10,100 \text{ Btu/lb}$ $-4,190 \text{ cal/g}$ 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	Continued on pages 7 and 8
NOTES	

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6 FIRE HAZARDS 6.1 Flash Point: 100 100 6.2 Flammable Limits in Air: Not Determined 6.3 Fire Extinguishing Agents: In- compatible with water 6.4 Fire Extinguishing Agents Not to be Used: Water, foam, carbon dioxide 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Not applicable 6.7 Ignition Temperature: 100 6.8 Electrical Hazard: Not applicable 6.9 Burning Rate: Not applicable	8 WATER POLLUTION 8.1 Aquatic Toxicity: No data available 8.2 Waterway Toxicity: 100-500 ppm 8.3 Biological Oxygen Demand (BOD): Not applicable 8.4 Food Chain Concentration Potential: None																										
9 SELECTED MANUFACTURERS W. R. Grace & Co. Harcourt Chemical Division P.O. Box 1000 Missoula, MT 59801 Monsanto Chemical Company Monsanto Chemical Division P.O. Box 1000 St. Louis, MO 63101 Union Carbide Corporation Union Carbide Chemical Division North Carolina, NC 28201																											
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not applicable 7.2 Reactivity with Common Materials: None 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not applicable 7.5 Polymerization: Not applicable 7.6 Inhibitor of Polymerization: None	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.9% 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Not applicable 10.4 Venting: Data not available																										
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual for details A T T E N T I O N																											
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not applicable 12.2 HAS Hazard Rating for Bulk Water Transportation: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Inhalation</td> <td></td> </tr> <tr> <td>Liquid or Solid Inhalation</td> <td></td> </tr> <tr> <td>Permeation</td> <td></td> </tr> <tr> <td>Water Ingestion</td> <td></td> </tr> <tr> <td>Human Contact</td> <td></td> </tr> <tr> <td>Aquatic Toxicity</td> <td></td> </tr> <tr> <td>Acute Toxicity</td> <td></td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Environmental</td> <td></td> </tr> <tr> <td>Water</td> <td></td> </tr> <tr> <td>Soil</td> <td></td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: None	Category	Rating	Health		Vapor Inhalation		Liquid or Solid Inhalation		Permeation		Water Ingestion		Human Contact		Aquatic Toxicity		Acute Toxicity		Reactivity		Environmental		Water		Soil		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 100 13.3 Boiling Point at 1 atm: 100°C (212°F) 13.4 Freezing Point: -10°C (14°F) 13.5 Critical Temperature: 311°C (592°F) 13.6 Critical Pressure: 33.5 atm (3400 kPa) 13.7 Specific Gravity: 1.0 13.8 Liquid Surface Tension: 22 dynes/cm at 20°C 13.9 Liquid-Water Interfacial Tension: 22 dynes/cm at 20°C 13.10 Vapor (Gas) Specific Gravity: None 13.11 Ratio of Specific Heats of Vapor (Gas): None 13.12 Latent Heat of Vaporization: None 13.13 Heat of Combustion: 10,000 Btu/lb (4184 cal/g) = 10 x 10³ J/g 13.14 Heat of Decomposition: None 13.15 Heat of Solution: None 13.16 Heat of Polymerization: None
Category	Rating																										
Health																											
Vapor Inhalation																											
Liquid or Solid Inhalation																											
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Water																											
Soil																											
NOTES																											

o-DICHLOROBENZENE

6 FIRE HAZARDS 61 Flash Point: AS ELOC N-1100 62 Flammable Limits in Air: 22-10 63 Fire Extinguishing Agents: Water Foam dry chemicals or carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Not permitted 65 Special Hazards of Combustion Products: Irritating vapors resulting from open flame can cause both acute and chronic 66 Behavior in Fire: No reaction 67 Ignition Temperature: 500 F 68 Electrical Hazard: No ignition 69 Burning Rate: Normal	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterbody Toxicity: Data not available 83 Biological Oxygen Demand (BOD): None 84 Food Chain Concentration Potential: Data not available																																		
9 SELECTED MANUFACTURERS																																			
Dow Chemical Midland Main Road Middlesbrough Cleveland England TS6 5NL Telephone: 01642 522222 Telex: 330200 Fax: 01642 522222																																			
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not permitted 75 Polymerization: No polymer 76 Inhibitor of Polymerization: No inhibitor	10 SHIPPING INFORMATION 101 Grade or Purity: Technical 99.9% minimum Technical 95% orthodichlorobenzene 14.0% para-dichlorobenzene Technical 80% ortho - 14% para - 6% meta Purity: not less than 99.9% ortho and more than 0.4% para 102 Storage Temperature: Data not available																																		
11 HAZARD ASSESSMENT CODE See hazard assessment code page 1000 XXX	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 147 13.3 Boiling Point at 1 atm: 180.5 °C (356.9 °F) 13.4 Freezing Point: 10.1 °C (50.2 °F) 13.5 Critical Temperature: 310.6 °C (591.1 °F) 13.6 Critical Pressure: 3.5 MPa (50.7 atm) 13.7 Specific Gravity: 1.307 g/cm³ (at 15°C) 13.8 Liquid Surface Tension: 35.5 dyne/cm (at 20°C) 13.9 Liquid-Water Interfacial Tension: 15.5 dyne/cm (at 20°C) 13.10 Vapor (Gas) Specific Gravity: 3.45 (air = 1) 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1 13.12 Latent Heat of Vaporization: 35.5 kJ/mol (8.4 kcal/mol) 13.13 Heat of Combustion: 39.5 kJ/mol (9.4 kcal/mol) 13.14 Heat of Decomposition: None known 13.15 Heat of Solution: None known 13.16 Heat of Polymerization: None known																																		
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: OSHA 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Flame</td> <td>2</td> </tr> <tr> <td>Health</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>2</td> </tr> <tr> <td>Other Hazards</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td>2</td> </tr> <tr> <td>Hazardous Effects</td> <td>2</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Acute Toxicity</td> <td>2</td> </tr> <tr> <td>Chronic Toxicity</td> <td>2</td> </tr> <tr> <td>Ecotoxicity</td> <td>2</td> </tr> <tr> <td>Other Hazards</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td>2</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Hazard Health Risk</td> <td>2</td> </tr> <tr> <td>Physical Hazard</td> <td>2</td> </tr> <tr> <td>Environmental Hazard</td> <td>2</td> </tr> </tbody> </table>	Category	Rating	Flame	2	Health	2	Reactivity	2	Other Hazards	2	Water Pollution	2	Hazardous Effects	2	Aquatic Toxicity	2	Acute Toxicity	2	Chronic Toxicity	2	Ecotoxicity	2	Other Hazards	2	Water Pollution	2	Category	Classification	Hazard Health Risk	2	Physical Hazard	2	Environmental Hazard	2	Continued on next page
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Physical Hazard	2																																		
Environmental Hazard	2																																		

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1. *Phragmites*

DBP

p-DICHLOROBENZENE

Common Synonyms Parachlorobenzene Dichlorobenzene Paradi	Solid crystals White to clear Mothball odor Sinks in water
Avoid contact with solid oil for separation before and after washing materials Not a flammable liquid or solid	
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE Reacts vigorously with concentrated sulfuric acid Extinguish with water dry chemical foam or alcohol Use of alcohol may cause water
Exposure	CAUTION FOR MEDICAL AID SOLID Irritating to skin and eyes Harmful if swallowed Keep away from mouth, do not swallow Flush mouth with plenty of water IF IN EYES, flush with plenty of water IF ALLOWED TO GET INTO CONSUMPTION, seek medical aid
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline May be dangerous if it enters water intakes Not a real hazard to fish, birds, or mammals Not a hazard to the environment
1 RESPONSE TO DISCHARGE See Response Methods Handbook CG 446-3 Issue warning - water contaminant Should be removed Chemical and physical treatment	2 LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms Dichlorobenzene Paradi Paradi P-paradi Parachlorobenzene Nintochlor 3.2 Coast Guard Compatibility Classification Halogenated hydrocarbon 3.3 Chemical Formula - p-C ₆ H ₄ Cl ₂ 3.4 IMCO/United Nations Numerical Designation - 90.1592	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Aromatic
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Full face mask fitted with organic vapor cartridge for concentrations over 25 ppm; also in protective clothing eye protection 5.2 Symptoms Following Exposure: INHALATION: irritation of upper respiratory tract; over exposure may cause depression and injury to liver and kidney. EYE CONTACT: pain and mild irritation 5.3 Treatment for Exposure: INHALATION: if any ill effects develop remove patient to fresh air and get medical attention. If breathing stops, give artificial respiration. EYES: flush with plenty of water. IF GET INTO EYES OR ON SKIN: if effects develop, SKIN AND INGESTION: no problem likely 5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm 5.5 Short-Term Inhalation Limits: 50 ppm for 60 min 5.6 Toxicity by Ingestion: Grade 2 ED ₀₁ to Severe 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: A vapors cause moderate irritation on such as person's face and high concentrations unpleasant. The effect is temporary 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause smothering and reddening of the skin 5.10 Odor Threshold: 15-30 ppm	

6 FIRE HAZARDS 6.1 Flash Point: 165°F (74°C) ISO C.C.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water foam carbon dioxide or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Vapors are irritating. Toxic chloromethyl oxygen chloride and phosgene gases may be generated in fires 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 1.5 mm/min (approx)	8 WATER POLLUTION 8.1 Aquatic Toxicity: 50 ppm * fish lethal fresh water 500 mg/l 48 hr rainbow trout 11 mg fresh water ** toxicity index if specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland Mich 48040 2. PPG Industries Inc. Industrial Chemical Division New Martinsville W. Va 26155 3. Standard Chlorine Chemical Co. 1915 25 Belleville Turnpike Kearny N. J. 07032
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook CG 446-3 II	10 SHIPPING INFORMATION 10.1 Grades or Purity: Solid 5 grades chemical purity close to 100 Liquid 1.2% orthodichlorobenzene 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Data not available 10.4 Ventiling: Data not available
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: GRM-A 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 147.03 13.3 Boiling Point at 1 atm: 146.6°C = 171.2°C = 347.4 K 13.4 Freezing Point: 130.1°C = 266.2 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.488 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

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DZP

DI-(p-CHLOROBENZOYL) PEROXIDE

Common Synonym		Solid or paste	White	Odorless
Bis(p-chlorobenzoyl) peroxide p-(chlorobenzoyl) peroxide p-p'-Chlorobenzoyl peroxide Di(4-chlorobenzoyl) peroxide		Sinks in water		
No data available for this chemical. The following information is provided for informational purposes only. No data available for this chemical.				
Fire	May explode on contact with combustibles POISONOUS GASES ARE PRODUCED IN FIRE. Substances that may be released in fire include: Hydrogen chloride, carbon monoxide, carbon dioxide, and water. Gases may be released from water.			
Exposure	SOLID Irritating to skin and eyes Harmful if swallowed May be harmful if inhaled May be harmful if absorbed through skin May be harmful if in contact with water May be harmful if in contact with acids May be harmful if in contact with bases May be harmful if in contact with oxidizing agents May be harmful if in contact with reducing agents May be harmful if in contact with flammable liquids May be harmful if in contact with flammable solids May be harmful if in contact with flammable gases May be harmful if in contact with flammable dusts May be harmful if in contact with flammable mists May be harmful if in contact with flammable vapors May be harmful if in contact with flammable fumes May be harmful if in contact with flammable smoke			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes No data available for this chemical.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning: oxidizing material water contaminant Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Bis (p-chlorobenzoyl) peroxide p-Chlorobenzoyl peroxide, p-p'-Dichlorobenzoyl peroxide, Di (4-chlorobenzoyl) peroxide, Cadox PS 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: (p-ClC ₆ H ₄ COO) ₂ 3.4 IMCO/United Nations Numerical Designation: 1.0149 (> 70%) S 2 (5%) (> 10% water or > 40% water)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or paste in silicone fluid and dibutyl phthalate 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves, protective clothing 5.2 Symptoms Following Exposure: Irritates eyes and (on prolonged contact) skin. Ingestion causes irritation of mouth and stomach 5.3 Treatment for Exposure: EYES: wash with water for at least 15 min.; consult a doctor. SKIN: wash with soap and water. INGESTION: induce vomiting and call a doctor 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Flood with water or use dry chemical foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic chlorinated biphenyls are formed in fires 6.6 Behavior in Fire: Solid may explode. Burns very rapidly when ignited. Smoke is unusually heavy when paste form is involved 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May react vigorously with combustible materials 7.3 Stability During Transport: Stable if below 80°F 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS Nours Chemical Corp Burt, New York 14028	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II		10. SHIPPING INFORMATION 10.1 Grade or Purity: Dry, wet with more than 20% water, 50% paste with silicone fluid 10.2 Storage Temperature: Below 80°F 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure-vacuum	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Organic Peroxide 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 311.1 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: > 1.1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (est.) -9,000 Btu/lb = -4,000 cal/g = -210 X 10 ³ J/kg 13.14 Heat of Decomposition: Data not available 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
(Continued on pages 5 and 6)			
NOTES			

DCB	DICHLOROBUTENE
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DCB	DICHLOROBUTENE
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Common Synonyms 1,4-Dichloro-2-butene 2-Butylene dichloride 1,1-Dichloro-2-butylene cis-1,4-dichloro-2-butene trans-1,4-dichloro-2-butene		Liquid Sinks and mixes slowly with water	Colorless	Sweet odor
1,4-Dichloro-2-butene 2-Butylene dichloride 1,1-Dichloro-2-butylene cis-1,4-dichloro-2-butene trans-1,4-dichloro-2-butene				
Fire		FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Hazardous reaction with water. Hazardous reaction with acids. Hazardous reaction with alkalis.		
Exposure		LIQUID Irritating to skin and eyes Harmful if swallowed Hazardous reaction with water. Hazardous reaction with acids. Hazardous reaction with alkalis.		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning - corrosive water contaminant Restrict access Should be removed Chemical and physical treatment		2. LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,4 Dichloro-2-butene 2 Butylene dichloride 1,4 Dichloro-2-butylene cis-1,4 Dichloro-2-butene trans-1,4 Dichloro-2-butene 3.2 Coast Guard Compatibility Classification Fluorinated compounds (F) 3.3 Chemical Formula <chem>ClC=CCl</chem> 3.4 IMCO/United Nations Numerical Designation: X 1760		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Characteristic sweet pungent		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Rubber gloves; chemical splash goggles; rubber boots and apron; barrier cream; organic canister mask				
5.2 Symptoms Following Exposure: Inhalation of vapor irritates nose and throat. Contact with eyes causes intense irritation and tears. Contact of liquid with skin causes severe blistering and dermatitis. Ingestion causes severe irritation of mouth and stomach.				
5.3 Treatment for Exposure, INHALATION: remove from exposure; provide low pressure oxygen if required; keep under observation until edema is ruled out. EYES: irrigate immediately for 15 min.; call physician. SKIN: wash immediately and thoroughly with soap and water; treat as a chemical burn. INGESTION: induce vomiting; call physician.				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade 3 oral LD ₅₀ (1,4-dichloro-2-butene) = 8.9 mg/kg (rat)				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 61 Flash Point: Data not available 62 Flammable Limits in Air: 1-4 63 Fire Extinguishing Agents: Water foam, dry chemical or carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Decomposition vapors contain phosgene and hydrogen chloride gases, both are toxic and irritating 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Data not available 68 Electrical Hazard: Data not available 69 Burning Rate: 2.6 mm/min	8. WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterlow Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 71 Reactivity with Water: Reacts slowly to form hydrochloric acid 72 Reactivity with Common Materials: Corrodes metal when wet 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Petro-Tex Chemical Corporation 5600 Park Place Boulevard Houston, Texas 77017 2. Pfaltz and Bauer, Inc. 126-04 Northern Boulevard Flushing, N.Y. 11368 3. Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14640
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Cis-trans equilibrium mixture 98+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arresters
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-2) A A Y	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 125.0 13.3 Boiling Point at 1 atm: 313°F = 156°C = 429°K 13.4 Freezing Point: cis: -54°F = -48°C = 225°K trans: 37°F = 3°C = 276°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.112 at 20°C (liquid) 13.8 Liquid Surface Tension: (est.) 24 dyne/cm = 0.024 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (est.) 30 dyne/cm = 0.030 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: 4 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0974 13.12 Latent Heat of Vaporization: (est.) 150 Btu/lb = 73 cal/g = 3.1 X 10³ J/kg 13.13 Heat of Combustion: 17,660 Btu/lb = 9,720 cal/g = 407 X 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

NOTES

DCF

DICHLORODIFLUOROMETHANE

Common Synonyms Action 6 Ekamon 12 F-12 Freon 12 Genetron 12 Isotron 12	Compressed gas Colorless Faint odor Visible vapor cloud is produced
Fire	Not flammable
Exposure	CAUTION: MEDICAL USE VAPOR Not irritating to eyes, nose or throat If inhaled will cause dizziness, difficult breathing Medical use only For use in medical applications only For use in medical applications only
Water Pollution	Not harmful to aquatic life
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41 Disperse and flush	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ekamon 12, Genetron 12, F-12, Halon 122, Freon 12, Isotron 12, Freon 12, Freon 12 3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon 3.3 Chemical Formula: CCl ₂ F ₂ 3.4 INCO ed Nations Numerical Designation: 20-102N	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied compressed gas 4.2 Color: Colorless 4.3 Odor: Odorless, slight characteristic
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, goggles 5.2 Symptoms Following Exposure: INHALATION: some narcosis when 10% in air is breathed 5.3 Treatment for Exposure: Remove patient to fresh contaminated area and apply artificial respiration if breathing has stopped until a physician is available; oxygen is to be given 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: 4000 ppm for 60 min 5.6 Toxicity by Ingestion: Not pertinent 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None, except at very high concentrations which may irritate lungs 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Physically harmless to the skin because it is very volatile and evaporates quickly 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Although nonflammable, dissociation products generated in a fire may be irritating or toxic 6.6 Behavior in Fire: Helps extinguish fire 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8 WATER POLLUTION 8.1 Aquatic Toxicity: Not pertinent 8.2 Waterfowl Toxicity: Not pertinent 8.3 Biological Oxygen Demand (BOD): Not pertinent 8.4 Food Chain Concentration Potential: None																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Allied Chemical Corp. Specialty Chemicals Division Baton Rouge, La. 70821 2. E. I. du Pont de Nemours & Co., Inc. Egon Products Division Wilmington, Del. 19898 3. Penwalt Corp. Chemical Division Calicut, City, Ky. 42029																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-1) A C 1 3	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.5% (vol) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Nonflammable compressed gas 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="855 1453 1103 1711"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>0</td></tr> <tr><td>Health</td><td>0</td></tr> <tr><td>Vapor Irritant</td><td>0</td></tr> <tr><td>Liquid or Solid Irritant</td><td>0</td></tr> <tr><td>Poisons</td><td>1</td></tr> <tr><td>Water Pollution</td><td>0</td></tr> <tr><td>Human Toxicity</td><td>0</td></tr> <tr><td>Aquatic Toxicity</td><td>0</td></tr> <tr><td>Aesthetic Effect</td><td>0</td></tr> <tr><td>Reactivity</td><td>0</td></tr> <tr><td>Other Chemicals</td><td>1</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="855 1733 1103 1819"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>0</td></tr> <tr><td>Flammability (Red)</td><td>0</td></tr> <tr><td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	0	Health	0	Vapor Irritant	0	Liquid or Solid Irritant	0	Poisons	1	Water Pollution	0	Human Toxicity	0	Aquatic Toxicity	0	Aesthetic Effect	0	Reactivity	0	Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	0	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 120.91 13.3 Boiling Point at 1 atm: -21.6°C = -29.8°C = 243.4 K 13.4 Freezing Point: -21.9°C = -27.4°C = 251.8 K 13.5 Critical Temperature: 23.2°C = 311.5 K = 389.0 K 13.6 Critical Pressure: 59.8 psi = 40.7 atm = 4.12 MN/m ² 13.7 Specific Gravity: 1.33 at 15°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 4.2 13.11 Ratio of Specific Heats of Vapor (Gas): 1.129 13.12 Latent Heat of Vaporization: 140 Btu/lb = 77.9 cal/g = 3.26 × 10 ⁴ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	0																																				
Health	0																																				
Vapor Irritant	0																																				
Liquid or Solid Irritant	0																																				
Poisons	1																																				
Water Pollution	0																																				
Human Toxicity	0																																				
Aquatic Toxicity	0																																				
Aesthetic Effect	0																																				
Reactivity	0																																				
Other Chemicals	1																																				
Water	0																																				
Self Reaction	0																																				
Category	Classification																																				
Health Hazard (Blue)	0																																				
Flammability (Red)	0																																				
Reactivity (Yellow)	0																																				
NOTES																																					

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DEL

1,2-DICHLOROETHYLENE

Common Synonyms Acetylene dichloride 1,2-dichloroethylene Diiform cis-1,2-dichloroethylene trans-1,2-dichloroethylene	Liquid Colorless Sweet pleasant odor Sinks in water. Flammable; irritating vapor is produced.
While this data is intended to provide information for the user, it is not intended to be a substitute for the manufacturer's information. The user should consult the manufacturer's information for the most current and complete information.	
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Flashpoint: 100°F (38°C). Boiling point: 128°F (53°C). Melting point: -105°F (-76°C).
Exposure	VAPOR If inhaled will cause dizziness, nausea, vomiting, or difficult breathing. M... LIQUID Harmful if swallowed. If swallowed,
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning: high flammability. Restrict access. Evacuate area. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetylene dichloride 1,2-dichloroethylene; Diiform cis- or trans-1,2-dichloroethylene 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $\text{C}_2\text{H}_2\text{Cl}_2$ 3.4 IMCO/United Nations Numerical Designation: 12.1150	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Ethereal, slightly acid, pleasant, chloroform like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, safety goggles, or supply mask or self-contained breathing apparatus. 5.2 Symptoms Following Exposure: Inhalation causes nausea, vomiting, weakness, tremor, epigastric cramps, central nervous depression. Contact with liquid causes irritation of eyes and (on prolonged contact) skin. Ingestion causes slight depression to deep narcosis. 5.3 Treatment for Exposure: INHALATION: remove from further exposure; if breathing is difficult, give oxygen; if victim is not breathing, give artificial respiration, preferably mouth to mouth; give oxygen when breathing is resumed; call a physician. EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. INGESTION: give gastric lavage and emetics. 5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral LD_{50} = 770 mg/kg (rat) 5.7 Late Toxicity: produces liver and kidney injury in experimental animals 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 17°F (7°C) 6.2 Flammable Limits in Air: 9.7% - 12.8% 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Phosgene and hydrogen chloride fumes may form in fires. 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 2.6 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY Reactivity with Water: No reaction. Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Will not occur under ordinary conditions of shipment. The reaction is not vigorous. 7.6 Inhibitor of Polymerization: None used.	9. SELECTED MANUFACTURERS 1. Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14650 2. Dynamit Nobel AG 105 Stonehurst Court Northvale, N.J. 07647 3. Pfaltz and Bauer, Inc. 126-04 Northern Boulevard Flushing, N.Y. 11358								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3). V V V 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table data-bbox="971 1480 1206 1557"> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	2	10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure/vacuum. 13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 97.0. 13.3 Boiling Point at 1 atm: cis: 140°F = 60°C = 333°K trans: 118°F = 48°C = 321°K 13.4 Freezing Point: cis: -114°F = -81°C = 192°K trans: -58°F = -50°C = 223°K 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.2 at 25°C (liquid). 13.8 Liquid Surface Tension: 24 dynes/cm = 0.024 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: (est.) 40 dynes/cm = 0.040 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: 3.34. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1468. 13.12 Latent Heat of Vaporization: 130 Btu/lb = 72 cal/g = 3.0×10^5 J/kg. 13.13 Heat of Combustion: -4.8472 Btu/lb = -2,692.9 cal/g = -112.67×10^3 J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	3								
Reactivity (Yellow)	2								
NOTES									

(Continued on pages 5 and 6)

DEE

DICHLOROETHYL ETHER

Common Synonyms Bis(2-chloroethyl) ether 2,2-Dichloroethyl ether Dichloroether Di(2-chloroethyl) ether Chlorex		Liquid	Colorless	Sweet pleasant odor
Sinks and mixes slowly with water				
AVOID CONTACT WITH EYES OR KEEP FACE AWAY FROM VAPOR WASH EYES IMMEDIATELY WITH WATER FOR AT LEAST 15 MINUTES. IF NECESSARY, GET MEDICAL ATTENTION.				
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Water reacts with a liquid that is heavier than water and forms a flammable gas.			
 Exposure	CAUTION: POISONOUS LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eye WASH IMMEDIATELY WITH WATER FOR AT LEAST 15 MINUTES. IF NECESSARY, GET MEDICAL ATTENTION. WASH EYES IMMEDIATELY WITH WATER FOR AT LEAST 15 MINUTES. IF NECESSARY, GET MEDICAL ATTENTION.			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes NEVER DISCHARGE INTO WATERWAYS			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison, water contaminant Restrict access Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Bis(2-chloroethyl) ether 2,2'-Dichloroethyl ether, Dichlorodiethyl ether, Di(2-chloroethyl) ether, Chlorex, DCEE, beta, beta'-Dichloroethyl ether 3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon 3.3 Chemical Formula: (C ₂ H ₄ Cl) ₂ O 3.4 IMCO/United Nations Numerical Designation: 3.3 1916		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweet like chloroform		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves, protective clothing 5.2 Symptoms Following Exposure: Inhalation of vapor causes irritation of nose, coughing, nausea. Liquid irritates eyes and causes mild irritation of skin. (Can be absorbed in toxic amounts through the skin.) Ingestion causes irritation of mouth and stomach; symptoms of systemic poisoning. 5.3 Treatment for Exposure: INHALATION: remove from exposure, support respiration, call physician if needed. EYES: irrigate with copious quantities of water for 15 min., call physician. SKIN: wipe off, wash well with soap and water. INGESTION: induce vomiting, get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm 5.5 Short-Term Inhalation Limits: 15 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3, oral LD ₅₀ = 75 mg/kg rat 5.7 Late Toxicity: Said to be carcinogenic. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure. 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS

- 6.1 Flash Point: 130°F (50°C) 131°F (55°C)
6.2 Flammable Limits in Air: Data not available
6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: May form phosgene or hydrogen chloride in fires
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 696°F
6.8 Electrical Hazard: Data not available
6.9 Burning Rate: 2.4 mm/min

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1. Nisso Petrochemical Industries Co. Ltd.
Tokyo, Japan
2. Aldrich Chemical Co., Inc.
940 West St. Paul Avenue
Milwaukee, Wis. 53233
3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Commercial
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Open flame arrester

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

APQNY

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Fire | 2 |
| Health | |
| Vapor Irritant | 3 |
| Liquid or Solid Irritant | 2 |
| Poison | 3 |
| Water Pollution | |
| Human Toxicity | 3 |
| Aquatic Toxicity | 2 |
| Aesthetic Effect | 2 |
| Reactivity | |
| Other Chemicals | 1 |
| Water | 0 |
| Self Reaction | 0 |
- 12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

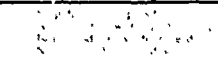
- 13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: 143.0
13.3 Boiling Point at 1 atm: 53.3°F = 12°C = 481°K
13.4 Freezing Point: -62°F = -52°C = 221°K
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 1.22 at 20°C (liquids)
13.8 Liquid Surface Tension: 37.9 dynes/cm = 0.929 N/m at 19°C
13.9 Liquid-Water Interfacial Tension: (est.) 40 dynes/cm = 0.040 N/m at 20°C
13.10 Vapor (Gas) Specific Gravity: 4.93
13.11 Ratio of Specific Heats of Vapor (Gas): 1.0743
13.12 Latent Heat of Vaporization: 133 Btu/lb = 79 kcal/g = 3.3×10^4 J/kg
13.13 Heat of Combustion: (est.) -1540 Btu/lb = -410 kcal/g = -1.7×10^7 J/kg
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

NOTES

DCM

DICHLOROMETHANE

Common Synonyms Methylene chloride Methylene dichloride		Watery liquid	Colorless	Sweet pleasant odor
		Sinks in water. Irritating vapor is produced		
				
Fire	Not flammable POISONOUS GASES ARE PRODUCED WHEN HEATED			
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled, will cause nausea and dizziness LIQUID Irritating to skin and eyes Harmful if swallowed EFFECTS Inhalation: Irritation of the respiratory tract, cough, and shortness of breath. Ingestion: Irritation of the gastrointestinal tract, nausea, and vomiting. Skin Contact: Irritation and dryness. Eye Contact: Irritation and redness.			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes			
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 445-41 Disperse and flush		2 LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms Methylene chloride Methylene dichloride 3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon 3.3 Chemical Formula: CH ₂ Cl ₂ 3.4 IMCO United Nations Numerical Designation: 900 1593		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pleasant, aromatic, like chloroform, sweet ethereal		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor canister mask, safety glasses, protective clothing 5.2 Symptoms Following Exposure: INHALATION: Irritative effect, nausea and dizziness. CONTACT WITH SKIN AND EYES: Skin irritation, irritation of eyes and nose. 5.3 Treatment for Exposure: INHALATION: Remove from exposure area. Oxygen if needed. INGESTION: Do not induce vomiting. CONTACT WITH SKIN AND EYES: Wash thoroughly with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: 100 ppm for 10 min 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 to 1 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause mild to irritate in such but are not severe with high concentrations and unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing, not allowed to remain, may cause irritation and reddening of the skin. 5.10 Odor Threshold: 70 to 100 ppm				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable under conditions likely to be encountered. 6.2 Flammable Limits in Air: 12-19% 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Dissociation products generated in a fire may be irritating or toxic. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 1134°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.		8 WATER POLLUTION 8.1 Aquatic Toxicity: Not pertinent. 8.2 Waterfowl Toxicity: Not pertinent. 8.3 Biological Oxygen Demand (BOD): Not pertinent. 8.4 Food Chain Concentration Potential: None.																													
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9 SELECTED MANUFACTURERS 1. Ancon Chemical Corp. Westlake, La. 70669 2. Dow Chemical Co. Midland, Mich. 48640 3. E. I. du Pont Industrial Chemicals Division 291 Florida St. Baton Rouge, La. 70801																													
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 445-1. A P A		10 SHIPPING INFORMATION 10.1 Grades or Purity: Various Grade, technical grade. 10.2 Storage Temperature: Data not available. 10.3 Inert Atmosphere: Inerted. 10.4 Venting: Data not available.																													
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: ORM-A 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Toxic</td><td>1</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>2</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>2</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>2</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table>		Category	Rating	Toxic	1	Health		Vapor Irritant	2	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 84.93 13.3 Boiling Point at 1 atm: 104.1°F = 39.5°C = 313.0 K 13.4 Freezing Point: -142.1°F = -96.7°C = 172.5 K 13.5 Critical Temperature: 471.1°F = 243.9°C = 518 K 13.6 Critical Pressure: 895 psia = 60.9 atm = 6.17 MN/m ² 13.7 Specific Gravity: 1.322 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 2.9 13.11 Ratio of Specific Heats of Vapor (Gas): 1.09 13.12 Latent Heat of Vaporization: 142 Btu/lb = 35 kcal/kg = 3.40 x 10 ⁵ J/kg 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.	
Category	Rating																														
Toxic	1																														
Health																															
Vapor Irritant	2																														
Liquid or Solid Irritant	1																														
Poisons	2																														
Water Pollution																															
Human Toxicity	1																														
Aquatic Toxicity	2																														
Aesthetic Effect	2																														
Reactivity																															
Other Chemicals	1																														
Water	0																														
Self Reaction	0																														
12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0	NOTES																					
Category	Classification																														
Health Hazard (Blue)	2																														
Flammability (Red)	1																														
Reactivity (Yellow)	0																														

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DCP

2,4-DICHLOROPHENOL

Common Synonyms		Solid crystals	Colorless	Medicinal odor
		Sinks in water		
Avoid contact with solid and dust. Keep eyes away. Wear goggles, self-contained breathing apparatus, and rubber gloves during handling of dry solids. Call fire department. Isolate and remove the source of material. Notify local health department in case of spillages.				
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE Wear goggles, self-contained breathing apparatus, and rubber gloves during handling of dry solids. Extinguish with dry chemical, foam, or water spray. Cool exposed containers with water.			
	CAUTION: IRRITANT AND POISONOUS SOLID OR DUST Will burn skin and eyes Poisonous if swallowed Remove contaminated clothing and shoes Flush affected area with plenty of water If IN EYES, hold eyelids open and flush with copious water If SWALLOWED, pour 1 pint (16 oz) of 5% NaHCO3 solution into 1 quart water Drink milk			
Exposure				
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify health department in case of spillages Notify petroleum refiners in case of spillages			
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4 Issue warning: Water contaminant Should be removed Chemical and physical treatment		2. LABELS Not listed, label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: See common synonyms 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: HOX2HC6H3Cl2 3.4 IMCO United Nations Numerical Designation: n.i. 2020		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Strong, medicinal		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Battery-operated, approved respirator with chemical filters, goggles 5.2 Symptoms Following Exposure: Tremors, convulsions, shortness of breath, irritation of respiratory system 5.3 Treatment for Exposure: Inhalation — rest; Ingestion — drink water, epsom salt solution 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD50 (strongly irritant) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant. May cause pain and second-degree burns after a few minutes' contact 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: 200°F (93°C) — FCCC 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Toxic gases can be evolved 6.6 Behavior in Fire: No data on burning 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 5 ppm/3 hours/rainbow trout/killed/fresh water 5 ppm/12 hours/bluegills/killed/fresh water 6.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 100% in 5 days 8.4 Food Chain Concentration Potential: Data not available
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May react vigorously with oxidizing materials 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48660 2. Monsanto Co. Monsanto Industrial Chemicals Co. 800 North Lindbergh Blvd. St. Louis, Mo. 63166
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Data not available 10.3 Inert Atmosphere: Data not available 10.4 Venting: Data not available
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.4 11	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 163.03 13.3 Boiling Point at 1 atm: 421°F = 216°C = 489 K 13.4 Freezing Point: 140°F = 45°C = 318 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.40 at 15°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

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DCA

2,4-DICHLOROPHENOXYACETIC ACID

Common Synonyms 2,4-D		Solid	White to tan	Odorless
		Sinks in water		
Keep away from children. Do not use near food or feedstuffs. Do not use near water.				
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Flammable liquid with water			
	CALL FOR MEDICAL AID SOLID POISONOUS IF SWALLOWED If swallowed, induce vomiting. If in eyes, flush with water. If on skin, wash with soap and water. Do not swallow. Do not use near food or feedstuffs. Do not use near water.			
Exposure				
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Do not use near water.			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison water contain spill Restrict access Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,4-D 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: 2,4-Cl ₂ C ₆ H ₃ (OCH ₃)COO ⁻ 3.4 MCO/United Nations Numerical Designation: 6.1 (ENV)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White to tan 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective dust mask, rubber gloves, chemical goggles 5.2 Symptoms Following Exposure: Dust may irritate eyes. Ingestion causes gastroenteric distress, diarrhea, mild central nervous system depression, dysphagia, and possible transient liver and kidney injury. 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. INGESTION: induce vomiting and follow with gastric lavage and supportive therapy. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3: oral rat LD ₅₀ = 375 mg/kg (rat); 50 mg/kg (human) 5.7 Late Toxicity: Causes birth defects in some laboratory animals 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating hydrogen chloride or phosgene gases may form 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 5 ppm 48 hr. kill fish; 40% kill salt water; 375 mg/L 48 hr. bluegill; 11 m. fresh water 8.2 Waterfowl Toxicity: LD₅₀ = ~2000 mg/kg 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: No buildup in food chain
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. Phodia, Inc. Chipman Division 120 Jersey Ave. New Brunswick, N. J. 08903 3. Monsanto Co. 800 N. Lindbergh Boulevard St. Louis, Mo. 63166
	10 SHIPPING INFORMATION 10.1 Grades or Purity: 95+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 221.0 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: 286.1 = 141°C = 314°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.563 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (expt) = 770 Btu/lb = -2400 cal/g = -100 × 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: ORM-A 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
(continued on pages 5 and 6)	
NOTES	

DPP

DICHLOROPROPANE

Common Synonyms Propylene dichloride 1,2-dichloropropane		Waters liquid Colorless Sweet odor
Sinks in water. Flammable, irritating vapor is produced.		
1. Physical Description: Colorless, liquid, with a sweet odor. It is heavier than water and insoluble in water. It is a volatile liquid with a boiling point of 34.5°C (94°F) and a melting point of -91.5°C (-133°F). It is a flammable liquid with a flash point of 11°C (52°F) and a fire point of 18°C (64°F). It is a highly volatile liquid with a vapor pressure of 100 mm Hg at 20°C (68°F). It is a highly volatile liquid with a vapor pressure of 100 mm Hg at 20°C (68°F).		
Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Vapor is heavier than air. Ext. Combustion: 1,2-dichloropropane is a flammable liquid.	
Exposure	VAPOR Irritating to eyes, nose and throat. LIQUID Irritating to skin and eyes. Harmful if swallowed.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook (CG 665-4). Evacuate area. Fire: warning: highly flammable. Evacuate area.		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,2-Dichloropropane Propylene dichloride 3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon 3.3 Chemical Formula: CH ₂ ClCHClCH ₃ 3.4 IMCO United Nations Numerical Designation: 12.1279		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweet
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supply in confined area; rubber gloves when splashing; protective cover for head and rubber footwear. 5.2 Symptoms Following Exposure: Contact with skin causes severe irritation. 5.3 Treatment for Exposure: INHALATION: remove to the fresh air; CONTACT WITH SKIN OR EYES: wash immediately with soap and water; FLUORIDES with water; 15 min. for 1 hour. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 g/kg (approximate) 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Irritant to eyes, nose, throat, and skin; irritation of the eyes is reported at very low concentrations; the effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard if swallowed; may cause smothering and reddening of the skin. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS 6.1 Flash Point: 111°C (232°F) 6.2 Flammable Limits in Air: 1.4 - 12.5 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic and irritative gases may be generated. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 405°C 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: test 1.32 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: 160 ppm crustacea T1 ₅₀ salt water 8.2 Waterflow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: No polymerization. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Dow Chemical Co. Midland, Mich. 48040 Jettison Chemical Co., Inc. 4346 Richmond Ave. Houston, Texas 77052 Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																																				
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook (CG 665-3) A X Y	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 112.9 13.3 Boiling Point at 1 atm: 34.3°C (93.7°F) 13.4 Freezing Point: -112.4°C (-170.3°F) 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity (20°C/20°C liquid): 1.283 13.8 Liquid Surface Tension: 39 dynes/cm at 20°C (68°F) 13.9 Liquid-Water Interfacial Tension: 37.9 dynes/cm at 22.7°C (73°F) 13.10 Vapor (Gas) Specific Gravity: 3.45 13.11 Ratio of Specific Heats of Vapor (Gas): 1.042 13.12 Latent Heat of Vaporization: 122 Btu/lb at 77°F (25°C) or 104 Btu/lb 13.13 Heat of Combustion: test 1760 Btu/lb = 4100 cal/g (170 x 10 ³ J/kg) 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation <table> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>3</td> </tr> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>3</td> </tr> <tr> <td>Water Pollution</td> <td>1</td> </tr> <tr> <td>Human Toxicity</td> <td>3</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> <tr> <td>Obstetric Hazards</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	3	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	3	Water Pollution	1	Human Toxicity	3	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity	1	Obstetric Hazards	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	NOTES
Category	Rating																																				
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Poisons	3																																				
Water Pollution	1																																				
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Flammability (Red)	3																																				
Reactivity (Yellow)	0																																				

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DPR

DICHLOROPROPENE

Common Synonyms 1,3-dichloropropene Telomer	Liquid Colorless Sweet odor Sinks in water. Flammable, irritating vapor is produced.
Hazardous to the Environment Aquatic Toxicity: Data not available. Persistence: Data not available.	Environmental Fate Biodegradation: Data not available. Volatilization: Data not available. Hydrolysis: Data not available.
Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose and throat. LIQUID Will burn skin and eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE: NO DISCHARGE See Response Methods Handbook, C-1, 646-6 Disposal: Incinerate.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,3-Dichloropropene, Telomer 3.2 Coast Guard Compatibility Classification: Substituted allyl 3.3 Chemical Formula: $C_3H_4Cl_2$ 3.4 IMCO United Nations Numerical Designation: 1.1.204	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweet, chloroform-like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: An approved self-contained breathing apparatus with a high efficiency particulate filter (N, R, or P) should be worn when handling this material in a confined breathing apparatus. Safety glasses should be worn. 5.2 Symptoms Following Exposure: No entry route is known. Inhalation causes irritation of the respiratory tract and coughing. 5.3 Treatment for Exposure: INHALATION: Remove person to fresh air. If breathing is difficult, give oxygen. If unconscious, give artificial respiration. If swallowed, give milk or water. If on skin, wash with soap and water. If in eyes, flush with water for 15 minutes. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 ppm (TWA) 5.5 Short-Term Inhalation Limits: 0.5 ppm (TWA) 5.6 Toxicity by Ingestion: Grade III Dermal Irritant 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes irritation of the respiratory tract and coughing. 5.9 Liquid or Solid Irritant Characteristics: Liquid causes irritation of the skin and may be dangerous if it enters water intakes. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 44-111°C 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Water, dry chemical, foam (action depends). 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic and irritating gases are generated. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Less than 1.4 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Irriter - a duplicate toxic freshwater. 8.2 Waterlow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Dow Chemical Co. Midland, Mich. 48640																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, C-1, 646-6 A-N-Y	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical, minimum 99% Technical, minimum 99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure vacuum																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>4</td> </tr> <tr> <td>Health</td> <td>4</td> </tr> <tr> <td>Vapor Irritant</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>4</td> </tr> <tr> <td>Reactivity</td> <td>4</td> </tr> <tr> <td>Water Pollution</td> <td>4</td> </tr> <tr> <td>Human Toxicity</td> <td>4</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>4</td> </tr> <tr> <td>Acute Toxicity</td> <td>2</td> </tr> </tbody> </table>	Category	Rating	Fire	4	Health	4	Vapor Irritant	2	Liquid or Solid Irritant	4	Reactivity	4	Water Pollution	4	Human Toxicity	4	Aquatic Toxicity	4	Acute Toxicity	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 110.99 13.3 Boiling Point at 1 atm: 47°C (117°F) 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.2 at 20°C (68°F) 13.8 Liquid Surface Tension: 31.2 dyne/cm = 0.0312 N/m at 24°C 13.9 Liquid-Water Interfacial Tension: 23.8 dyne/cm = 0.0238 N/m at 24°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization (est): 113 Btu/lb = 62.8 cal/g = 2.63 x 10 ⁵ J/kg 13.13 Heat of Combustion (est): 10,000 Btu/lb = 10,000 cal/g = 4.18 x 10 ⁷ J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																				
Fire	4																				
Health	4																				
Vapor Irritant	2																				
Liquid or Solid Irritant	4																				
Reactivity	4																				
Water Pollution	4																				
Human Toxicity	4																				
Aquatic Toxicity	4																				
Acute Toxicity	2																				
NOTES																					

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DTM

4,4'-DICHLORO- α -TRICHLOROMETHYLBENZHYDROL

Chemical Synonyms Diolol Ketthaneol Ketthane 1,1-Bis(p-chlorophenyl)-2,2-trichloroethanol		Solid powder or liquid (solution) May float or sink in water	Solid is white to gray; liquid is brown	Solid is odorless; liquid has odor of solvent
Fire LIQUID SOLVENT MAY BE FLAMMABLE SOLID IS COMBUSTIBLE Irritating gases may be produced when heated Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area				
Exposure DUST Irritating to eyes, nose and throat If inhaled will cause headache or dizziness LIQUID OR SOLID Irritating to skin and eyes If swallowed will cause headache, nausea or dizziness				
Water Pollution Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes				
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning if water contains material High fire, vapors, fumes, smoke Mechanical containment (liquid, solid) Should be removed Chemical and physical treatment		2 LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,1-Bis(p-chlorophenyl)-2,2-trichloroethanol; Di(p-chlorophenyl)-trichloromethylcarbinol; Diol of Ketthane; Ketthaneol 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{C}_{12}\text{H}_8\text{Cl}_4$ (DHCC) 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Powder, semi-solid or liquid 4.2 Color: White to gray solid; red to black semi-solid; brown liquid 4.3 Odor: Solids have slight characteristic odor; liquid has odor of the solvent xylene		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus if exposed to vapors; rubber gloves; splash goggles 5.2 Symptoms Following Exposure: Irritation; ingestion causes nausea, headache, weight loss, convulsions, possible kidney and liver damage; contact with eyes causes irritation 5.3 Treatment for Exposure: INHALATION: move to fresh air, apply artificial respiration and oxygen if indicated; EYES: wash for 15 min with water; call a physician; SKIN: wash well with soap and water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral LD₅₀ = 475 mg/kg rats; 150 mg/kg rats 5.7 Late Toxicity: Suppresses immune reactions in rats 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				
6 FIRE HAZARDS 6.1 Flash Point: 75-100°C (solvent) 6.2 Flammable Limits in Air: 1.5-10% (for xylene solutions) 6.3 Fire Extinguishing Agents: foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride fumes may form in fire 6.6 Behavior in Fire: Xylene solvent vapors may travel; source of ignition and flashback 6.7 Ignition Temperature: 550°C (for xylene solutions) 6.8 Electrical Hazard: xylene (Class I, Group D) 6.9 Burning Rate: xylene 5 mm/min				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Contact with steel at elevated temperature causes formation of toxic chlorine and hydrogen chloride gases. Liquid may attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent				
8 WATER POLLUTION 8.1 Aquatic Toxicity: 100 ppm (24 hr LC₅₀ for fish in fresh water) 8.2 Waterfowl Toxicity: 100 ppm 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available				
9 SELECTED MANUFACTURERS Rohm and Haas Co. Independence Mall West Philadelphia, PA 19103				
10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 92-98% (95% plus 5% inert solids, 70% xylene, 3% combustible solvent) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open flame arresters for liquid forms				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) Liquid: A T L Solid: H		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or liquid 13.2 Molecular Weight: 470.8 13.3 Boiling Point at 1 atm: (data apply to xylene solution; solid decomposition) 282°C = 539°C = 412 K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: >1.1 at 20°C (solids) <0.9 at 20°C (liquids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent		
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		(Continued on page 1 and 2)		
NOTES				

6 FIRE HAZARDS

6.1 Flash Point: Not available

6.2 Flammability Limits in Air: Not available

6.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical, water, foam

6.4 Fire Extinguishing Agents Not to be Used: Not applicable

6.5 Special Hazards of Combustion Products: Not applicable

6.6 Behavior in Fire: Not applicable

6.7 Ignition Temperature: Not available

6.8 Electrical Hazard: Data not available

6.9 Burning Rate: Data not available

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available

8.2 Waterfowl Toxicity: Data not available

8.3 Biological Oxygen Demand (BOD): Data not available

8.4 Food Chain Concentration Potential: Not applicable

7 CHEMICAL REACTIVITY

7.1 Reacts with Water: Not applicable

7.2 Reactivity with Common Materials: Not applicable

7.3 Stability During Transport: Stable

7.4 Neutralizing Agents for Acids and Bases: Not applicable

7.5 Polymerization: May polymerize under heat and pressure

7.6 Inhibitor of Polymerization: Not applicable

9 SELECTED MANUFACTURERS

Eastman Organic Chemicals, Inc.
265 Broadway
New York, New York 10007

Chemical Process Corp.
270 Park Ave.
New York, New York 10017

10 SHIPPING INFORMATION

10.1 Grade or Purity: Not applicable

10.2 Storage Temperature: Ambient

10.3 Inert Atmosphere: Not applicable

10.4 Venting: Not applicable

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Manual, 2nd ed., p. 111

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Flammable Liquid

12.2 NFPA Hazard Rating for Bulk Water Transportation:

Category	Rating
Health	
Vapor Toxicity	
Liquid or Solid Irritation	
Poison	
Water Environment	
Human Toxicity	
Aquatic Toxicity	
Anesthetic Effects	
Reactivity	
Explosion Hazard	
Water	
Self-Reaction	

12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid

13.2 Molecular Weight: 102

13.3 Boiling Point at 1 atm: 103°C (217.4°F)

13.4 Freezing Point: -11.3°C (10.9°F)

13.5 Critical Temperature: Not available

13.6 Critical Pressure: Not available

13.7 Specific Gravity: 0.764 at 20°C (68°F)

13.8 Liquid Surface Tension: Data not available

13.9 Liquid-Water Interfacial Tension: Data not available

13.10 Vapor (Gas) Specific Gravity: Not applicable

13.11 Ratio of Specific Heats of Vapor (Gas): Not applicable

13.12 Latent Heat of Vaporization: Not applicable

13.13 Heat of Combustion: 18,540 Btu/lb = 10,400 cal/g = 437 × 10³ J/kg

13.14 Heat of Decomposition: Not applicable

13.15 Heat of Solution: Not applicable

13.16 Heat of Polymerization: Not applicable

NOTE5

DED

DIELDRIN

Chemical Synonyms: HEOD endosulfan 1,2,3,4,10,10- hexachloro-4,7-epoxy-1- (4,4,5,5-tetrahydro-1,4-oxaphosphorin-2-ylthio)- ethane		Solid	Light brown	Mild chemical odor
		Sinks in water		
Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED				
Fire				
 Exposure		DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause headache, dizziness, or loss of consciousness SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED If swallowed will cause headache, nausea, dizziness, vomiting, or loss of consciousness		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-2 Issue warning - water contaminant Restrict access Should be removed Chemical and physical treatment		2 LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 2.1 Synonyms: HEOD endosulfan 1,2,3,4,10,10-hexachloro-4,7-epoxy-1- (4,4,5,5-tetrahydro-1,4-oxaphosphorin-2-ylthio)- ethane 2.2 Coast Guard Compatibility Classification: Not listed 2.3 Chemical Formula: $C_{12}H_{10}Cl_6O_3P$ 2.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Buff to light brown 4.3 Odor: Mild chemical		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: U.S. B-10 approved respirator, clean rubber gloves, goggles, face shield 5.2 Symptoms Following Exposure: Inhalation, ingestion, or skin contact causes irritation, coughing, and nausea, vomiting, headache, fainting, tremors. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air, give oxygen and artificial respiration as required. INGESTION: induce vomiting and get medical attention. EYES: flush with plenty of water, get medical attention. SKIN: flush with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.25 mg/m ³ 5.5 Short-Term Inhalation Limits: 1 mg/m ³ for 10 min 5.6 Toxicity by Ingestion: Grade 4 oral LD ₅₀ of 40 mg/kg rats, 45 mg/kg dogs 5.7 Late Toxicity: Banned by EPA in October 1974 because of alleged "imminent hazard" to human health as a potential carcinogen to man 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin 5.10 Odor Threshold: 0.04 ppm				

6. FIRE HAZARDS

- 6.1 Flash Point: Not flammable
- 6.2 Flammable Limits in Air: Not flammable
- 6.3 Fire Extinguishing Agents: Not pertinent
- 6.4 Fire Extinguishing Agents Not to be Used:
- 6.5 Special Hazards of Combustion Products: Toxic and irritating hydrocarbon chloride fumes may form in fire
- 6.6 Behavior in Fire:
- 6.7 Ignition Temperature: Not pertinent
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity:
 0.001 mg/l water causes 100% fish death
 100 ppm water causes 100% fish death
 1000 ppm water causes 100% fish death
 10000 ppm water causes 100% fish death
 100000 ppm water causes 100% fish death
- 8.2 Waterfowl Toxicity: 1.0 mg/kg
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Feed Chain Concentration Potential: High

9. SELECTED MANUFACTURERS

Shel Chemical Co.
 Agricultural Div.
 2201 Cross Country Rd.
 San Ramon, Calif. 94583

7. CHEMICAL REACTIVITY

- 7.1 Activity with Water: No reaction
- 7.2 Reactivity with Common Materials:
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Technical 95%
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open flame attester (for liquid form)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-2

II

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
- 13.2 Molecular Weight: 340.91
- 13.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 13.4 Freezing Point: 120°F (49°C) to 129°F
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.75 at 20°C (water)
- 13.8 Liquid Surface Tension: Not pertinent
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: Data not available
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

Continued on page 2 and 3

NOTES

DEA

DIETHANOLAMINE

Common Synonyms 2,2'-Iminoethanol Bis (2-hydroxyethyl) amine		Only liquid or solid crystals	Liquid is colorless Solid is white	Slight dead fish or ammonia odor
Soluble and mixes with water				
1. HAZARD IDENTIFICATION 2. HAZARD CHARACTERISTICS 3. HAZARD STATEMENTS 4. HAZARD PRECAUTIONS 5. HAZARD RESPONSE				
Fire	Combustible Flammable liquid and solid Flash point: 100°F (38°C) Boiling point: 170°F (77°C) Autoignition: 500°F (260°C) Decomposition: 400°F (205°C) Oxidation: Stable			
Exposure	LIQUID Irritating to skin and eyes. Causes severe irritation and burns. POISONING Ingestion: Causes severe irritation and burns. Inhalation: Causes severe irritation and burns. Skin contact: Causes severe irritation and burns. SWALLOWED Causes severe irritation and burns. INHALED Causes severe irritation and burns. SKIN CONTACT Causes severe irritation and burns.			
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes No specific treatment required			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41. Disperse and flush			2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 31 Synonyms: Bis(2-hydroxyethyl) amine, DEA, 2,2'-Dihydroxyethylamine, Di(2-hydroxyethyl)amine, 2,2'-Iminoethanol. 32 Coast Guard Compatibility Classification: A1 (extinguishable). 33 Chemical Formula: (HOCH ₂ CH ₂) ₂ NH 34 IMCO, United Nations Numerical Designation: Not listed			4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid. 42 Color: Colorless. 43 Odor: Mild ammonia or faint fishy characteristic.	
5. HEALTH HAZARDS 51 Personal Protective Equipment: Full face mask or similar vapor mask only if required; eye and body covering clothing; chemical goggles. 52 Symptoms Following Exposure: Irritation of eyes and skin. Breathing vapors may cause coughing and smothering sensation; nausea; headache. 53 Treatment for Exposure: INHALATION: no problem likely. Get medical attention if effects develop. INGESTION: induce vomiting if large amounts are swallowed and call a physician. If no symptoms develop, no known antidote. EYES: flush with plenty of water for at least 15 min and get medical attention promptly. SKIN: flush with plenty of water. Wash contaminated clothing before reuse. 54 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 55 Short-Term Inhalation Limits: Not pertinent. 56 Toxicity by Ingestion: Grade 2 (LD 0.5 to 0.9 g/kg m). 57 Late Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will avoid high concentrations unless essential. The effect is temporary. 59 Liquid or Solid Irritant Characteristics: Causes smothering of the skin and first degree burns on short exposure and may cause second or third degree burns on long exposure. 510 Odor Threshold: Data not available.				

6. FIRE HAZARDS 61 Flash Point: 100°F (38°C). 62 Flammable Limits in Air: 1.5% (lower), 9.8% (upper). 63 Fire Extinguishing Agents: Water, alcohol, foam, carbon dioxide, dry chemical. 64 Fire Extinguishing Agents Not to be Used: Addition of water may cause frothing. 65 Special Hazards of Combustion Products: Irritating vapors are generated when heated. 66 Behavior in Fire: Not pertinent. 67 Ignition Temperature: 525°F. 68 Electrical Hazard: Not pertinent. 69 Burning Rate: 0.74 mm/min.	8. WATER POLLUTION 81 Aquatic Toxicity: 2100 ppm, 24 hr, sunfish bioassay, 11 ppm, freshwater. 82 Waterflow Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): 100 mg/l, 5 days. 84 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: No reaction. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Flush with water. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Jefferson Chemical Co., Inc., 3316 Richmond Ave., Houston, Texas 77002. 2. Olin Corp., Chemicals Division, 120 Farm Ridge Rd., Stamford, Conn. 06084. 3. Union Carbide Corp., Chemicals and Plastics Division, 270 Park Ave., New York, N.Y. 10017.																												
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3. -A P Q	10. SHIPPING INFORMATION 101 Grades or Purity: 98.99%. 102 Storage Temperature: Ambient. 103 Inert Atmosphere: No requirement. 104 Venting: Open.																												
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed. 122 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>1</td></tr> <tr><td>Health</td><td>1</td></tr> <tr><td>Vapor Irritant</td><td>5</td></tr> <tr><td>Liquid or Solid Irritant</td><td>2</td></tr> <tr><td>Poisons</td><td>2</td></tr> <tr><td>Water Pollution</td><td>1</td></tr> <tr><td>Human Toxicity</td><td>1</td></tr> <tr><td>Aquatic Toxicity</td><td>1</td></tr> <tr><td>Aesthetic Effect</td><td>5</td></tr> <tr><td>Reactivity</td><td>1</td></tr> <tr><td>Other Chemicals</td><td>3</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self Reaction</td><td>0</td></tr> </tbody> </table> 123 NFPA Hazard Classifications: Not listed.	Category	Rating	Fire	1	Health	1	Vapor Irritant	5	Liquid or Solid Irritant	2	Poisons	2	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	5	Reactivity	1	Other Chemicals	3	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid. 132 Molecular Weight: 109.14. 133 Boiling Point at 1 atm: 170°F = 77°C = 351°K. 134 Freezing Point: -21°F = -29°C = 243°K. 135 Critical Temperature: 442°F = 228°C = 501°K. 136 Critical Pressure: 4700 psi = 320 kg/cm ² = 3.2 MN/m ² . 137 Specific Gravity: 1.09 at 25°C (liquid). 138 Liquid Surface Tension: Not pertinent. 139 Liquid-Water Interfacial Tension: Not pertinent. 140 Vapor (Gas) Specific Gravity: Not pertinent. 141 Ratio of Specific Heats (Cp/Cv) (Gas): Not listed. 142 Latent Heat of Vaporization: 7630 Btu/lb = 148 cal/g = 6.20 x 10 ⁴ J/kg. 143 Heat of Combustion: -10,790 Btu/lb = -6000 cal/g = -251 x 10 ³ J/kg. 144 Heat of Decomposition: Not pertinent. 145 Heat of Solution: 10.3 Btu/lb = 7 cal/g = 0.3 x 10 ⁴ J/kg. 146 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	1																												
Health	1																												
Vapor Irritant	5																												
Liquid or Solid Irritant	2																												
Poisons	2																												
Water Pollution	1																												
Human Toxicity	1																												
Aquatic Toxicity	1																												
Aesthetic Effect	5																												
Reactivity	1																												
Other Chemicals	3																												
Water	0																												
Self Reaction	0																												
NOTES																													

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DEB

DIETHYLBENZENE

Common Synonyms	Liquid Colorless Sweet, gasoline-like odor Floats on water
Synonyms	None
Fire	Combustible Flash point: 135°F (52°C) Fire hazard: Moderate
Exposure	Allergic reactions LIQUID Irritating to skin and eyes Nausea, dizziness, headache Irritation to eyes, nose, throat, and skin
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Not recommended for use in water
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Aromatic hydrocarbon 3.3 Chemical Formula: $C_{10}H_{12}$ 3.4 IMCO/United Nations Numerical Designation: 133, 2049	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Characteristic aromatic, like benzene, like toluene
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, safety goggles 5.2 Symptoms Following Exposure: High vapor concentrations produce eye and respiratory tract irritation, dizziness, depression. Liquid irritates and may blister skin; can cause corneal injury to eye. 5.3 Treatment for Exposure: INHALATION: remove to fresh air and start artificial respiration. INGESTION: do NOT induce vomiting; call a doctor. CONTACT WITH EYES AND SKIN: flush with water for 15 min. Wash skin with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, oral rat LD ₅₀ = 1.2 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes and respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: 135°F (52°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, water, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 743°F (ortho) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																												
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 American Petrofina Inc. Cody Oil & Chemical Co. Division Big Spring, Texas 79720 2 Dow Chemical Co. Midland, Mich. 48640 3 Sinclair Koppers Co. Koppers Bldg. Pittsburgh, Pa. 15219																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T-U	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical (mixture of isomers) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arrester																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 HAS Hazard Rating for Bulk Water Transportation: <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>2</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>1</td></tr> <tr> <td>Aquatic Toxicity</td><td>3</td></tr> <tr> <td>Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed	Category	Rating	Fire	2	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 134.21 13.3 Boiling Point at 1 atm: 146°F = 180°C = 453°K 13.4 Freezing Point: <160°F = <70°C = <343°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.86 at 20°C (liquid) 13.8 Liquid Surface Tension: 30 dynes/cm = 0.030 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 140 Btu/lb = 77 cal/g = 3.2×10^5 J/kg 13.13 Heat of Combustion: 17,800 Btu/lb = 9,990 cal/g = 414×10^3 J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	2																												
Health																													
Vapor Irritant	1																												
Liquid or Solid Irritant	1																												
Poisons	1																												
Water Pollution																													
Human Toxicity	1																												
Aquatic Toxicity	3																												
Aesthetic Effect	2																												
Reactivity																													
Other Chemicals	1																												
Water	0																												
Self Reaction	0																												
NOTES																													

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DEC

DIETHYL CARBONATE

Common Synonyms Ethyl carbonate Carbonic acid diethyl ester		Waters: liquid Colorless Pleasant odor Floats on water. Flammable; irritating vapor is produced.
Fire		
Exposure		
Water Pollution		
1 RESPONSE TO DISCHARGE See Response Methods Manual, CG 446.4 Dispose and flush.		2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms Carbonic acid diethyl ester ethyl carbonate Ethin 3.2 Coast Guard Compatibility Classification Ester 3.3 Chemical Formula: $(C_2H_5)_2CO_3$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pleasant, ethereal, mild and nonresidual
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing, rubber gloves and goggles; organic vapors; mist or aerosol. 5.2 Symptoms Following Exposure: High vapor concentration can cause headache, irritation of eyes and respiratory tract, dizziness, nausea, weakness, loss of consciousness. 5.3 Treatment for Exposure: INHALATION: remove from exposure; administer artificial respiration and oxygen if needed. EYES: flush with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors may cause slight irritation of eyes. 5.9 Liquid or Solid Irritant Characteristics: Minimum irritant. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS 6.1 Flash Point: 115°F (40.5°C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Water. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 3.4 mm/min.		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterflow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Too slow to be hazardous. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9 SELECTED MANUFACTURERS 1. Chemicon Corp. Organic Chemicals Division 4100 S. Texas 95000 2. I.M.C. Corp. Organic Chemicals Division 635 Third Ave. New York, N.Y. 10012
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Manual, CG 446.4) A11		10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.99% 10.2 Storage Temperature: Data not available. 10.3 Inert Atmosphere: Data not available. 10.4 Venting: Data not available.
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 118.13 13.3 Boiling Point at 1 atm: 200.2°F = 93.5°C = 310.0 K 13.4 Freezing Point: -45.1°F = -42.2°C = 240.9 K 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.975 (20°C/4°C) 13.8 Liquid Surface Tension: 26.5 dyne/cm = 0.0265 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 12 mdyne/cm = 0.012 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 140.96 Btu/lb = 3.3 X 10 ³ J/kg 13.13 Heat of Combustion: -9760 Btu/lb = -5420 cal/g = -227 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES		

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Common Synonyms Poly Sol Butyl methoxyethyl ether Dihex		Waters Liquid Colorless Pleasant odor	
Step 1: Search for possible chemical hazards Step 2: Search for possible physical hazards			
Fire		Combustible Flash point: 100°F (38°C) Boiling point: 140°F (60°C) Autoignition: 300°F (150°C) Explosion limits: 2.5% - 12.5% (vol)	
Exposure		ALL FORMS OF ACUTE LIQUID If swallowed, will cause nausea, vomiting or loss of consciousness. If SWALLOWED, it is a POISONOUS substance in drinking water. If inhaled, it is a POISONOUS substance in drinking water.	
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not a significant water pollutant.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41. Dispense and flush.		2. LABELS No hazard label required by Code of Federal Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms Butyl methoxyethyl ether Dihex Poly Sol 3.2 Coast Guard Compatibility Classification Miscellaneous liquid 3.3 Chemical Formula $C_6H_{14}O$ 3.4 IMCO United Nations Numerical Designation Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped) Liquid 4.2 Color: Colorless 4.3 Odor: Mild chemical	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment Ventilated rubber gloves, safety goggles. 5.2 Symptoms Following Exposure. IRRITATION (eye, nose, mucosa, vomiting, abdominal cramps, weakness, progressing to coma). 5.3 Treatment for Exposure. IRRITATION: eye, nose, and induce vomiting; oxygen and artificial respiration as needed. 5.4 Toxicity by Inhalation (Threshold Limit Value) Not pertinent. 5.5 Short-Term Inhalation Limits. Data not available. 5.6 Toxicity by Ingestion. Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics. None. 5.9 Liquid or Solid Irritant Characteristics. None. 5.10 Odor Threshold: Data not available.			

6. FIRE HAZARDS 6.1 Flash Point: 100°F (38°C) 6.2 Flammable Limits in Air Data not available. 6.3 Fire Extinguishing Agents. Dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used Not pertinent. 6.5 Special Hazards of Combustion Products. Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD) Data not available. 8.4 Food Chain Concentration Potential None.	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water. No reaction. 7.2 Reactivity with Common Materials No reaction. 7.3 Stability During Transport Stable. 7.4 Neutralizing Agents for Acids and Caustics Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization Not pertinent.		9. SELECTED MANUFACTURERS Olin Corp. Chemicals Division 120 Luning Ridge Rd. Stamford Conn 06404 Ethyl Alcohol Co. Chemical Division 100 Stanton St. Methuen Mass 01469	
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-31. A P Q		10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical. 10.2 Storage Temperature: Data not available. 10.3 Inert Atmosphere: Data not available. 10.4 Venting: Data not available.	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations. Combustible Liquid. 12.2 HAS Hazard Rating for Bulk Water Transportation Not listed. 12.3 NFPA Hazard Classifications. Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 134.12. 13.3 Boiling Point at 1 atm: 324°F = 162°C = 435°K. 13.4 Freezing Point -94°F = -70°C = 203°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.948 at 20°C (liquid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization 130 Btu/lb = 24 cal/g = 8.19 J/g. 13.13 Heat of Combustion: 13,000 Btu/lb = 3,000 cal/g = 12,500 J/g. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.	
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NOTES

DME

DIETHYLENEGLYCOL MONOBUTYL ETHER

Common Synonyms 2-Butoxyethoxyethanol Butoxydiethylene glycol Butyl "Carbitol" Dowasol DB Poly-sol DB	Liquid Colorless Mild pleasant odor Mixes with water
Fire	Combustible Flash point: 100°F (38°C) Boiling point: 200°F (93°C) Freezing point: -100°F (-73°C)
Exposure	LIQUID Irritating to skin and eyes. Prolonged contact with skin may cause dryness and irritation. Ingestion may cause mild gastrointestinal upset. Inhalation may cause mild respiratory irritation.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning - water contaminant. Disperse and flush.	2. LABELS No label required by code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Butoxydiethylene glycol, Butoxydiglycol, Diglycol monobutyl ether, Butyl "Carbitol", Dowanol DB, Poly-Sol DB. 3.2 Coast Guard Compatibility Classification: Glycol ether. 3.3 Chemical Formula: $C_4H_9OCH_2CH_2OCH_2CH_2OH$. 3.4 IMCO/United Nations Numerical Designation: Not listed.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Mild characteristic pleasant.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety goggles or face shield. 5.2 Symptoms Following Exposure: Inhalation for brief periods has no significant effect. Contact with liquid causes moderate irritation of eyes and cornal conjunctiva. Prolonged contact with skin causes only minor irritation. 5.3 Treatment for Exposure: INHALATION: remove to fresh air; if effects are observed, call a doctor. EYES: immediately flush with plenty of water for at least 15 min. SKIN: wash well with soap and water. INGESTION: give large amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 2 g/kg (guinea pig). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 200°F (93°C). 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Water, alcohol, foam, carbon dioxide, dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 442°F. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 13 mm/min.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 44% of theoretical in 5 days. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Union Carbide Corporation Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017 2. Shell Chemical Company Industrial Chemical Division One Shell Plaza Houston, Texas 77001 3. Jefferson Chemical Company, Inc. 260 Madison Avenue New York, N.Y. 10016.																																				
11 HAZARD ASSESSMENT CODE (See HAZARD ASSESSMENT HANDBOOK CG 446-3) A P Q	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arresters.																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="981 1431 1229 1690"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td></td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td></td></tr> <tr><td>Liquid or Solid Irritant</td><td>1</td></tr> <tr><td>Poisons</td><td></td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td></td></tr> <tr><td>Aquatic Toxicity</td><td>1</td></tr> <tr><td>Aesthetic Effect</td><td>1</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td></td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="981 1711 1229 1798"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>2</td></tr> <tr><td>Flammability (Red)</td><td>2</td></tr> <tr><td>Reactivity (Yellow)</td><td>1</td></tr> </tbody> </table>	Category	Rating	Fire		Health		Vapor Irritant		Liquid or Solid Irritant	1	Poisons		Water Pollution		Human Toxicity		Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity		Other Chemicals		Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 162.2. 13.3 Boiling Point at 1 atm: 200°F (93°C) = 373 K. 13.4 Freezing Point: -100°F (-73°C) = 223 K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.854 at 20°C (liquid). 13.8 Liquid Surface Tension: 24 dyne/cm = 0.024 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 440 Btu/lb = 74 cal/g = 313 J/g. 13.13 Heat of Combustion: 10,400 Btu/lb = 17,400 cal/g = 73,000 J/g. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 10 Btu/lb = 20 cal/g = 84 J/g. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire																																					
Health																																					
Vapor Irritant																																					
Liquid or Solid Irritant	1																																				
Poisons																																					
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Health Hazard (Blue)	2																																				
Flammability (Red)	2																																				
Reactivity (Yellow)	1																																				
NOTES Continued on pages 1 and 2.																																					

DEM

DIETHYLENEGLYCOL MONOBUTYL ETHER ACETATE

Common Synonyms 2-(2-Butoxyethoxy) ethyl acetate 2-(2-Butoxyethoxy) ethyl acetate Diglycol monobutyl ether acetate Butyl "Carbol" acetate		Liquid	Colorless	Mild odor
Floats and mixes slowly with water				
Fire		Combustible		
Exposure		LIQUID Irritating to skin and eyes		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4. Issue warning: water contaminant Disperse and flush		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-(2-Butoxyethoxy) ethyl acetate; Diglycol monobutyl ether acetate; Butyl "Carbol" acetate; Extending DB Acetate 3.2 Coast Guard Competibility Classification: Ester (13) 3.3 Chemical Formula: C ₁₂ H ₂₂ O ₆ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild, nonresidual		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Face shield or safety glasses, protective gloves, and mask for prolonged exposure to vapor				
5.2 Symptoms Following Exposure: Prolonged breathing of vapor may cause irritation and nausea. Contact with liquid may cause mild irritation of eyes and skin. Can be absorbed through skin in small amounts.				
5.3 Treatment for Exposure: INHALATION: move person to fresh air. Breathing has stopped, administer artificial respiration. EYES: flush with water for at least 15 min. SKIN: wash skin with large amounts of water for 15 min. Call physician if needed. INGESTION: induce vomiting, get medical attention.				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available.				
5.5 Short-Term Inhalation Limits: Because of high boiling point, skin, eye hazards from inhalation are minimal.				
5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 2.74 g/kg guinea pig.				
5.7 Late Toxicity: Kidney damage noted in rats following repeated contact with skin.				
5.8 Vapor (Gas) Irritant Characteristics: Data not available.				
5.9 Liquid or Solid Irritant Characteristics: Data not available.				
5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 6.1 Flash Point: 230 F (110 C) 6.2 Flammable Limits in Air: 0.8 - 8.0 6.3 Fire Extinguishing Agents: Water, alcohol foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not listed 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 3.5 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Union Carbide Corporation Chemicals and Plastics Division 250 Park Avenue New York, N.Y. 10017 2. Eastman Chemical Products, Inc. Kingsport, Tenn. 37662 3. Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14650								
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Not listed 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Open flame arresters								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3 A P Q	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 214.3 13.3 Boiling Point at 1 atm: 275 F = 140 C = 313 K 13.4 Freezing Point: -111 F = -85 C = 188 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.885 at 20 C (liquid) 13.8 Liquid Surface Tension: 22 dynes/cm at 20°C (20 C) 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 406 Btu/lb = 1190 cal/g = 2.58 x 10³ J/kg 13.13 Heat of Combustion: 16,110 Btu/lb = 4,700 cal/g = 110 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 16,110 Btu/lb = 4,700 cal/g = 110 x 10³ J/kg 13.16 Heat of Polymerization: Not pertinent								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td></td></tr><tr><td>Flammability (Red)</td><td></td></tr><tr><td>Reactivity (Yellow)</td><td></td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)		Flammability (Red)		Reactivity (Yellow)		
Category	Classification								
Health Hazard (Blue)									
Flammability (Red)									
Reactivity (Yellow)									
(Continued on pages 7 and 8)									
NOTES									

DGE	DIETHYLENE GLYCOL MONOETHYL ETHER
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Common Synonyms Poly-Safe DE Demand DE Carbide 2,2-Ethoxy-1,1,1-trichloroethane		Label Floats and mixes with water	Colorless	Fruity odor																																
6 FIRE HAZARDS 6.1 Flash Point: 201°C (392°F) 6.2 Flammable Limits in Air: 2.2-8.5% (vol) 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 489°C 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 2.4 mm/min					8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 34% (at 20°C) 8.4 Food Chain Concentration Potential: None																															
Fire		Combustible																																		
Exposure		LIQUID Harmful if swallowed.																																		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.																																		
1 RESPONSE TO DISCHARGE See Response Methods Manual, 2G-644-4 Disposed in tank		2 LABELS No hazard label required GHS 05, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100																																		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Carbide, Demand DE, Poly-Safe DE, Demand DE, Carbide, 2,2-Ethoxy-1,1,1-trichloroethane, P-Safe DE 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: <chem>CCl3C(OCC)CCl3</chem> 3.4 IMCO United Nations Numerical Designation: Not applicable		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weak, fruity odor 4.4 Specific Gravity: 1.300 (at 20°C)																																		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles 5.2 Symptoms Following Exposure: Not applicable 5.3 Treatment for Exposure: SKIN AND EYES: Wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not applicable 5.5 Short-Term Inhalation Limits: Not applicable 5.6 Toxicity by Ingestion: Not applicable 5.7 Late Toxicity: Not applicable 5.8 Vapor (Gas) Irritant Characteristics: Not applicable 5.9 Liquid or Solid Irritant Characteristics: Not applicable 5.10 Odor Threshold: Not applicable					11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, 2G-644-3 A-P-Q	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 144.1 13.3 Boiling Point at 1 atm: 47.1°C (116.8°F) 13.4 Freezing Point: -105.1°C (-157.2°F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.300 (at 20°C, liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 340.0 kJ/kg (100.0 Btu/lb) 13.13 Heat of Combustion: 11,340 Btu/lb (-6350 cal/g = 265 x 10 J/g) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																														
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td>1</td></tr><tr><td>Vapor Toxicity</td><td>0</td></tr><tr><td>Liquid Surface Tension</td><td>0</td></tr><tr><td>Pressure</td><td>0</td></tr><tr><td>Water Pollution</td><td>1</td></tr><tr><td>Hazardous to Air</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Acute Toxicity</td><td>1</td></tr><tr><td>Reactivity</td><td>1</td></tr><tr><td>Other Chemical</td><td>2</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self-Reaction</td><td>0</td></tr></table> 12.3 NFPA Hazard Classifications: Not listed					Category	Rating	Fire	1	Health	1	Vapor Toxicity	0	Liquid Surface Tension	0	Pressure	0	Water Pollution	1	Hazardous to Air	1	Aquatic Toxicity	1	Acute Toxicity	1	Reactivity	1	Other Chemical	2	Water	0	Self-Reaction	0				
Category	Rating																																			
Fire	1																																			
Health	1																																			
Vapor Toxicity	0																																			
Liquid Surface Tension	0																																			
Pressure	0																																			
Water Pollution	1																																			
Hazardous to Air	1																																			
Aquatic Toxicity	1																																			
Acute Toxicity	1																																			
Reactivity	1																																			
Other Chemical	2																																			
Water	0																																			
Self-Reaction	0																																			
NOTES																																				

DGM

DIETHYLENE GLYCOL MONOMETHYL ETHER

Common Synonyms Poly Sels DM Divinyl DM 2,2-methoxyethoxyethanol Methyl Carbol		Liquid	Colorless	Pleasant odor
Floats and mixes with water				
Specific Gravity: 0.836 Boiling Point: 107°C Freezing Point: -11°C				
Fire	Combustible Flash Point: 107°C Ignition Temperature: 400°C			
Exposure	LIQUID Irritating to eyes Harmful if swallowed May be dangerous if it enters water intakes			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 445-4 Disperse and Flush		2. LABELS See Hazardous Materials Handbook, CG 445-4 GHS 07: Corrosive		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dibutyl DM, Divinyl DM, 2,2-Methoxyethoxyethanol, Methyl Carbol, Poly Sels DM 3.2 Coast Guard Compatibility Classification: GHS 07: Corrosive 3.3 Chemical Formula: C10H22O4 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild, pleasant		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Not required 5.2 Symptoms Following Exposure: Irritation to eyes 5.3 Treatment for Exposure: SKIN OR EYES: Flush with water 5.4 Toxicity by Inhalation (Threshold Limit Value): Not applicable 5.5 Short-Term Inhalation Limits: Not applicable 5.6 Toxicity by Ingestion: Not applicable 5.7 Late Toxicity: Not applicable 5.8 Vapor (Gas) Irritant Characteristics: Not applicable 5.9 Liquid or Solid Irritant Characteristics: Not applicable 5.10 Odor Threshold: Not applicable				

6. FIRE HAZARDS 6.1 Flash Point: 107°C 6.2 Flammable Limits in Air: LFL = 1.2% 6.3 Fire Extinguishing Agents: Water, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: None 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: None 6.7 Ignition Temperature: 400°C 6.8 Electrical Hazard: Not applicable 6.9 Burning Rate: Data not available		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 34% of theoretical in 5 days 8.4 Food Chain Concentration Potential: None	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not applicable 7.5 Polymerization: Not applicable 7.6 Inhibitor of Polymerization: Not applicable		9. SELECTED MANUFACTURERS Eastman Kodak Co. Eastman Chemicals Division Kingsport, Tenn. 37602 Eastman Chemical Co. 1000 Richmond Ave. Houston, Tex. 77002 Eastman Chemical Corp. Chemicals & Plastics Division 270 Park Ave. New York, N.Y. 10017	
11. HAZARD ASSESSMENT CODE See Hazardous Materials Handbook, CG 445-4 APO		10. SHIPPING INFORMATION 10.1 Grades or Purities: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not applicable 10.4 Venting: Open to atmosphere	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations, Combustible Liquid 12.2 HAS Hazard Rating for Bulk Water Transportation		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 118.1 13.3 Boiling Point at 1 atm: 107°C (225°F) 13.4 Freezing Point: -11°C (11°F) 13.5 Critical Temperature: Not applicable 13.6 Critical Pressure: Not applicable 13.7 Specific Gravity: 0.836 13.8 Liquid Surface Tension: Not applicable 13.9 Liquid-Water Interfacial Tension: Not applicable 13.10 Vapor (Gas) Specific Gravity: Not applicable 13.11 Ratio of Specific Heats of Vapor (Gas): Not applicable 13.12 Latent Heat of Vaporization: Not applicable 13.13 Heat of Combustion: 10,840 Btu/lb (4020 cal/g) = 252 x 10 J/kg 13.14 Heat of Decomposition: Not applicable 13.15 Heat of Solution: Not applicable 13.16 Heat of Polymerization: Not applicable	
12.3 NFPA Hazard Classifications: Not listed		NOTES	

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DET

DIETHYLENETRIAMINE

Common Synonyms 2,2-Dimethylethanamine Bis (2-aminoethyl) amine	Liquid Colorless to yellow Ammonia odor Floats and mixes with water
Fire	Combustible Flash point: 100°F (38°C) Boiling point: 118°F (48°C) Freezing point: -111°F (-80°C)
Exposure	LIQUID Will burn, skin and eyes Harmful if swallowed Irritant to skin, eyes, and respiratory tract May be dangerous if it enters water intake
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intake
1 RESPONSE TO DISCHARGE See Response Methods Manual, Sec. 11.4 Dispense and flush	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Bis (2-aminoethyl) amine 2,2-Dimethylethanamine 3.2 Coast Guard Compatibility Classification: None 3.3 Chemical Formula: NH(CH ₂) ₂ NH(CH ₂) ₂ NH 3.4 IMCO United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light amber-yellow 4.3 Odor: Strong ammoniacal to light ammoniacal
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Amine respirators can detect mask leakage; eye splash may be severe. 5.2 Symptoms Following Exposure: Prolonged breathing of vapor may cause asthma. Liquid harmful to eyes. Skin rash can form. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air. INGESTION: Do NOT induce vomiting; give large quantities of water; give activated charcoal if vinegar or an equivalent is available; get medical attention. SKIN CONTACT: Flush with plenty of water. EYE CONTACT: Flush with plenty of water for at least 15 min and get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2.1 (by 0.5 to 1 g/kg) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause wheezing, irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure and may cause secondary burns on long exposure. 5.10 Odor Threshold: 10 ppm	

6 FIRE HAZARDS 6.1 Flash Point: 210°F (99°C) 6.2 Flammable Limits in Air: Lower: 11% (30%) 6.3 Fire Extinguishing Agents: Water, dry chemical, alcohol foam, carbon dioxide, chemical. 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing. 6.5 Special Hazards of Combustion Products: Irritating vapors are generated when heated. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 1100°F (593°C) 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: 710 ppm/24 hr./brine shrimp/TLM 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: 21% of theoretical in 5 days/freshwater acclimated seed																												
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: No hazardous reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48069 2. Jefferson Chemical Co., Inc. 1316 Jackson Rd. Houston, Texas 77052 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																												
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, Sec. 11.4 A P Q	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.9% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open																												
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive Material 12.2 NAS Hazard Rating for Bulk Water Transportation <table data-bbox="976 1432 1211 1694"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td>1</td></tr> <tr> <td> Vapor Irritant</td><td>1</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td> Poisoning</td><td>2</td></tr> <tr> <td>Water Pollution</td><td>2</td></tr> <tr> <td> Human Toxicity</td><td>2</td></tr> <tr> <td> Aquatic Toxicity</td><td>2</td></tr> <tr> <td> Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td>1</td></tr> <tr> <td> Other Chemicals</td><td>1</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poisoning	2	Water Pollution	2	Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity	1	Other Chemicals	1	Water	0	Self Reaction	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 109.1 13.3 Boiling Point at 1 atm: 40.1°C (104.2°F) 13.4 Freezing Point: -111.1°C (-168.2°F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.644 (20°C liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 10,900 kJ/kg (25,000 Btu/lb) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 10,900 kJ/kg (25,000 Btu/lb) 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	1																												
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Water Pollution	2																												
Human Toxicity	2																												
Aquatic Toxicity	2																												
Aesthetic Effect	2																												
Reactivity	1																												
Other Chemicals	1																												
Water	0																												
Self Reaction	0																												
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Category	Classification																												
Health Hazard (Blue)	1																												
Flammability (Red)	1																												
Reactivity (Yellow)	0																												
NOTES																													

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DEP

DI-(2-ETHYLHEXYL) PHOSPHORIC ACID

Common Synonyms 2-Ethyl-1-hexanol hydrogen phosphate Bis(2-ethylhexyl) hydrogen phosphate Di(2-ethylhexyl) phosphate Di(2-ethylhexyl) acid phosphate		Liquid	Light yellow	Odorless
Floats on water				
Fire	Combustible			
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed			
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 544-41 Issue warning: "CONTAMINANT." Restrict access. Mechanical contamination should be removed. Chemical and physical treatment.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Bis(2-ethylhexyl) hydrogen phosphate; Di(2-ethylhexyl) phosphate; Di(2-ethylhexyl) acid phosphate; DEHPA. 3.2 Coast Guard Competibility Classification: Not applicable. 3.3 Chemical Formula: $[(CH_3CH_2CH_2CH_2CH_2CH_2)O]_2P(=O)OH$ 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Amber. 4.3 Odor: None.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield; rubber gloves; protect clothing. 5.2 Symptoms Following Exposure: Causes eye irritation. May cause severe eye injury. Consult an eye specialist. Also causes skin irritation and burns. Ingestion produces irritation similar to that caused by strong bases. 5.3 Treatment for Exposure: EYES: Immediately flush with plenty of water for at least 15 min. Seek a physician. SKIN: Immediately flush with plenty of water for at least 15 min. INGESTION: Induce vomiting and call a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 1.5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are minor irritants to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Causes eye irritation. Causes skin and first degree burns on short exposure and may cause eye and degree burns on long exposure. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS

6.1 Flash Point: 55°F (13°C)
 6.2 Flammable Limits in Air: Not pertinent
 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide
 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing
 6.5 Special Hazards of Combustion Products: Irritating phosphorus oxides may be released
 6.6 Behavior in Fire: Not pertinent
 6.7 Ignition Temperature: Data not available
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: Data not available

8. WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
 8.2 Waterfowl Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD): Data not available
 8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

Union Carbide Corporation
 Chemicals and Plastics Division
 270 Park Avenue
 New York, N.Y. 10017

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
 7.2 Reactivity with Common Materials: Mildly corrosive to most metals; may form flammable hydrogen gas
 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Sodium bicarbonate or lime solution
 7.5 Polymerization: Not pertinent
 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

10.1 Grades or Purity: 92%+
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 544-3)

A 1 1

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Corrosive liquid
 12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	0
Health	0
Vapor Irritant	0
Liquid or Solid Irritant	1
Poison	1
Water Pollution	0
Human Toxicity	0
Aquatic Toxicity	0
Aesthetic Effect	0
Reactivity	0
Other Chemicals	0
Water	0
Self-Reaction	0

12.3 NFPA Hazard Classifications: Not used

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 322.4
 13.3 Boiling Point at 1 atm: Decomposes
 13.4 Freezing Point: $-76.1 \leq t \leq -69.4$ °C; $-105 \leq t \leq -103$ °F
 13.5 Critical Temperature: Not pertinent
 13.6 Critical Pressure: Not pertinent
 13.7 Specific Gravity: 0.977 at 20°C (liquids)
 13.8 Liquid Surface Tension: test 1: 20 dynes/cm = 0.020 N/m at 20°C
 13.9 Liquid-Water Interfacial Tension: test 1: 30 dynes/cm = 0.030 N/m at 20°C
 13.10 Vapor (Gas) Specific Gravity: Not pertinent
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
 13.12 Latent Heat of Vaporization: Not pertinent
 13.13 Heat of Combustion: 13,470 Btu/lb = 31,700 cal/g = 132,500 J/kg
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

NOTES

DPH

DIETHYL PHTHALATE

Common Synonyms: Phthalic acid diethyl ester Ethyl phthalate 1,2-Benzenedicarboxylic acid diethyl ester		Liquid	White	Mild chemical odor
		Sinks in water Freezing point is 27°F		
Fire		Combustible Irritating fumes may be produced when heated		
Exposure		LIQUID Not harmful		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Should be removed Chemically and physically treated		2. LABELS No hazard label required by U.S. Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,2-Benzenedicarboxylic acid diethyl ester; Ethylphthalate; Phthalic acid diethyl ester 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₁₂ H ₁₄ O ₄ (H) 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Slight characteristic ester odor		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves; goggles; face shield 5.2 Symptoms Following Exposure: Nausea; vomiting; throat irritation; eye irritation 5.3 Treatment for Exposure: INHALATION: remove from exposure; move to fresh air; if breathing is difficult, give oxygen; if unconscious, give artificial respiration 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 oral LD ₅₀ (rat) 1.5 g/kg 5.7 Late Toxicity: Prolonged inhalation or ingestion may produce irritation of upper respiratory tract in humans 5.8 Vapor (Gas) Irritant Characteristics: Unknown 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: 105°F (40°C) 6.2 Flammable Limits in Air: 1.1 to 6.7% (L to U) 6.3 Fire Extinguishing Agents: Dry chemical; foam; carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Irritating vapors of unburned chemicals may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: 455°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: 12 ppm 48-hour goldfish killed; fresh water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Eastman Chemical Products, Inc. Kingsport, Tenn. 37602 2 Monsanto Company 480 North Lindbergh Blvd. St. Louis, Mo. 63109 3 Aldrich Chemical Co. 480 W. Saint Paul Ave. Milwaukee, Wis. 53233
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) XXX	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 222 13.3 Boiling Point at 1 atm: 205.1°C (381.2°F) 13.4 Freezing Point: 2.8°C (37.0°F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.12 at 20°C (liquid) 13.8 Liquid Surface Tension: 37.5 dynes/cm at 20°C (liquid) 13.9 Liquid-Water Interfacial Tension: 6.27 dynes/cm at 20°C (liquid) 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 7.0 kcal/mole at 20°C (liquid) 13.13 Heat of Combustion: 10,920 Btu/lb (50,100 J/g) at 25°C (liquid) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Category Classification Health Hazard: 3 Flammability: 2 Reactivity: 1	
NOTES	

DEZ

DIETHYLZINC

Common Synonyms Zinc diethyl Diethyl zinc Zinc ethyl	Waters liquid Colorless IGNITES WHEN EXPOSED TO AIR Flammable irritating vapor is produced
Fire	IGNITES WHEN EXPOSED TO AIR Flammable liquid and vapor. Ignites spontaneously in air.
Exposure	VAPOR OR DUST Irritating to eyes, nose and throat. If inhaled will cause bronchitis or difficult breathing. LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous to surface water intakes.
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 666-6 Toxic material - High flammability Reacts with water Flammable	2. LABELS 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Zinc diethyl, Diethyl zinc, Zinc ethyl 3.2 Coast Guard Compatibility Classification: Not Applicable 3.3 Chemical Formula: $(C_2H_5)_2Zn$ 3.4 IMCO/United Nations Numerical Designation: 4.1	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Not pertinent
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Cartridge type or fresh air mask for fumes or smoke. PVC fire retardant or asbestos gloves, full face shield, safety glasses or goggles, fire retardant overalls as standard wear. For special cases use asbestos suit or rain suit. 5.2 Symptoms Following Exposure: Inhalation: Irritation, possible immediate irritation to nose and throat, excessive or prolonged inhalation causes irritation to lungs, irritation to the eyes may cause severe irritation, irritation to the skin may cause severe irritation. Ingestion: Irritation, possible immediate irritation to the mouth and throat, irritation to the stomach and intestines. Skin Contact: Irritation, possible immediate irritation to the skin. Eye Contact: Irritation, possible immediate irritation to the eyes. 5.3 Treatment for Exposure: INHALATION: Move victim to fresh air. If victim does not immediately get medical attention, administer oxygen. If victim is unconscious, administer oxygen. If victim is breathing, administer oxygen. If victim is not breathing, administer artificial respiration. EYES: Flush with large amounts of running water for at least 15 minutes. Flush thoroughly with water. If irritation persists, get medical attention. SKIN: Flush with large amounts of water. If irritation persists, get medical attention. If victim is unconscious, administer artificial respiration. If victim is not breathing, administer artificial respiration. If victim is not breathing, administer artificial respiration.	

6 FIRE HAZARDS

- 6.1 Flash Point: Not pertinent
 6.2 Flammable Limits in Air: Not pertinent
 6.3 Fire Extinguishing Agents: Dry chemical and unpowdered alcohol
 6.4 Fire Extinguishing Agents Not to be Used: Water, foam, halogenated agents
 6.5 Special Hazards of Combustion Products: Yields zinc oxide fumes when burning. Can cause metal fume fever.
 6.6 Behavior in Fire: Reacts spontaneously with air, oxygen and combusts with water, evolves flammable ethane gas. Contact with water or damp surfaces produces flammable ethane gas.
 6.7 Ignition Temperature: Not pertinent
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: Not pertinent

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Reacts violently to form flammable ethane gas.
 7.2 Reactivity with Common Materials: Will react with surface moisture, generating flammable ethane gas.
 7.3 Stability During Transport: Not pertinent
 7.4 Neutralizing Agents for Acids and Corrosives: Not pertinent
 7.5 Polymerization: Not pertinent
 7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Not pertinent
 8.2 Waterfowl Toxicity: Not pertinent
 8.3 Biological Oxygen Demand (BOD): None
 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1. Ethyl Corporation
 Industrial Services Division
 Ethyl Tower
 481 Florida
 Bay Ridge, La. 70705
 2. Texas Alkyls Incorporated
 P.O. Box 490
 Deep Park, Texas 75546
 American Petroleum
 Products
 P.O. Box 100
 Beverly, Massachusetts

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Not pertinent. Also shipped as 25% solution in water in high density polyethylene.
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: Not pertinent. Inert nitrogen gas.
 10.4 Venting: Not pertinent

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 666-3
 A07

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable liquid
 12.2 HAS Hazard Rating for Bulk Water Transportation: Not pertinent
 12.3 IFA Hazard Classifications:

Category	Classification
Health Hazard (GHS)	
Environment (GHS)	
Reactivity (GHS)	

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 156.2
 13.3 Boiling Point at 1 atm: 120°C (248°F)
 13.4 Freezing Point: -115°C (-175°F)
 13.5 Critical Temperature: Not pertinent
 13.6 Critical Pressure: Not pertinent
 13.7 Specific Gravity: 0.70 at 20°C (liquid)
 13.8 Liquid Surface Tension: 20 dynes/cm at 20°C (liquid)
 13.9 Liquid-Water Interfacial Tension: Not pertinent
 13.10 Vapor (Gas) Specific Gravity: Not pertinent
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
 13.12 Latent Heat of Vaporization: 10.5 kcal/mole (43.9 kJ/mole)
 13.13 Heat of Combustion: 10.5 kcal/mole (43.9 kJ/mole)
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

5. HEALTH HAZARDS (Cont'd)

- 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent
 5.5 Short-Term Inhalation Limits: Not pertinent
 5.6 Toxicity by Ingestion: Not pertinent
 5.7 Life Toxicity: Not pertinent
 5.8 Vapor (Gas) Irritant Characteristics: Data not available
 5.9 Liquid or Solid Irritant Characteristics: Data not available
 5.10 Other Threshold: Not pertinent

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: 3.7% - 18% 6.3 Fire Extinguishing Agents: Shut off gas source, use water to cool adjacent combustibles 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Irritating hydrogen fluoride fumes may form in fire 6.6 Behavior in Fire: Container may explode. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back. 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Contamination Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 - Du Pont de Nemours & Co. (Inc.) Freon Products Div. Wilmington, Del. 19785
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A B C D E F G 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: as listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 66.05 13.3 Boiling Point at 1 atm: $-23.3^{\circ}\text{F} = -13.3^{\circ}\text{C} = 245.8^{\circ}\text{K}$ 13.4 Freezing Point: $-179.9^{\circ}\text{F} = -117.8^{\circ}\text{C} = 156^{\circ}\text{K}$ 13.5 Critical Temperature: $236.3^{\circ}\text{F} = 113.5^{\circ}\text{C} = 386.6^{\circ}\text{K}$ 13.6 Critical Pressure: 652 psia = 44.37 atm = 4.50 MPa, m 13.7 Specific Gravity: 0.95 at 20°C (liquid) 13.8 Liquid Surface Tension: 11.25 dynes/cm = 0.01125 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: 2.3 13.11 Ratio of Specific Heats of Vapor (Gas): 1.141 13.12 Latent Heat of Vaporization: 140.5 Btu/lb = 78.03 cal/g = 3265 x 10³ J/kg 13.13 Heat of Combustion: 2956 Btu/lb = 4420 cal/g = 185 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

Continued on pages 5 and 6

NOTES

DFA

DIFLUOROPHOSPHORIC ACID, ANHYDROUS

Common Synonyms Difluorophosphoric acid		Liquid	Colorless	Sharp, irritating odor
		Reacts violently with water. Irritating vapors produced on contact with water.		
AS IDENTIFIED BY THE FOLLOWING TESTS:				
Fire		Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED		
Exposure		VAPOR Irritating to eyes, nose and throat LIQUID Will burn skin and eyes Harmful if swallowed		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: "poisonous liquid water contaminant" Restrict access Evacuate area Disperse and flush with water		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Difluorophosphoric acid 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: HOPOF 3.4 IMCO/United Nations Numerical Designation: N 1765		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sharp, very irritating		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Air line mask or self contained breathing apparatus; full protective clothing				
5.2 Symptoms Following Exposure: Inhalation causes severe irritation of upper respiratory tract. Contact with liquid causes severe irritation of eyes and skin. Ingestion causes severe burns on mouth and stomach.				
5.3 Treatment for Exposure: Get medical attention as soon as possible following exposure to this compound. INHALATION: remove from exposure and support respiration. EYES: wash with copious volumes of water for at least 15 min. SKIN: wash with large amounts of water for 15 min. INGESTION: if victim is conscious have him drink large amounts of water followed by milk or milk of magnesia.				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Data not available				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.				
5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.				
5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS		8. WATER POLLUTION	
6.1 Flash Point: Not flammable		8.1 Aquatic Toxicity: Data not available	
6.2 Flammable Limits in Air: Not flammable		8.2 Waterfowl Toxicity: Data not available	
6.3 Fire Extinguishing Agents: Not pertinent		8.3 Biological Oxygen Demand (BOD): None	
6.4 Fire Extinguishing Agents Not to be Used: Do not use water on adjacent fires.		8.4 Food Chain Concentration Potential: None	
6.5 Special Hazards of Combustion Products: Irritating and toxic fumes of hydrogen fluoride and phosphoric acid may be formed in fires.		9. SELECTED MANUFACTURERS	
6.6 Behavior in Fire: Not pertinent		1. Ozark Mahoning Company 870 South Boulder Tulsa, Okla. 74119	
6.7 Ignition Temperature: Not pertinent		2. Pfaltz and Bauer, Inc. 126-04 Northern Boulevard Flushing, N.Y. 11368	
6.8 Electrical Hazard: Not pertinent			
6.9 Burning Rate: Not pertinent			
7. CHEMICAL REACTIVITY		10. SHIPPING INFORMATION	
7.1 Reactivity with Water: Reacts vigorously to form corrosive and toxic hydrofluoric acid.		10.1 Grades or Purity: 1 P Acid No. 2 90+ Commercial 96+ plus 3% monodifluorophosphoric acid	
7.2 Reactivity with Common Materials: In the presence of moisture is corrosive to glass, other siliceous materials, and most metals.		10.2 Storage Temperature: Ambient	
7.3 Stability During Transport: Stable		10.3 Inert Atmosphere: No requirement	
7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with sodium bicarbonate or lime solution.		10.4 Venting: Pressure/vacuum	
7.5 Polymerization: Not pertinent			
7.6 Inhibitor of Polymerization: Not pertinent			
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A (3)		13. PHYSICAL AND CHEMICAL PROPERTIES	
12. HAZARD CLASSIFICATIONS		13.1 Physical State at 15°C and 1 atm: Liquid	
12.1 Code of Federal Regulations: Corrosive liquid		13.2 Molecular Weight: 103.0	
12.2 NFPA Hazard Rating for Bulk Water Transportation		13.3 Boiling Point at 1 atm: 241.1 = 116°C = 239 K	
Category	Rating	13.4 Freezing Point: -149.1 = -95°C = 174 K	
Fire	0	13.5 Critical Temperature: Not pertinent	
Health		13.6 Critical Pressure: Not pertinent	
Vapor Irritant	2	13.7 Specific Gravity: 1.583 at 25°C (liquid)	
Liquid or Solid Irritant	4	13.8 Liquid Surface Tension: Data not available	
Toxics	2	13.9 Liquid-Water Interfacial Tension: Not pertinent	
Water Pollution		13.10 Vapor (Gas) Specific Gravity: Not pertinent	
Human Toxicity		13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent	
Aquatic Toxicity		13.12 Latent Heat of Vaporization: 140 Btu/lb = 32 cal/g = 3.2 X 10 ⁴ J/kg	
Acute Toxicity	2	13.13 Heat of Combustion: Not pertinent	
Reactivity		13.14 Heat of Decomposition: Not pertinent	
Other Chemicals		13.15 Heat of Solution: Data not available	
Water	0	13.16 Heat of Polymerization: Not pertinent	
Self Reaction	0		
12.3 NFPA Hazard Classifications: Not listed		NOTES	

Continued on page 1484

DHP

DIHEPTYL PHTHALATE

Common Synonyms Phthalic acid, diheptyl ester		Liquid	White	Odorless
		May float or sink in water		
Fire		Combustible		
Exposure		LIQUID Irritating to skin and eyes Harmful if swallowed		
Water Pollution		Effect of low concentrations on aquatic life is unknown Foaming to shoreline May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods HANDBOOK CG 446 4) Mechanical containment Should be removed Chemical and physical treatment		2 LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Phthalic acid, diheptyl ester 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: C ₁₄ H ₂₂ (COOC-H ₁₁) ₂ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation of vapors from very hot material may cause headache, drowsiness, and convulsions. Contact with eyes may cause irritation 5.3 Treatment for Exposure: INHALATION: move to fresh air. EYES: flush with water. SKIN: wipe off, flush with water, wash with soap and water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products 6.6 Behavior in Fire 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. K & K Laboratories, Inc. 121 Express Street Plainville, N.Y. 11803 2. Research Organic-Inorganic Chemical Corp. 11886 Sheldon Sun Valley, Calif. 91352
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Pure 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open

11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A-T-L-N-Y	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 362 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: (est.) 1.0 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: (est.) = 16,850 Btu/lb = -9,370 cal/g = -392 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	

Continued on pages 5 and 6

NOTES

(continued on pages 5 and 6)

D&C	DIISOBUTYLCARBINOL
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D&C	DIISOBUTYLCARBINOL
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Common Synonyms 2,6-Dimethyl-4-heptanol		Only liquid	Colorless
		Floats on water	
No discharge if possible Call Fire Department Is it a liquid or a solid? Is it a gas? No. 1 - 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100			
Fire		Combustible Extinguish with dry chemical, alcohol foam, or water. Can be exposed to water.	
Exposure		CALL FOR MEDICAL AID LIQUID Harmful if swallowed. IF SWALLOWED: do not induce vomiting. Have victim drink water. If in eyes: flush with water for 15 minutes.	
Water Pollution		Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. No data on health and safety to humans. No data on effects on the water system.	
1. RESPONSE TO DISCHARGE See Response Methods Manual, CG 446-41. Mechanically contain spill. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms 2,6-Dimethyl-4-heptanol 3.2 Coast Guard Compatibility Classification Alcohol 3.3 Chemical Formula $C_{10}H_{22}O$ 3.4 IMCO United Nations Numerical Designation Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped) Liquid 4.2 Color Colorless 4.3 Odor Characteristic	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment Air supplied mask for prolonged exposure; plastic gloves, goggles. 5.2 Symptoms Following Exposure None expected. 5.3 Treatment for Exposure SKIN AND EYES: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value) Not pertinent. 5.5 Short-Term Inhalation Limits Not pertinent. 5.6 Toxicity by Ingestion LD ₅₀ 2.2 g/kg (9.1 g/lb) rat. 5.7 Late Toxicity Data not available. 5.8 Vapor (Gas) Irritant Characteristics None. 5.9 Liquid or Solid Irritant Characteristics None. 5.10 Odor Threshold Data not available.			
6. FIRE HAZARDS 6.1 Flash Point 107°F (42°C) 6.2 Flammable Limits in Air 3.5% - 6.1% 6.3 Fire Extinguishing Agents Carbon dioxide, dry chemical, alcohol foam. 6.4 Fire Extinguishing Agents Not to be Used None listed. 6.5 Special Hazards of Combustion Products Not pertinent. 6.6 Behavior in Fire Not pertinent. 6.7 Ignition Temperature 494°F (257°C) 6.8 Electrical Hazard Not pertinent. 6.9 Burning Rate Data not available.			
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water No reaction. 7.2 Reactivity with Common Materials No reaction. 7.3 Stability During Transport Stable. 7.4 Neutralizing Agents for Acids and Caustics Not pertinent. 7.5 Polymerization Not pertinent. 7.6 Inhibitor of Polymerization Not pertinent.			
8. WATER POLLUTION 8.1 Aquatic Toxicity Data not available. 8.2 Waterway Toxicity Data not available. 8.3 Biological Oxygen Demand (BOD) Data not available. 8.4 Food Chain Concentration Potentials None.			
9. SELECTED MANUFACTURERS Union Carbide Corp. Chemicals and Plastics Division 200 Park Ave. New York, N.Y. 10017			
10. SHIPPING INFORMATION 10.1 Grades or Purity 98.5% 10.2 Storage Temperature Ambient. 10.3 Inert Atmosphere No requirement. 10.4 Venting Open flame arresters.			
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 446-31. A - 1 - U		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm Liquid. 13.2 Molecular Weight 144.21. 13.3 Boiling Point at 1 atm 182°C = 358°F = 455°K. 13.4 Freezing Point -85°C = -121°F = 188°K. 13.5 Critical Temperature Not pertinent. 13.6 Critical Pressure Not pertinent. 13.7 Specific Gravity 0.812 at 20°C (liquid). 13.8 Liquid Surface Tension Data not available. 13.9 Liquid-Water Interfacial Tension Data not available. 13.10 Vapor (Gas) Specific Gravity Not pertinent. 13.11 Ratio of Specific Heats of Vapor (G _v) Not pertinent. 13.12 Latent Heat of Vaporization 140 Btu/lb = 32.2 kcal/kg = 12.2 x 10 ³ J/kg. 13.13 Heat of Combustion (calorimeter) 400 Btu/lb = 9.3 kcal/g = 40.5 x 10 ³ J/kg. 13.14 Heat of Decomposition Not pertinent. 13.15 Heat of Solution Not pertinent. 13.16 Heat of Polymerization Not pertinent.	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations Combustible Liquid. 12.2 NFPA Hazard Rating for Bulk Water Transportation Not listed. 12.3 NFPA Hazard Classifications Not listed.			
NOTES			

DBL

DIISOBUTYLENE

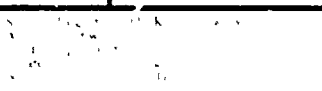
Common Synonyms 2,4-Dimethylpentene	Liquid Colorless Gasoline like odor Floats on water. Flammable. Irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. If caught in fire, keep container cool with water. May be ignited by static electricity. Do not expose to direct sunlight.
Exposure	HAZARD FORMER AT 100 VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush contaminated areas with plenty of water. If SWALLOWED, do not induce vomiting. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. Not a water pollutant.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445-4). Evaporating, flammable, irritant. Toxicity: C, D	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,4-Dimethylpentene 3.2 Coast Guard Compatibility Classification: (D) (In) 3.3 Chemical Formula: C_5H_{10} 3.4 IMCO United Nations Numerical Designation: 2.2 (In)	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Gasoline like
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: (P) (See CG 445-4) 5.2 Symptoms Following Exposure: (S) (See CG 445-4) 5.3 Treatment for Exposure: (T) (See CG 445-4) 5.4 Toxicity by Inhalation (Threshold Limit Value): (T) (See CG 445-4) 5.5 Short-Term Inhalation Limits: (S) (See CG 445-4) 5.6 Toxicity by Ingestion: (I) (See CG 445-4) 5.7 Late Toxicity: Liver and kidney damage in experimental animals. 5.8 Vapor (Gas) Irritant Characteristics: (V) (See CG 445-4) 5.9 Liquid or Solid Irritant Characteristics: (L) (See CG 445-4) 5.10 Odor Threshold: (O) (See CG 445-4)	

6 FIRE HAZARDS 6.1 Flash Point: 55°F (13°C) 6.2 Flammable Limits in Air: 0.9-11.1% (V) 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 755°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 7 ft/min (2.1 m/min)	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																												
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. B. F. Goodrich Co. 6090 Oak Tree Blvd. Cleveland, Ohio 44131 2. Petro-Tex Chemical Corp. 5000 Park Place Houston, Texas 77017 3. Texaco, Inc. 135 E. 42nd St. New York, N.Y. 10017																												
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 445-4 A T U A W	10 SHIPPING INFORMATION 10.1 Grades or Purity: Research grade, 99.9% Pure grade, 99.9% Technical grade, 98.5% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester) or pressure/vacuum																												
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>2</td> </tr> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Vapor Irritant</td> <td>0</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td>1</td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self-Reaction</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed	Category	Rating	Fire	2	Health	1	Vapor Irritant	0	Liquid or Solid Irritant	1	Poisons	1	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity	1	Other Chemicals	1	Water	0	Self-Reaction	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 70.12 13.3 Boiling Point at 1 atm: 24.3°F = 101.5°C = 374.7°K 13.4 Freezing Point: -13.3°F = -9.5°C = 268.7°K 13.5 Critical Temperature: 545.1°F = 286.2°C = 559.9°K 13.6 Critical Pressure: 340 psia = 23.55 atm = 2.67 MN/m ² 13.7 Specific Gravity: 0.675 at 20°C (liquid) 13.8 Liquid Surface Tension: 20 dyne/cm = 0.020 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.051 (20°C) 13.12 Latent Heat of Vaporization: 110 Btu/lb = 64 cal/g = 2.5 x 10 ³ J/kg 13.13 Heat of Combustion: -18,991 Btu/lb = -10,900 cal/g = -440 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	2																												
Health	1																												
Vapor Irritant	0																												
Liquid or Solid Irritant	1																												
Poisons	1																												
Water Pollution	1																												
Human Toxicity	1																												
Aquatic Toxicity	1																												
Aesthetic Effect	2																												
Reactivity	1																												
Other Chemicals	1																												
Water	0																												
Self-Reaction	1																												
NOTES - See end of page 4 and 5																													

REVISED 1978

DIK

DIISOBUTYL KETONE

Common Synonyms 2,6-Dimethyl-4-heptanone 5-Diisopropylacetone Isobutyl ketone DIIBK		Liquid	Colorless	Mild, sweet odor
Floats on water				
				
Fire	Combustible			
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: DIIBK, ssm. Diisopropylacetone, 2,6-Dimethyl-4-heptanone, Isobutyl ketone. 3.2 Coast Guard Compatibility Classification: Ketone. 3.3 Chemical Formula: $(CH_3)_2CHCH_2COCH_2CH(CH_3)_2$ (Isobutyl) $C_{10}H_{20}O$ 3.4 IMCO/United Nations Numerical Designation: 33, 115*		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Mild, characteristic ketonic.		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Air supplied mask in confined areas; plastic gloves; face shield and safety glasses. 5.2 Symptoms Following Exposure: Inhalation of vapor causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Vapor irritates eyes. Contact with liquid irritates skin. 5.3 Treatment for Exposure: INHALATION: move to fresh air; give oxygen if breathing is difficult; call a physician. EYES: flush with plenty of water. SKIN: wipe off; flush with plenty of water; wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm. 5.5 Short-Term Inhalation Limits: 40 ppm/30 min. 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 1.4 g/kg (mouse); 5.5 g/kg (rat). 5.7 Late Toxicity: Causes increased liver and kidney weights in rats; decreased liver weights in guinea pigs. 5.8 Vapor (Gas) Irritation Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 5.10 Odor Threshold: Data not available.				

- 6. FIRE HAZARDS**
- 6.1 **Flash Point:** 131°F (50°C) 120°F (49°C)
- 6.2 **Flammable Limits in Air:** 0.81% - 11% at 200°
- 6.3 **Fire Extinguishing Agents:** Foam, dry chemical, carbon dioxide.
- 6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
- 6.5 **Special Hazards of Combustion Products:**
- 6.6 **Behavior in Fire:**
- 6.7 **Ignition Temperature:** 745°
- 6.8 **Electrical Hazard:** Data not available.
- 6.9 **Burning Rate:** Data not available.

- 7. CHEMICAL REACTIVITY**
- 7.1 **Reactivity with Water:** No reaction.
- 7.2 **Reactivity with Common Materials:** May attack some forms of plastics.
- 7.3 **Stability During Transport:** Stable.
- 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 7.5 **Polymerization:** Not pertinent.
- 7.6 **Inhibitor of Polymerization:** Not pertinent.

11. HAZARD ASSESSMENT CODE
(See Hazard Assessment Handbook, CG 446-3)
 A T U

- 12. HAZARD CLASSIFICATIONS**
- 12.1 **Code of Federal Regulations:** Combustible Liquid.
- 12.2 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 2 |
| Health | |
| Vapor Irritant | 2 |
| Liquid or Solid Irritant | 1 |
| Poisons | 1 |
| Water Pollution | |
| Human Toxicity | 1 |
| Aquatic Toxicity | 2 |
| Aesthetic Effect | 2 |
| Reactivity | |
| Other Chemicals | 2 |
| Water | 0 |
| Self Reaction | 0 |
- 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 2 |
| Reactivity (Yellow) | 0 |

- 8. WATER POLLUTION**
- 8.1 **Aquatic Toxicity:** 45 ppm/24 hr. benthic shrimp, 11 w.
- 8.2 **Waterfowl Toxicity:** Data not available.
- 8.3 **Biological Oxygen Demand (BOD):** 4% of theoretical in 5 days, fresh water.
- 8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

- Union Carbide Corp.
Chemicals and Plastics Div.
270 Park Avenue
New York, N.Y. 10017
- Lastman Chemical Products, Inc.
Kingsport, Tenn. 37662
- Aldrich Chemical Co.
940 W. Saint Paul Ave.
Milwaukee, Wis. 53233

- 10. SHIPPING INFORMATION**
- 10.1 **Grade or Purity:** Technical.
- 10.2 **Storage Temperature:** Ambient.
- 10.3 **Inert Atmosphere:** No requirement.
- 10.4 **Venting:** Open (flame arrester).

- 13. PHYSICAL AND CHEMICAL PROPERTIES**
- 13.1 **Physical State at 15°C and 1 atm:** Liquid.
- 13.2 **Molecular Weight:** 142.23.
- 13.3 **Boiling Point at 1 atm:** 125°F = 52°C = 436°K.
- 13.4 **Freezing Point:** -43°F = -42°C = 231°K.
- 13.5 **Critical Temperature:** Not pertinent.
- 13.6 **Critical Pressure:** Not pertinent.
- 13.7 **Specific Gravity:** 0.806 at 20°C (liquid).
- 13.8 **Liquid Surface Tension:** 23.92 dynes/cm = 0.32 mN/m at 22°C.
- 13.9 **Liquid-Water Interfacial Tension:** Data not available.
- 13.10 **Vapor (Gas) Specific Gravity:** 4.9.
- 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
- 13.12 **Latent Heat of Vaporization:** 121 Btu/lb = 67 cal/g = 2.8 x 10³ J/kg.
- 13.13 **Heat of Combustion:** 16,047 Btu/lb = 8,910 cal/g = 3.73 x 10⁴ J/kg.
- 13.14 **Heat of Decomposition:** Not pertinent.
- 13.15 **Heat of Solution:** Not pertinent.
- 13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 5 and 6)

NOTES

DID

DIISODECYL PHTHALATE

Common Synonyms Phthalic acid, bis (8-methyl- nonyl) ester Phthalic acid diisodecyl ester Plasticizer DDP		Liquid	Colorless
May float or sink in water			
Fire	Combustible Hazardous		
Exposure	LIQUID Not harmful		
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes. Hazardous		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Phthalic acid bis(8-methylnonyl) ester; Phthalic acid diisodecyl ester; Plasticizer DDP 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: C ₂₄ H ₄₈ O ₄ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Faint	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: No symptoms reported for any rate of exposure 5.3 Treatment for Exposure: INGESTION: call physician; EYES: flush with water; call physician SKIN: wipe off; wash with soap and water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS 6.1 Flash Point: 450°F (1)(6.2 Flammable Limits in Air: 111.9-275 at 508°F 6.3 Fire Extinguishing Agents: Dry chemical foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products 6.6 Behavior in Fire: 6.7 Ignition Temperature: 755°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Eastman Chemical Co. Kingsport, Tenn. 37662 2 W. R. Grace & Co. Hatch Chemical Div. King George Post Rd. Fords, N. J. 08863 3 Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 446.7 (theor.) 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: -58°F = -50°C = 223°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.967 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: (est.) -16,600 Btu/lb = -9,270 cal/g = -386 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

(Continued on pages 5 and 6)

DIP

DIISOPROPANOLAMINE

Common Synonyms 1.1 Isomide-2 Propanol 2.2 Dihydroxypropylamine		Liquid or solid crystals Liquid floats and mixes with water Solid sinks and mixes in water	Liquid is colorless Solid is white to light yellow	Dead fish or ammonia odor
Avoid contact with liquid, keep people away Wear eye protection and breathe protection for those working with Inhalation Skin contact Swallowing Ingestion Inhalation Ingestion 				

6 FIRE HAZARDS 6.1 Flash Point: 240°F (115°C) 6.2 Flammable Limits in Air: 1.1% (LFL) - 14.4% (UFL) 6.3 Fire Extinguishing Agents: Water, alcohol foam, dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 500°F (260°C) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																																				
11 HAZARD ASSESSMENT CODE (See HAZARD ASSESSMENT HANDBOOK, CG 446-3) A P Q	10 SHIPPING INFORMATION 10.1 Grades or Purity: 97% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td>1</td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>2</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td>1</td></tr><tr><td>Human Toxicity</td><td>2</td></tr><tr><td>Aquatic Toxicity</td><td>2</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td>1</td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Water</td><td>1</td></tr><tr><td>Self Reaction</td><td>1</td></tr></tbody></table> 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard/Toxic</td><td>1</td></tr><tr><td>Flammability/Reactivity</td><td>1</td></tr><tr><td>Reactivity/Chemical</td><td>1</td></tr></tbody></table>	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	1	Water Pollution	1	Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity	1	Other Chemicals	1	Water	1	Self Reaction	1	Category	Classification	Health Hazard/Toxic	1	Flammability/Reactivity	1	Reactivity/Chemical	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid or solid 13.2 Molecular Weight: 113.14 13.3 Boiling Point at 1 atm: $479.7^\circ\text{F} = 249.3^\circ\text{C} = 472.1^\circ\text{K}$ 13.4 Freezing Point: $108.1^\circ\text{F} = 42.3^\circ\text{C} = 315.5^\circ\text{K}$ 13.5 Critical Temperature: $750.1^\circ\text{F} = 399.5^\circ\text{C} = 672.7^\circ\text{K}$ 13.6 Critical Pressure: $529.4\text{ psia} = 36.2\text{ atm} = 3.6\text{ MN/m}^2$ 13.7 Specific Gravity: 0.999 at 42°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: $185.1\text{ Btu/lb} = 42.7\text{ kJ/kg}$ 13.13 Heat of Combustion: $12,595\text{ Btu/lb} = 2860\text{ kJ/kg}$ 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: $12,595\text{ Btu/lb} = 2860\text{ kJ/kg}$ 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	1																																				
Health	1																																				
Vapor Irritant	1																																				
Liquid or Solid Irritant	2																																				
Poisons	1																																				
Water Pollution	1																																				
Human Toxicity	2																																				
Aquatic Toxicity	2																																				
Aesthetic Effect	2																																				
Reactivity	1																																				
Other Chemicals	1																																				
Water	1																																				
Self Reaction	1																																				
Category	Classification																																				
Health Hazard/Toxic	1																																				
Flammability/Reactivity	1																																				
Reactivity/Chemical	1																																				
NOTES																																					

REVISED 1978

DIISOPROPYLAMINE

6 FIRE HAZARDS 6.1 Flash Point: 201°C (391°F) 6.2 Flammable Limits in Air: OMS = 1% 6.3 Fire Extinguishing Agents: Alcohol foam dry chemical carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fires 6.6 Behavior in Fire: Vapor is heavier than air and may travel to a source of ignition and flash back 6.7 Ignition Temperature: None 6.8 Electrical Hazard: Class I 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: 60 ppm 24 hr creek chub lethal fresh water 40-60 ppm * creek chub critical range fresh water * Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Union Carbide Corp. Chemicals and Plastics Div. 270 Park Avenue New York, N.Y. 10017 2 Pennwalt Corporation Three Parkway Philadelphia, Pa. 19102 3 Virginia Chemicals, Inc. 1340 W. Norfolk Rd. Portsmouth, Va. 23703																																				
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 100% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arrestor																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook TCS 446-3) APORN	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 101.19 13.3 Boiling Point at 1 atm: 153.0°F @ 1 atm = 67.8°C 13.4 Freezing Point: -141.3°F = -96.3°C = 216.9 K 13.5 Critical Temperature: 480.1° F = 249.0°C = 522.2° K 13.6 Critical Pressure: text > 400 psi @ 30 atm = 3 MN/m² 13.7 Specific Gravity: 0.717 at 20°C (liquids) 13.8 Liquid Surface Tension: 19.64 dynes/cm = 0.01964 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.4 13.11 Ratio of Specific Heats of Vapor (Gas): cal/mol 13.12 Latent Heat of Vaporization: 121 Btu/lb = 27 kcal/kg = 2.3 x 10⁵ J/kg 13.13 Heat of Combustion: -14,500 Btu/lb = -11,000 cal/g = -460 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 140 Btu/lb = 76 kcal/kg = 3.2 x 10⁵ J/kg 13.16 Heat of Polymerization: Not pertinent																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Toxic</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>2</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>-</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>-</td> </tr> <tr> <td>Acute Health Effect</td> <td>-</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>+</td> </tr> <tr> <td>Flammability (Red)</td> <td>+</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Toxic	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	2	Water Pollution		Human Toxicity	-	Aquatic Toxicity	-	Acute Health Effect	-	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	+	Flammability (Red)	+	Reactivity (Yellow)	0	U.S. GOVERNMENT PRINTING OFFICE: 1984
Category	Rating																																				
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Flammability (Red)	+																																				
Reactivity (Yellow)	0																																				

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DIH

DIISOPROPYLBENZENE HYDROPEROXIDE

Common Synonyms Isopropylbenzyl Hydroperoxide		Liquid	Colorless to pale yellow	Sharp, unpleasant odor
		May float or sink in water		
Fire		Combustible Will increase the intensity of a fire May cause fire on contact with combustibles Containers may explode in fire		
Exposure		VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficulty breathing LIQUID Irritating to skin and eyes Harmful if swallowed		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if enters water intakes		
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41 Issue warning - oxidizing material Restrict access Mechanical containment Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Isopropylbenzyl hydroperoxide 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $(C_6H_5)CH(CH_3)C_6H_5OOH$ $(C_6H_5)CH(CH_3)C_6H_5O_2H$ 3.4 IMCO/United Nations Numerical Designation: + 2 1X75		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: colorless to pale yellow 4.3 Odor: Sharp, disagreeable		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Solvent resistant gloves, chemical resistant apron, chemical goggles or face shield, self-contained breathing apparatus 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact with eyes or skin causes throbbing sensation and irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air, call a doctor. EYES: flush with water for 15 min., holding eyelids open. call physician. SKIN: wash several times with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS

- 6.1 Flash Point: 175°F ()
6.2 Flammable Limits in Air: Data not available
6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
6.5 Special Hazards of Combustion Products: Flammable alcohol and ketone gases are formed in fire
6.6 Behavior in Fire: Burns with a flare effect. Containers may explode
6.7 Ignition Temperature: Data not available
6.8 Electrical Hazard: Data not available
6.9 Burning Rate: Data not available

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: Aluminum, copper, brass, lead, zinc salts, mineral acids, oxidizing or reducing agents all can cause rapid decomposition
7.3 Stability During Transport: Unstable, slowly evolves oxygen
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-31)
1-1-1

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Organic Peroxide
12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classification: Not listed

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

Hercules, Inc.
Wilmington, Del 19309

10. SHIPPING INFORMATION

- 10.1 Grades or Purities: 54.16% (the balance being diisopropylbenzene, a combustible hydrocarbon)
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Open flame arrester

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: 144.26
13.3 Boiling Point at 1 atm: Not pertinent (decomposes)
13.4 Freezing Point: $<15^{\circ}C$ or $<59^{\circ}F$ or $<264^{\circ}K$
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 0.956 at 15°C (liquids)
13.8 Liquid Surface Tension: Data not available
13.9 Liquid-Water Interfacial Tension: Data not available
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Data not available
13.14 Heat of Decomposition: Data not available
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

NOTES

DAC

DIMETHYLACETAMIDE

Common Synonyms N,N-Dimethylacetamide Acetic acid dimethylamide		Liquid Mixes with water	Colorless	Weak fishy odor
Fire	Combustible			
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water bodies			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant Disperse and flush			2. LABELS No label required by code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: N,N-Dimethylacetamide Acetic acid dimethylamide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $(CH_3)_2NCOCH_3$ 3.4 ICAO/United Nations Numerical Designation: Not listed			4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weak fishy	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield; rubber gloves 5.2 Symptoms Following Exposure: Liquid causes mild irritation of eyes and skin. Ingestion causes depression, lethargy, confusion and disorientation, visual and auditory hallucinations, perceptual distortions, delusions, emotional detachment, and affective flattening 5.3 Treatment for Exposure: EYES: Flush with plenty of water for 15 min.; get medical attention. SKIN: Flush with plenty of water for 15 min.; INGESTION: induce vomiting and follow with plenty of fluids and saline cathartics; treatment for liver and kidney injury is supportive and symptomatic 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade I oral LD_{50} = 5.6 g/kg (rat) 5.7 Late Toxicity: May produce chronic liver and kidney damage 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: 46.5 ppm				

6 FIRE HAZARDS 6.1 Flash Point: 188°F (87°C) 6.2 Flammable Limits in Air: 3.5% - 11.5% 6.3 Fire Extinguishing Agents: Water, dry chemical, alcohol foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 964°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 2.5 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. E. I. duPont de Nemours & Co., Inc. Biochemicals Department 4607 Market Street Wilmington, Del. 19804 2. BASF Wyandotte Corp. 1609 Biddle Avenue Wyandotte, Mich. 48192 3. Pratz and Bauer, Inc. 12644 Northern Boulevard Flushing, N.Y. 11355
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open flame atmosphere
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-4) A P Q	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 87.1 13.3 Boiling Point at 1 atm: $331.1 \pm 1.06^\circ \text{C} = 232.0^\circ \text{F}$ 13.4 Freezing Point: $-4.1 \pm 0.2^\circ \text{C} = 25.0^\circ \text{F}$ 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.843 at 20°C (liquid) 13.8 Liquid Surface Tension: 34 dynes/cm = 0.034 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 274 Btu/lb $= 1,941 \text{ cal/g} = 4.95 \times 10^3 \text{ J/kg}$ 13.13 Heat of Combustion: $-17,560 \text{ Btu/lb}$ $= -6,980 \text{ cal/g} = -292 \times 10^3 \text{ J/kg}$ 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

(continued on pages 4 and 5)

6 FIRE HAZARDS 61 Flash Point: 201°C 62 Flammable Limits in Air: 2.8% - 14.4% 63 Fire Extinguishing Agents: Stop flow of gas. Use water spray or nonoxidizing dry chemical for freon water solutions. 64 Fire Extinguishing Agents Not to be Used: Do not use foam. 65 Special Hazards of Combustion Products: Vapors are eye, skin and respiratory irritant. 66 Behavior in Fire: Not pertinent. 67 Ignition Temperature: 56.1 68 Electrical Hazard: Data not available. 69 Burning Rate: 4.0 mm/min	8 WATER POLLUTION 81 Aquatic Toxicity: 50ppm 24 hr. 48 hr. 96 hr. 100% water >100 ppm 48 hr. 50ppm 100% salt water. 82 Waterborne Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): Data not available. 84 Food Chain Concentration Potential: None.																																		
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: No hazardous reaction. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Not pertinent. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Chemical Services Corp. 245 Park Ave. New York, N.Y. 10017 2. GAF Corp. Chemical Division Calver City, Ky. 42026 Pennard Haz-Cor Independence Mall West Philadelphia, Pa. 19106																																		
11 HAZARD ASSESSMENT CODE See Hazard Assessment Codebook, 1984, 3 A B C K L M N	10 SHIPPING INFORMATION 101 Grosses or Purty: 55 lbs. net wt. 60 lbs. gross wt. 25, 30, 40, 50, 60, 70, 80, 90, 100 102 Storage Temperature: Ambient 103 Inert Atmosphere: Not recommended 104 Venting: Safety relief																																		
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Category</th> <th style="width: 40%;">Rating</th> </tr> </thead> <tbody> <tr> <td>Health</td> <td>4</td> </tr> <tr> <td>Vapor Toxicity</td> <td>4</td> </tr> <tr> <td>Liquid or Solid Toxicity</td> <td>4</td> </tr> <tr> <td>Poison</td> <td>4</td> </tr> <tr> <td>Water Pollution</td> <td>4</td> </tr> <tr> <td>Human Toxicity</td> <td>4</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>4</td> </tr> <tr> <td>Acute Solid Toxicity</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>4</td> </tr> <tr> <td>Physical Chemistry</td> <td>4</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Category</th> <th style="width: 60%;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (H)</td> <td>4</td> </tr> <tr> <td>Flammability (F)</td> <td>4</td> </tr> <tr> <td>Reactivity (R)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Health	4	Vapor Toxicity	4	Liquid or Solid Toxicity	4	Poison	4	Water Pollution	4	Human Toxicity	4	Aquatic Toxicity	4	Acute Solid Toxicity	2	Reactivity	4	Physical Chemistry	4	Water	0	Self Reaction	0	Category	Classification	Health Hazard (H)	4	Flammability (F)	4	Reactivity (R)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 45.06 13.3 Boiling Point at 1 atm: 33.3°C (92.0°F) (29.8°C) 13.4 Freezing Point: -102.5°C (-152.5°F) 13.5 Critical Temperature: 126.1°C (259.0°F) (124.8°C) 13.6 Critical Pressure: 33.5 atm (3.4 MPa) (500 psia) 13.7 Specific Gravity: 1.355 (at 15°C) 13.8 Liquid Surface Tension: 24.0 dyne/cm 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.52 13.11 Ratio of Specific Heats of Vapor (Gas): 1.18 13.12 Latent Heat of Vaporization: 359.0 kJ/kg (140.0 cal/g) = 882.5 Btu/lb 13.13 Heat of Combustion: -16,800 Btu/lb = -9320 cal/g = -39.0 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -1.0 Btu/lb = -0.418 cal/g = -1.7 x 10³ J/kg 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																		
Health	4																																		
Vapor Toxicity	4																																		
Liquid or Solid Toxicity	4																																		
Poison	4																																		
Water Pollution	4																																		
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Flammability (F)	4																																		
Reactivity (R)	0																																		

NOTES

6 FIRE HAZARDS	8 WATER POLLUTION
6.1 Flash Point: 100	8.1 Aquatic Toxicity: 100
6.2 Flammable Limits in Air: 100	8.2 Waterfowl Toxicity: 100
6.3 Fire Extinguishing Agents: 100	8.3 Biological Oxygen Demand (BOD): 100
6.4 Fire Extinguishing Agents Not to be Used: 100	8.4 Food Chain Concentration Potential: 100
6.5 Special Hazards of Combustion Products: 100	
6.6 Behavior in Fire: 100	
6.7 Ignition Temperature: 100	
6.8 Electrical Hazard: 100	
6.9 Burning Rate: 100	
9 SELECTED MANUFACTURERS	
1. East Chemical Co. Chemicals and Plastics Div. 27 West Avenue New York, N.Y. 10011 2. East Chemical Co. Plastics Div. 27 West Avenue New York, N.Y. 10011 3. East Chemical Co. Plastics Div. 27 West Avenue New York, N.Y. 10011 4. East Chemical Co. Plastics Div. 27 West Avenue New York, N.Y. 10011	
7. CHEMICAL REACTIVITY	
7.1 Reactivity with Water: 100	
7.2 Reactivity with Common Materials: 100	
7.3 Stability During Transport: 100	
7.4 Neutralizing Agents for Acids and Caustics: 100	
7.5 Polymerization: 100	
7.6 Inhibitor of Polymerization: 100	
10. SHIPPING INFORMATION	
10.1 Grade or Purity: 100 10.2 Storage Temperature: 100 10.3 Inert Atmosphere: 100 10.4 Venting: 100	
11 HAZARD ASSESSMENT CODE	
See Hazard Assessment Methods, C6.4.1.1 A.0	
12. HAZARD CLASSIFICATIONS	
12.1 Code of Federal Regulations: 100	
12.2 HAS Hazard Rating for Bulk Water Transportation	
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1. Fire	
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100. Hazardous to the Environment	

DIM

DIMETHYL ETHER

Common Synonyms	
Methyl ether	
Liquefied gas	Colorless Pleasant odor
	Floats and boils on water. Flammable irritating vapor is produced.
Fire	FLAMMABLE: Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR: Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, or loss of consciousness. LIQUID: Irritating to skin and eyes. Will cause frostbite.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Summary Handbook, CG 445.4 Toxic warning signs: flammable, irritant, reactive. Evacuate area.	
2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Methyl ether Wood ether 3.2 Coast Guard Compatibility Classification: Flammable (F) 3.3 Chemical Formula: $(CH_3O)_2$ 3.4 IMCO/United Nations Numerical Designation: 2103	
4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid under pressure. 4.2 Color: Colorless. 4.3 Odor: Ethereal, somewhat sweet.	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Mask for organic vapor, goggles, or rubber gloves, safety shoes. 5.2 Symptoms Following Exposure: Irritation produces some anesthesia that less than that of ethyl ether. Nausea, dizziness, headache, irritation of eyes, loss of consciousness. Liquid or concentrated vapor irritates eyes. Contact of liquid with skin may cause frostbite. 5.3 Treatment for Exposure: INHALATION: Remove from exposure and support respiration. All symptoms will subside with proper first aid. SKIN: Remove by use of soap and water or by wrapping the affected part in plastic. 5.4 Toxicity by Inhalation (Three, old Limit Value): Data not available. 5.5 Short-Term Inhalation LD₅₀: Data not available. 5.6 Toxicity by Ingestion: Not pertinent. 5.7 Lethal Dose: LD₅₀ 300 g/kg, rat. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS

- 6.1 Flash Point: Not pertinent (flammable gas).
- 6.2 Flammable Limits in Air: 3.5 - 14%.
- 6.3 Fire Extinguishing Agents: Let fire burn. Shut off gas flow, avoid exposed surroundings with water.
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent.
- 6.5 Special Hazards of Combustion Products: Not pertinent.
- 6.6 Behavior in Fire: Containers may explode. Vapors are heavier than air and may travel long distance to a source of ignition and flash back.
- 6.7 Ignition Temperature: 602 °C.
- 6.8 Electrical Hazard: Data not available.
- 6.9 Burning Rate: 6.6 mm/min.

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
- 7.2 Reactivity with Common Materials: No reaction.
- 7.3 Stability During Transport: Stable.
- 7.4 Neutralizing Agents for Acids and Bases: Not pertinent.
- 7.5 Polymerization: Not pertinent.
- 7.6 Inhibitor of Polymerization: Not pertinent.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
- 8.2 Waterway Toxicity: Data not available.
- 8.3 Biological Oxygen Demand (BOD): Data not available.
- 8.4 Food Chain Concentration Potential: None.

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017
2. Matheson Gas Products
East Rutherford, N.J. 07073
3. Phillips and Bauer, Inc.
12504 Northern Boulevard
Flushing, N.Y. 11356

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: 99+%
- 10.2 Storage Temperature: Ambient.
- 10.3 Inert Atmosphere: No requirement.
- 10.4 Loading: Safety rated.

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Form 3000, CG 445.2
A-B-C-K-L-M-N

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable compressed gas.
- 12.2 HAS Hazard Rating for Bulk Water Transportation: Not rated.
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 2 |
| Reactivity (Yellow) | 0 |

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Gas.
- 13.2 Molecular Weight: 36.
- 13.3 Boiling Point at 1 atm: $-23.7^{\circ}\text{C} = -10.7^{\circ}\text{F} = 245.5^{\circ}\text{K}$.
- 13.4 Freezing Point: $-122.9^{\circ}\text{C} = -189.2^{\circ}\text{F} = 150.3^{\circ}\text{K}$.
- 13.5 Critical Temperature: $26.4^{\circ}\text{C} = 79.5^{\circ}\text{F} = 299.5^{\circ}\text{K}$.
- 13.6 Critical Pressure: 780 psi = 53.4 atm = 4.4 MN/m².
- 13.7 Specific Gravity: 0.724 at -122.9°C (liquid).
- 13.8 Liquid Surface Tension: 21 dynes/cm = 0.021 N/m at -122.9°C .
- 13.9 Liquid-Water Interfacial Tension: 15 dynes/cm = 0.015 N/m at -122.9°C .
- 13.10 Vapor (Gas) Specific Gravity: 1.54.
- 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1456.
- 13.12 Latent Heat of Vaporization: 380 Btu/lb = 112 cal/g = 465 J/g.
- 13.13 Heat of Combustion: 1,450 Btu/lb = 430 J/g = 1,450 cal/g.
- 13.14 Heat of Decomposition: Not pertinent.
- 13.15 Heat of Solution: Not pertinent.
- 13.16 Heat of Polymerization: Not pertinent.

NOTES

DMF

DIMETHYLFORMAMIDE

Common Synonyms N,N-Dimethylformamide DMF	Watery liquid Colorless Slight ammonia odor Floats and mixes with water
Fire	Combustible
Exposure	LIQUID Will burn on skin and eyes Irritation to eyes, nose, throat, and skin Burns on skin
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446.4) Restrict access Disperse and flush	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: N,N-Dimethylformamide DMF 3.2 Coast Guard Compatibility Classification Amide 3.3 Chemical Formula HCON(CH ₃) ₂ 3.4 EXOC United Nations Numerical Designations: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped) Liquid 4.2 Color Colorless 4.3 Odor Slightly ammoniacal, essentially odorless
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety glasses on face shield, rubber apron and boots 5.2 Symptoms Following Exposure: Irritation of eyes, skin and nose. May cause nausea 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air if he is not breathing; give artificial respiration for difficult breathing; give oxygen if available. SKIN OR EYES: Flush with plenty of water while removing contaminated clothing and shoes. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Gravidity (LD ₅₀ = 10.5 g/kg rat) 5.7 Late Toxicity: Causes abortions in pregnant rats, possibly in humans also 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation; such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure and may cause secondary burns on long exposure. 5.10 Odor Threshold: 100 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 151°F (61°C) 6.2 Flammable Limits in Air: 2.2 - 15.2% 6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to Be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Vapors are irritating 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 833°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 2.2 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0.9 lb/lb 5 days 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Air Products and Chemicals, Inc. Allentown, Pa. 18105 2. E. I. duPont de Nemours & Co., Inc. Organic Chemicals Dept. Wilmington, Del. 19895 3. Houghton Chemical Corp. 52 Cambridge St. Boston, Mass. 02134																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446.3) A P Q	10. SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Interim Atmosphere: No requirement 10.4 Ventilation: Open (flame arrester)																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation <table data-bbox="1003 1477 1239 1749"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Explosive</td><td>0</td></tr> <tr> <td>Health</td><td>0</td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td>Poisons</td><td>3</td></tr> <tr> <td>Water Pollution</td><td>0</td></tr> <tr> <td>Human Toxicity</td><td>2</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Acute Effect</td><td>0</td></tr> <tr> <td>Reactivity</td><td>0</td></tr> <tr> <td>Other chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed	Category	Rating	Explosive	0	Health	0	Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	3	Water Pollution	0	Human Toxicity	2	Aquatic Toxicity	2	Acute Effect	0	Reactivity	0	Other chemicals	1	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 73.09 13.3 Boiling Point at 1 atm: 107°F = 42°C = 315°K 13.4 Freezing Point: -51°F = -61°C = 212°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.940 at 20°C (liquids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.101 13.12 Latent Heat of Vaporization: 24° Btu/lb = 13 kcal/g = 5.75 X 10 ³ J/kg 13.13 Heat of Combustion: -11,240 Btu/lb = -267 cal/g = -262.4 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -63 Btu/lb = -35 cal/g = -1.5 X 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Explosive	0																												
Health	0																												
Vapor Irritant	1																												
Liquid or Solid Irritant	2																												
Poisons	3																												
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Aquatic Toxicity	2																												
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Water	0																												
Self Reaction	0																												
NOTES																													

REVISED 1978

DDW

DIMETHYLHEXANE DIHYDROPEROXIDE, WET

Common Synonyms 2,5-Dimethylhexane-2,5-dihydroperoxide 2,5-Dihydroperoxy-2,5-dimethylhexane		Wet solid	White
May float or sink in water			
Stop this hazard possible. Keep people away from fire. Department of Agriculture, Washington, D.C. 20250. For more information, contact the National Fire Protection Association.			
Fire	Not flammable when wet Will increase the intensity of a fire May explode if exposed to heat or flames If a discharge occurs with water, prevent fire Extinguish with dry chemical or foam. Do not use water Water may be ineffective. Do not use water on exposed containers with water		
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If necessary, remove person to fresh air with plenty of water If breathing is stopped, give artificial respiration If breathing is difficult, give oxygen SOLID Irritating to skin and eyes Harmful if swallowed If more contaminated clothing on, flush affected areas with plenty of water If IN EYES, hold eyes open and flush with plenty of water If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk If SWALLOWED and victim is UNCONSCIOUS, have victim induce vomiting If SWALLOWED and victim is UNCONSCIOUS OR HAS NO CONSCIOUSNESS, do nothing except keep victim warm		
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify appropriate wildlife officials Notify appropriate water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Isolate warning - oxidizing material Restrict access Mechanical containment Should be removed Chemical and physical treatment		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,5-Dihydroperoxy-2,5-dimethylhexane, 2,5-Dimethylhexane-2,5-dihydroperoxide 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₈ H ₁₈ (OOH) ₂ · H ₂ O 3.4 IMCO/United Nations Numerical Designation: 5.1-152X		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Wet solid 4.2 Color: White 4.3 Odor: Data not available	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Contact with eyes or skin causes irritation 5.3 Treatment for Exposure: INHALATION: remove from exposure, call a doctor. EYES: wash with large amount of water for at least 15 min. SKIN: wash with large amount of water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective on fire 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: Decomposes violently when heated in fire. Can increase intensity of fire when in contact with combustible material. Containers may explode 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Decomposes in contact with many metals and acids 7.3 Stability During Transport: Stable below 100°F 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Pennwalt Corporation Liquid Division P. O. Box 104N Buffalo, N. Y. 14240 2. Waco Chemical Corporation U. S. Peroxygen Division 450 Morton Avenue Richmond, Calif. 94804 3. Polysciences, Inc. Paul Valley Industrial Park Warrington, Pa. 18976
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Approx. 90-95% water. The dry chemical is too hazardous to ship. 10.2 Storage Temperature: 4-38°C (40-100°F) 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 178.2 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: (est.) 1.0 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Data not available 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Organic Peroxide 12.2 NAF Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
<i>(Continued on page 5 and 6)</i>	
NOTES	

6. FIRE HAZARDS 61 Flash Point: 14°F 62 Flammable Limits in Air: 2-9% 63 Fire Extinguishing Agents: Flood with water 64 Fire Extinguishing Agents Not to be Used: In large fires, water (or carbon dioxide and bicarbonate types) may allow flash back and explosive re-ignition. 65 Special Hazards of Combustion Products: None 66 Behavior in Fire: Tends to ignite if less diluted with much water 67 Ignition Temperature: 452-452°F 68 Electrical Hazard: Class I Group D 69 Burning Rate: 3 mm/min	8. WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: Data not available																																				
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: Dissolves slowly and decomposes many plastics 73 Stability During Transport: Stable below 1112°F 74 Neutralizing Agents for Acids and Caustics: Flush with water 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS EMC Corporation Organic Chemicals Division 653 Third Ave. New York, N.Y. 10012																																				
	10. SHIPPING INFORMATION 101 Grades or Purity: Propellant grade 98% min 102 Storage Temperature: Below 150°F 103 Inert Atmosphere: Inerted 104 Venting: Data not available																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) APORS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 60.11 13.3 Boiling Point at 1 atm: at 0.1 = 63.3°C = 146.9°F 13.4 Freezing Point: -71°F = -57°C = 216°K 13.5 Critical Temperature: 40°F = 249°C = 522°K 13.6 Critical Pressure: 865 psia = 5.93 atm = 5.40 MN/m² 13.7 Specific Gravity: 0.791 at 20°C (liquid) 13.8 Liquid Surface Tension: 28 dynes/cm = 0.028 N/m at 25°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 2.1 13.11 Ratio of Specific Heats of Vapor (Gas): rest at 182 13.12 Latent Heat of Vaporization: 261 Btu/lb = 115 cal/g = 6.07 × 10³ J/kg 13.13 Heat of Combustion: -14,170 Btu/lb = -670 cal/g = -329.3 × 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: rest at 30 Btu/lb = -10 cal/g = -0.6 × 10³ J/kg 13.16 Heat of Polymerization: Not pertinent																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>4</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>3</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td> Poisons</td><td>4</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>4</td></tr> <tr> <td> Aquatic Toxicity</td><td>2</td></tr> <tr> <td> Acute Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>4</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>4</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications <table border="1"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>3</td></tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	3	Liquid or Solid Irritant	4	Poisons	4	Water Pollution		Human Toxicity	4	Aquatic Toxicity	2	Acute Effect	2	Reactivity		Other Chemicals	4	Water	0	Self Reaction	4	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	3	Reactivity (Yellow)	3	NOTES 1. <i>Manufactured under license</i>
Category	Rating																																				
Fire	4																																				
Health																																					
Vapor Irritant	3																																				
Liquid or Solid Irritant	4																																				
Poisons	4																																				
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DMP

DIMETHYLPOLYSILOXANE

Common Synonyms		Liquid	Colorless	Odorless
Poly (dimethylsiloxane) Dimethyl silicone oil Silicone fluids Dimethyl silicone fluids		Floats on water		
Fire	Combustible Flash point: 275.645 F (141.5 C) W			
Exposure	LIQUID Irritating to eyes Eyes: Irritation Skin: Irritation Inhalation: Irritation Ingestion: Irritation			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes S S			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Poly (dimethylsiloxane) Dimethylsilicone oil, Silicone fluids Dimethyl silicone fluids 3.2 Coast Guard Compatibility Classification Not applicable 3.3 Chemical Formula $(CH_3)_2SiO$ [Sil(CH ₃) ₂ O] _n Si(CH ₃) ₂ H 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety goggles 5.2 Symptoms Following Exposure: Contact of liquid with eyes may cause irritation down to cornea Does not irritate skin. Harmless when ingested 5.3 Treatment for Exposure: Eye: Flush with water. Skin: Wash with soap and water. Ingestion: Do not induce vomiting. If swallowed, drink plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point 275.645 F (141.5 C) 6.2 Flammable Limits in Air Not pertinent 6.3 Fire Extinguishing Agents Foam dry chemical carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used Water may be ineffective 6.5 Special Hazards of Combustion Products Not pertinent 6.6 Behavior in Fire Not pertinent 6.7 Ignition Temperature 220-260 F 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity Data not available 8.2 Waterfowl Toxicity Data not available 8.3 Biological Oxygen Demand (BOD) Data not available 8.4 Food Chain Concentration Potential Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water No reaction 7.2 Reactivity with Common Materials No reaction 7.3 Stability During Transport Stable 7.4 Neutralizing Agents for Acids and Caustics Not pertinent 7.5 Polymerization Not pertinent 7.6 Inhibitor of Polymerization Not pertinent	9. SELECTED MANUFACTURERS 1. Dow Corning Corporation South Saginaw Road Midland, Mich. 48640 2. Union Carbide Corporation Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017
	10. SHIPPING INFORMATION 10.1 Grades or Purity A series of compounds having viscosities of from 10 to 100 (100) g is available 10.2 Storage Temperature Ambient 10.3 Inert Atmosphere No requirement 10.4 Venting (None)
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A U N X	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm Liquid 13.2 Molecular Weight Not pertinent 13.3 Boiling Point at 1 atm $> 300 \text{ F} > 149 \text{ C} > 422 \text{ K}$ 13.4 Freezing Point Not pertinent 13.5 Critical Temperature Not pertinent 13.6 Critical Pressure Not pertinent 13.7 Specific Gravity 0.98 at 20 C (liquid) 13.8 Liquid Surface Tension $19.21 \text{ dynes/cm} = 0.0190021 \text{ N/m at } 20 \text{ C}$ 13.9 Liquid-Water Interfacial Tension (est.) $30 \text{ dynes/cm} = 0.030 \text{ N/m at } 20 \text{ C}$ 13.10 Vapor (Gas) Specific Gravity Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas) Not pertinent 13.12 Latent Heat of Vaporization Not pertinent 13.13 Heat of Combustion (est.) = -1000 Btu/lb $= -6700 \text{ cal/g} = -260 \times 10^3 \text{ J/kg}$ 13.14 Heat of Decomposition Not pertinent 13.15 Heat of Solution Not pertinent 13.16 Heat of Polymerization Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation Not listed 12.3 NFPA Hazard Classifications Not listed	(continued on pages 5 and 6) NOTES

(Continued on pages 5 and 6)

DSF	DIMETHYL SULFATE
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6 FIRE HAZARDS 6.1 Flash Point: 240 F (116 C) 182 F (83 C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water foam, carbon dioxide or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: None pertinent 6.5 Special Hazards of Combustion Products: Flammable toxic vapors generated 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 470 F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Slightly non-hazardous reaction 7.2 Reactivity with Common Materials: Corrodes metal when wet 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Custics: Sodium bicarbonate or lime 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. I du Pont de Nemours & Co., Inc. Industrial and Biochemicals Dept. Wilmington, Del 19888																																				
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, Section CG-446-3, A-P-Q-N-Y	10 SHIPPING INFORMATION 10.1 Grades or Purify: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/Vacuum																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive materials 12.2 HAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Category</th><th style="width: 40%;">Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td align="center">1</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td align="center">4</td></tr> <tr><td>Liquid or Solid Irritant</td><td align="center">4</td></tr> <tr><td>Poisons</td><td align="center">4</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td align="center">4</td></tr> <tr><td>Aquatic Toxicity</td><td align="center">5</td></tr> <tr><td>Acute Toxicity</td><td align="center">4</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td align="center">3</td></tr> <tr><td>Water</td><td align="center">0</td></tr> <tr><td>Self Reaction</td><td align="center">0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Category</th><th style="width: 40%;">Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td align="center">4</td></tr> <tr><td>Flammability (Red)</td><td align="center">2</td></tr> <tr><td>Reactivity (Yellow)</td><td align="center">0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	4	Water Pollution		Human Toxicity	4	Aquatic Toxicity	5	Acute Toxicity	4	Reactivity		Other Chemicals	3	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	4	Flammability (Red)	2	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 126.13 13.3 Boiling Point at 1 atm: 171.8 F = 78.2 C = 362.0 K 13.4 Freezing Point: -25.2 F = -3.2 C = 241.4 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.37 at 15 C (liquids) 13.8 Liquid Surface Tension: 40.1 dynes/cm = 6.40E-3 N/m at 15 C 13.9 Liquid-Water Interfacial Tension: 25.2 dynes/cm = 0.02 N/m at 20 C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	4																																				
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NOTES																																					

DMS

DIMETHYL SULFOXIDE

Common Synonyms: Methyl Sulfoxide DMSO	Physical State: Liquid Color: Colorless Odor: Mild garlicky odor Other: Sinks and mixes with water
No spill discharge if possible. Call fire department. Avoid contact with eyes. If exposed, remove clothing and flush with water. No known health or environmental hazards.	
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles, safety suit, self-protecting apparatus, and rubber gloves when handling in fire. Extinguish with water. Do not use alcohol, carbon tetrachloride, or other flammable liquids.
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. Does not affect areas with protective equipment. IF IN EYES, hold eyelids open and flush with plenty of water.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. No known health or environmental hazards. No known reproductive hazards.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 445-1. Disperse and flush.	2. LABELS No hazard labels required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: DMSO Methyl sulfoxide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CH ₃ SOCH ₃ 3.4 IMCO United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Slight garlicky odor
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Based on Federal Agency Recommendations, Respiratory Protection, and other appropriate protective equipment. 5.2 Symptoms Following Exposure: Slight eye irritation. 5.3 Treatment for Exposure: Wash eyes and skin with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Slight above the lip. 5.7 Late Toxicity: Causes damage to eye in dogs, pigs, rats, and rabbits. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. Irritation to clothing and all wet items may be caused by staining and softening of the cloth. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 204 F (90 C) 6.2 Flammable Limits in Air: 3-11% 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Sulfur dioxide, formaldehyde, and methyl sulfide can form. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 172 F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 2.0 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 34,500 ppm, 48 hr. Toxicity: Harmful to fish. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: No.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Chem-Zell, Inc., Corp. Chemical Products Division Bushy San Francisco, CA 94134
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 445-1. A P Q	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required. 10.4 Venting: Open (flame arresters or pressure vacuum).
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 78.13 13.3 Boiling Point at 1 atm: 107.1°C (225°F) 13.4 Freezing Point: -18.3°C (0°F) 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.100 at 20°C (liquid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 29.8 kJ/mol (7.1 kcal/mol) 13.13 Heat of Combustion: -10.0 kJ/mol (2.4 kcal/mol) 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: -10.0 kJ/mol (2.4 kcal/mol) 13.16 Heat of Polymerization: Not pertinent.
NOTES	

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DMT

DIMETHYL TEREPHTHALATE

Common Synonyms Terephthalic acid dimethyl ester		Solid or heated liquid Liquid solidifies. Solid and liquid sink in water.	White solid or colorless liquid	Odorless
Fire		Combustible		
Exposure		DUST Not harmful LIQUID OR SOLID Heated liquid will burn skin and eyes. Harmful if swallowed.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment of floatings Should be removed Chemical and physical treatment		2. LABELS No label requirements under Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Terephthalic acid dimethyl ester 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: 14 C10H10O4 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or liquid 4.2 Color: Colorless 4.3 Odor: None perceptible		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Minus DMT goggles, face shield, gloves and protective clothing, suit, dust mask, goggles. 5.2 Symptoms Following Exposure: Minus DMT all cause severe chemical burns to the skin. 5.3 Treatment for Exposure: EYES: Flush dust from eyes with water. SKIN: Wash with soap and water. If burned by molten DMT, flush area immediately with cold water for at least 15 min. apply wet pack for at least 30 min. do not rub through DMT off burn. If on clothing, remove clothing. If DMT has penetrated, because this will remove underlying skin, seek prompt medical treatment for significant burns. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 1 oral LD50 = 4,340 mg/kg rat. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.				

6 FIRE HAZARDS 6.1 Flash Point: 298.1°C (568°F) molten. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 405°C (761°F) Endov. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Hercules Incorporated Synthetics Department 910 Market Street Wilmington, Del. 19899 2. Amoco Chemicals Corporation 200 East Randolph Drive Chicago, Ill. 60601 3. E. I. du Pont de Nemours & Company, Inc. Polymer Intermediates Department Wilmington, Del. 19898
	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.9% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Inert gas blanket is advisable. 10.4 Venting: Pressure vacuum.
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A T C N Y H	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 222.2 13.3 Boiling Point at 1 atm: 262.4°C = 504.3°F 13.4 Freezing Point: 24.2°C = 75.6°F = 41.8 K 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.2 at 20°C (solid) 1.10 at 145°C (liquid) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 42 Btu/lb = 67.2 cal/g = 281.8 kJ/kg 13.13 Heat of Combustion: -10,310 Btu/lb = -15,577 cal/g = -219.6 kJ/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	
NOTES (See handbook pages 1 and 2)	

DMZ		DIMETHYLZINC	
Common Synonyms Zinc dimethyl Zinc methyl Methylzinc		Liquid Colorless	
Fire IGNITES WHEN EXPOSED TO AIR Irritating gases are produced when heated		6 FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry chemical sand, powdered limestone 6.4 Fire Extinguishing Agents Not to be Used: Water, foam, halogenated agents, or carbon dioxide 6.5 Special Hazards of Combustion Products: Not applicable 6.6 Behavior in Fire: Reacts spontaneously with air, oxygen, and violently with water 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Quench Rate: Not pertinent	
Exposure VAPOR OR MIST Irritating to eyes, nose and throat If inhaled will cause headache, nausea, vomiting or difficult breathing LIQUID Will burn skin and eyes If swallowed will cause nausea, or vomiting		7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts spontaneously generating flammable methane gas 7.2 Reactivity with Common Materials: Will react with surface moisture to generate flammable methane 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	
Water Pollution Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		8 WATER POLLUTION 8.1 Aquatic Toxicity: Not pertinent 8.2 Waterfowl Toxicity: Not pertinent 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None 9. SELECTED MANUFACTURERS Texas Alkyls Incorporated P.O. Box 669 Irving, Texas 75039 Ventron Corporation Alfa Products Beverly, Massachusetts	
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Issue a warning of high flammability Keep away from Exposed area		10 SHIPPING INFORMATION 10.1 Grade or Purity: Technical Electron 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: This nitrogen gas 10.4 Venting: Safety relief	
2 LABELS 		11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 F+OZ	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Zinc dimethyl Zinc methyl Methylzinc 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: (CH ₃) ₂ Zn 3.4 IMCO/United Nations Numerical Designation: 4.2 1.4/1		12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Not pertinent		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 154.4 13.3 Boiling Point at 1 atm: 13.3.1 = 25.5 ± 0.1 K 13.4 Freezing Point: -14.4 ± 0.2 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.94 at 15.5°C (liquid) 13.8 Liquid Surface Tension: (estimated) 13.8.1 = 0.018 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 13.12.1 = 14.9 kJ/kg 13.12.2 = 3.53 × 10 ³ J/kg 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Cartridge type fresh air respirator, or use of PAF fire retardant or other impervious full face chest safety respirator with gas canister and sufficient air supply. Protective gloves, eye protection, and footwear. 5.2 Symptoms Following Exposure: Inhalation of mist or vapors causes immediate irritation of upper respiratory tract. Excessive or prolonged inhalation of fumes from fumes from decomposition may cause metal fume fever, with fever, headache, fever, chills, nausea, vomiting, muscular aches, perspiration, conjunctivitis, and general weakness. Some of these symptoms may last 12-24 hrs. Eyes are irritated and severely irritated by liquid, vapors, and fumes. If it is removed to the high flushing with water, chemical may permanently damage eye. Skin with underlying edema and redness when chemical reacts with moisture may cause severe irritation. If it is washed quickly, skin may be spared. If it is not washed quickly, it may cause severe irritation. If it is not washed quickly, it may cause severe irritation. Ingestion of liquid or vapors causes immediate burning at site of contact. Nausea, vomiting, cramps, and diarrhea may follow. Injuries may be treated as usual. 5.3 Treatment for Exposure: INHALATION: highly irritant, as liquid or vapor either ignites spontaneously or reacts with moisture to form methane and zinc oxide. Move victim to clean air and administer mouth-to-mouth resuscitation if breathing has ceased. Give oxygen only when authorized by physician. Keep victim warm and comfortable. Call physician immediately. If immediately flush with large amounts of water for at least 15 min. holding eyelids apart to ensure thorough irrigation. Use only irrigation only when directed by physician and do not attempt to neutralize with chemicals. Get medical attention as soon as possible. SKIN: immediately flush affected area with large volumes of water. Do not attempt to neutralize with chemicals. Get medical attention if irritation persists. INGESTION: highly irritant, as liquid or vapor either		5 HEALTH HAZARDS (Cont'd) 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Not pertinent 5.7 Acute Toxicity: Not pertinent 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent	

DNT

2,4-DINITROANILINE

Common Synonyms 2,4-Dinitroaniline	Solid powder or crystals Yellow Musty odor Sinks in water
AVOID CONTACT WITH: 1. ANTIMONY, arsenic, barium, bismuth, boron, calcium, cerium, cobalt, copper, chromium, iron, lead, lithium, magnesium, manganese, mercury, nickel, niobium, potassium, molybdenum, sodium, strontium, tellurium, tin, titanium, tungsten, vanadium, zinc, zirconium. 2. AQUEOUS SOLUTIONS OF: 1. AMMONIUM, barium, bismuth, boron, calcium, cerium, cobalt, copper, chromium, iron, lead, lithium, magnesium, manganese, mercury, nickel, niobium, potassium, molybdenum, sodium, strontium, tellurium, tin, titanium, tungsten, vanadium, zinc, zirconium.	
Fire	Combustible May explode if subjected to heat or flame POISONOUS GAS IS PRODUCED WHEN HEATED Toxic when heated May be ignited by heat, sparks or flames Combustion may produce irritating and/or toxic fumes or gas, including nitrogen oxides
 Exposure	SEE FOR MEDICAL AID DUST POISONOUS IF INHALED May be harmful SOLIDS POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to eyes Harmful if swallowed or absorbed through skin If in eyes, flush with water for at least 15 minutes IF SWALLOWED: Do not induce vomiting. Give first aid as directed on label. IF SWALLOWED: Do not induce vomiting. Give first aid as directed on label. IF SWALLOWED: Do not induce vomiting. Give first aid as directed on label. IF SWALLOWED: Do not induce vomiting. Give first aid as directed on label.
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not recommended for use in waterways
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,4-Dinitroaniline 3.2 Coast Guard Competibility Classification: Not applicable 3.3 Chemical Formula: <chem>NH2C6H3(NO2)2</chem> 3.4 IMCO United Nations Numerical Designation: 6.1 (1996)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow 4.3 Odor: Musty
5. HEALTH HAZARDS 5.1 Personal Protection Equipment: Self-contained breathing apparatus, full face, supplied air, escape goggles, plastic laboratory protective clothes 5.2 Symptoms Following Exposure: May cause headache, irritation of the eyes, nose, throat, and skin 5.3 Treatment for Exposure: INHALATION: If inhaled, move to fresh air. INGESTION: Induce vomiting, give universal antidote, get prompt medical care. CONTACT WITH SKIN AND EYES: Remove victim from exposure area. Wash exposed skin with warm water and soap. Flush eyes with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 3, oral rat LD50 = 418 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Causes stinging of the skin and first degree burns on short exposure, may cause second degree burns on long exposure 5.10 Odor Threshold: Not pertinent	

6. FIRE HAZARDS 6.1 Flash Point: 405.1°C 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: If in fires, use water, dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water (flammable dusts may be ignited) 6.5 Special Hazards of Combustion Products: May be harmful if inhaled 6.6 Behavior in Fire: May explode 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None 9. SELECTED MANUFACTURERS American Aniline Products, Inc. 25 Mulford Road Paterson, N.J. 07650 American Alcolac Corp. Chemical and Plastics Division Springfield, N.J. 07081 Martin Marietta Corp. Southern Division, Division Charlotte, N.C. 28206
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: Reacts with oxidizing materials 7.3 Stability During Transport: May deteriorate when heated under confinement 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	10. SHIPPING INFORMATION 10.1 Grade or Purity: Technical and Pure 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Data not available
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 168.1 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: 105.1°C (221.2°F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.36 (20°C) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

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DNB

m-DINITROBENZENE

Common Synonyms 1,3-Dinitrobenzene 1,3-Dinitrobenzol m-DNB		Solid Sinks in water	Yellow Slight odor
AVOID CONTACT WITH SOLID AND DUST. KEEP DUST AWAY. Avoid contact with solid and dust. Keep dust away. Avoid contact with solid and dust. Keep dust away.			
Fire	Combustible May explode if exposed to heat or flames. (1) Solid: May explode if exposed to heat or flames. (2) Liquid: May explode if exposed to heat or flames.		
 <u>Exposure</u>	VAPOR OR DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED (1) Inhalation: May cause irritation of the respiratory tract. (2) Skin: May cause irritation of the skin. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED (1) Ingestion: May cause irritation of the gastrointestinal tract. (2) Skin: May cause irritation of the skin.		
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. (1) Solid: May be dangerous if it enters water intakes. (2) Liquid: May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-4 Toxic warning: poison, acute (1) Inhalation: May cause irritation of the respiratory tract. (2) Skin: May cause irritation of the skin. Should be removed Chemical and physical reaction		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,3-Dinitrobenzene 1,3-Dinitrobenzol = DNB m-DNB 1,3-Dinitrobenzol 3.2 Coast Guard Compatibility Classification To be developed 3.3 Chemical Formula: C ₆ H ₄ N ₂ O ₄ 3.4 IMCO/United Nations Numerical Designation: 6.1, 6.2		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow 4.3 Odor: Weak	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: This report is for informational purposes only. 5.2 Symptoms Following Exposure: Inhalation: May cause irritation of the respiratory tract. Skin: May cause irritation of the skin. 5.3 Treatment for Exposure: INHALATION: Remove person to fresh air. If breathing is difficult, give oxygen. SKIN: Wash with soap and water. EYE: Flush with water for 15 minutes. SKIN: Wash with soap and water. INGESTION: Induce vomiting. Do not induce vomiting if the person is unconscious. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m ³ 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 oral LD ₅₀ : 42 mg/kg body weight 5.7 Late Toxicity: May cause liver damage (hepatotoxicity) 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water or pressurized foam 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: May explode 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Not pertinent 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not pertinent 7.2 Reactivity with Common Materials: Not pertinent 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Aldrich Chemical Co., Inc. 940 West St. Paul Avenue Milwaukee, Wis. 53233 Eastman Organic Chemicals Eastman Organic Chemicals Rochester, N.Y. 14640
	10. SHIPPING INFORMATION 10.1 Grades or Purities: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not pertinent 10.4 Venting: Unnecessary
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-3 11	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 182 13.3 Boiling Point at 1 atm: 294°C (561°F) 13.4 Freezing Point: 10°C (50°F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.56 (at 20°C) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Rate of Specific Heats of Vapor (G): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 41.8 kJ/mol 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous Class B 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

DNC	DINITROCRESOLS
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DNC	DINITROCRESOLS
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Common Synonyms 4,4-Dinitro-o-cresol 1,5-Dinitro-o-cresol 2,6-Dinitro-o-cresol	Solid Sinks in water	Yellow
HAZARD STATEMENT: MAY BE IRRITANT TO EYES, SKIN AND RESPIRATORY TRACT		
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire	
 Exposure	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause loss of consciousness SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED If swallowed will cause nausea, vomiting or loss of consciousness	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes	
1 RESPONSE TO DISCHARGE See Response Numbered Paragraphs: C-6, 666, 6 Do not handle: water contamination Restrict access Should be removed Chemical and physical treatment	2. LABELS No Hazardous Inhibitor Code Federal Regulations	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,6-Dinitro-p-cresol 1,5-Dinitro-o-cresol; 4,4-Dinitro-o-cresol 3.2 Coast Guard Compatibility Classification: Not used 3.3 Chemical Formula: C₇H₃(NO₂)₄O 3.4 IMCO/United Nations Numerical Designation: 1.4, 5.1	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow 4.3 Odor: Data not available	
5 HEALTH HAZARDS		
5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective clothing, rubber gloves 5.2 Symptoms Following Exposure: Very high fever, severe headache, irritative cough with burning, sharp pain in nose, dizziness, indigestion, chest irritation, indigestion may cause some symptoms as heart. In eyes, in case of feeling well being or face, wear in the increased, headache, nausea, vomiting, loss of consciousness, coma and death. Contact with eyes cause irritation, contact with skin causes local reactions and danger to eyes, some effects. No. Some authorities recommend that, although workers have been kept regular is determine hazard of this substance. Further use should be avoided. This does not prevent from using emergency. 5.3 Treatment for Exposure: INHALATION: remove person from exposure, move to fresh air, give first aid and medical attention. INGESTION: same as for inhalation and give appropriate first aid and induce vomiting get medical attention. EYES: Flush with water for at least 15 min. SKIN: Wash thoroughly with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m³ 5.5 Short-Term Inhalation Limits: 1 mg/m³ (30 min) 5.6 Toxicity by Ingestion: Grade 4 (LD 50 mg/kg rats) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Oral Threshold: Data not available		

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7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Sherwin-Williams Chemicals P.O. Box 120 Cleveland, Ohio 44110 Platz & Bauer, Inc. 200 Eastland Ave. Stamford, Conn. 06902 J. I. Baker Chemical Co. Phillipsburg, N.J. 08865
	10 SHIPPING INFORMATION 10.1 Grade or Purity: Technical 99.95% Pails containing 55 lb net water per cwt 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not recommended 10.4 Venting: Open

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11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook (7-646-2) II	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed	13.2 Molecular Weight: 194 13.3 Boiling Point at 1 atm: Not pertinent (decomposes)
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classification:	13.4 Freezing Point: $-76.1 \pm 0.1^\circ \text{F}$ $-50.0 \pm 0.1^\circ \text{C}$ (at 101.3 kPa) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent
12.4 HAZOP: Not listed	13.7 Specific Gravity: Not listed (at 15°C) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent
12.5 HAZOP: Not listed	13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
12.6 HAZOP: Not listed	13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 7150 Btu/lb -1620 cal/g; -164 kJ/kg
12.7 HAZOP: Not listed	13.14 Heat of Decomposition: Data not available 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

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12.4 Other Hazardous Properties:	13.7 Specific Gravity: Not listed (at 20°C/4°C) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent
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12.6 Other Hazardous Properties:	13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 7150 Btu/lb -1420 cal/g; $-164 \times 10^3 \text{ J/kg}$
12.7 Other Hazardous Properties:	13.14 Heat of Decomposition: Data not available 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook (C-5, 646-2) II	12. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 194 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: $-76.1 \pm 0.1^\circ\text{C}$ $= -105.19 \pm 0.18^\circ\text{F}$ (359.9 K) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: Not pertinent (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 7150 Btu/lb $= 3202 \text{ cal/g} = 164 \times 10^3 \text{ J/kg}$ 13.14 Heat of Decomposition: Data not available 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classification: See	(continued on page 7 of 8)

5 HEALTH HAZARDS (Cont d)

5 HEALTH HAZARDS (Cont d)

DNP

2,4-DINITROPHENOL

Common Synonyms alpha Dinitrophenol 1-Hydroxy-2,4-dinitrobenzene		Solid crystal	Yellow	Sweet, musty odor
		Sinks in water		
Fire	COMBUSTIBLE May explode if subjected to heat or flame POISONOUS GASES PRODUCED WHEN HEATED			
	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED SOLID POISONOUS IF SWALLOWED			
EXPOSURE				
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE See Response to Discharge, NFPA 444, 4 Toxic and irritant Releases Should be removed Chemically and physically treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synon. ms: Nitrophenol alpha-Dinitrophenol Hydroxy-2,4-dinitrobenzene 3.2 Coast Guard Compatibility Classification: Not compatible 3.3 Chemical Formula: HO-C ₆ H ₃ (NO ₂) ₂ 3.4 IMCO United Nations Numerical Designation: 1101		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow 4.3 Odor: Musty-sweet		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Not recommended; use appropriate respiratory and skin protection 5.2 Symptoms Following Exposure: Irritation; dizziness; nausea; vomiting; diarrhea 5.3 Treatment for Exposure: Remove victim from exposure; if inhaled, move to fresh air; if on skin, wash with soap and water; if ingested, induce vomiting; if swallowed, give water 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.2 mg/m ³ 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Toxic; 2.1 g/kg (acute) 5.7 Late Toxicity: Produces clouding of lens of eye (cataracts) in animals and humans; birth defects in chick embryos 5.8 Vapor (Gas) Irritant Characteristics: Not irritant 5.9 Liquid or Solid Irritant Characteristics: Causes stinging of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure 5.10 Odor Threshold: 11 mg/m ³ (acute)				

6 FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, dry chemical, carbon dioxide, foam 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Vapor irritant 6.6 Behavior in Fire: Can decompose; explodes when heated under confinement 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8 WATER POLLUTION 8.1 Aquatic Toxicity: Sluggish in the medium sized fresh water 8.2 Waterford Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Reacts with oxidizing materials and combustibles 7.3 Stability During Transport: May decompose when heated under confinement 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. American Alcolac Products, Inc. 25 McLean Blvd. Parsippany, N.J. 07054 2. Martin Marietta Corp. Southern Division, C. Division Charlotte, N.C. 28201	
11 HAZARD ASSESSMENT CODE See Hazard Assessment, NFPA 444, 4 11		10 SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Data not available	
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid, included Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not used 12.3 NFPA Hazard Classifications: Not used		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 174 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: 20.1°C (68.2°F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.38 at 20°C 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats (Vapor (Gas)): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
NOTES			

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DTT

2,4-DINITROTOLUENE

Common Synonyms DNT 2,4-Dinitrotoluene 1-Methyl-2,4-Dinitrobenzene		Solid or heated liquid: Yellow to red solid or yellow liquid Liquid solidities: Solid and liquid sink in water	Slight odor
Physical Properties Boiling Point: 237°C (459°F) Melting Point: 11°C (52°F) Density: 1.27 g/cm³ (79.4 lb/gal) Vapor Pressure: 0.001 mm Hg (0.0013 kPa) at 20°C			
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire		
 Exposure	LIQUID OR SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Will burn skin and eyes If swallowed: will cause nausea, vomiting or loss of consciousness Irritates eyes, nose, throat, and skin May cause dizziness, headache, and fatigue		
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-4 Environmental Protection Agency Material Safety Data Sheet MSDS No. 1000 Emergency Response Guidebook		2. LABELS See Labels Handbook, CG 444-4 Environmental Protection Agency Material Safety Data Sheet	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,4-Dinitrotoluene 3.2 Coast Guard Compatibility Classification: T-100 3.3 Chemical Formula: C ₇ H ₅ N ₂ O ₄ 3.4 IMCO/United Nations Numerical Designation: 2,4-Dinitrotoluene		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow liquid 4.3 Odor: None	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: See Material Safety Data Sheet 5.2 Symptoms Following Exposure: Irritation of eyes, nose, throat, and skin 5.3 Treatment for Exposure: See Material Safety Data Sheet 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m³ 5.5 Short-Term Inhalation Limits: 1.0 mg/m³ 5.6 Toxicity by Ingestion: Irritation of the gastrointestinal tract 5.7 Late Toxicity: May cause dizziness, headache, and fatigue 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: None			

6. FIRE HAZARDS 6.1 Flash Point: 111°C (232°F) 6.2 Flammable Limits in Air: 1.1% to 7.1% 6.3 Fire Extinguishing Agents: Water, foam, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: None 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Decomposes to form toxic gases 6.7 Ignition Temperature: 300°C (572°F) 6.8 Electrical Hazard: None 6.9 Burning Rate: None		8. WATER POLLUTION 8.1 Aquatic Toxicity: Irritation to fish 8.2 Waterfowl Toxicity: Irritation to birds 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: None 7.2 Reactivity with Common Materials: None 7.3 Stability During Transport: Stable at 20°C (68°F) 7.4 Neutralizing Agents for Acids and Caustics: None 7.5 Polymerization: None 7.6 Inhibitor of Polymerization: None		9. SELECTED MANUFACTURERS Eastman Organic Chemicals General Electric American Cyanamid Eastman Organic Chemicals Eastman Organic Chemicals Eastman Organic Chemicals Eastman Organic Chemicals Eastman Organic Chemicals Eastman Organic Chemicals									
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-4 2,4-DNT		10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: None 10.4 Venting: Open to atmosphere									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: None 12.2 NAS Hazard Rating for Bulk Water Transportation: None 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health</td> <td>2</td> </tr> <tr> <td>Flammability</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> </tbody> </table>		Category	Classification	Health	2	Flammability	2	Reactivity	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 171.14 13.3 Boiling Point at 1 atm: 237°C (459°F) 13.4 Freezing Point: 11°C (52°F) 13.5 Critical Temperature: 300°C (572°F) 13.6 Critical Pressure: 3.5 MPa (50.8 atm) 13.7 Specific Gravity: 1.27 13.8 Liquid Surface Tension: 35.0 dyne/cm 13.9 Liquid-Water Interfacial Tension: 15.0 dyne/cm 13.10 Vapor (Gas) Specific Gravity: 4.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1 13.12 Latent Heat of Vaporization: 35.0 kJ/mol 13.13 Heat of Combustion: -30.0 kJ/mol 13.14 Heat of Decomposition: None 13.15 Heat of Solution: None 13.16 Heat of Polymerization: None	
Category	Classification										
Health	2										
Flammability	2										
Reactivity	1										
NOTES											

DOA

DIOCTYL ADIPATE

Common Synonyms Adipic acid bis(2-octylheptyl) ester Di(2-octylheptyl) adipate		Only liquid	Colorless	Odorless
		Floats on water		
Stop discharge, if possible Call fire department Avoid contact with liquid Isolate and remove discharged material Notify local health and pollution control agencies				
Fire		Combustible Extinguish with foam, dry chemical, or carbon dioxide Water may be used from a safe distance		
Exposure		CALL FOR MEDICAL AID LIQUID Irritating to eyes Wash eyes with water Wash with plenty of water		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and pollution control agencies Stop process if it enters water		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG #45, 4) Mechanical containment Chemical and physical treatment		2 LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms Adipic acid bis(2-octylheptyl) ester Adipic acid bis(2-octylheptyl) adipate DOA 3.2 Coast Guard Compatibility Classification F-ter 3.3 Chemical Formula C ₄₈ H ₉₆ O ₄ 3.4 IMCO United Nations Numerical Designation Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped) Liquid 4.2 Color Colorless 4.3 Odor Mild characteristic		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment None required 5.2 Symptoms Following Exposure Low toxicity; no report of injury in industrial handling 5.3 Treatment for Exposure: CONTACT WITH SKIN AND EYES: wipe off and wash skin with soap and water. Treat like lubricant oil. Flush eyes with water. Remove to fresh air 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits Not pertinent 5.6 Toxicity Ingestion Grade 1 LD ₅₀ 3.0 g/kg 5.7 Late Toxicity None 5.8 Vapor (Gas) Irritant Characteristics Vapors not irritating to the eyes and throat 5.9 Liquid or Solid Irritant Characteristics Moderate hazard. If spilled on clothing and allowed to remain may cause staining and irritation of the skin 5.10 Odor Threshold Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point: 390°F (200°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Data not available 6.4 Fire Extinguishing Agents Not to be Used: Data not available 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Allied Chemical Corp. Plastics Division Morristown, N.J. 07960 2. Diamond Shamrock Corp. Nopco Chemicals Division Morristown, N.J. 07960 3. W. R. Grace & Co. Hulse Chemical Division Fort St. Vrain, CO 80541
	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.5% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG #46, 3) A 1 1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 771 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.928 at 20°C (liquid) 13.8 Liquid Surface Tension: (test 1) 35 dyne/cm at 20°C 13.9 Liquid-Water Interfacial Tension: (test 1) 30 dyne/cm at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -15,433 Btu/lb = -4580 cal/g = -359 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

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DOP

DIOCTYL PHTHALATE

Common Synonyms Phthalic acid bis(2-ethylhexyl) ester DOP Bis(2-ethylhexyl) phthalate Di(2-ethylhexyl) phthalate Octoil	Only liquid Colorless Slight odor Floats on water
Fire	Not combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Chemical or physical treatment	2 LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms Bis(2-ethylhexyl) phthalate Di(2-ethylhexyl) phthalate DOP Octoil Pht diacid bis(2-ethylhexyl) ester 3.2 Coast Guard Compatibility Classification F+	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped) Liquid 4.2 Color Colorless 4.3 Odor Very slight characteristic
5 HEALTH HAZARDS 5.1 Personal Protective Equipment Not required 5.2 Symptoms Following Exposure Produces mild effects if inhaled. Irritation may occur if inhaled in vapor at high temperatures. 5.3 Treatment for Exposure Leave contaminated area. Wash skin with soap and water. Flush eyes with water. 5.4 Toxicity by Inhalation (Threshold Limit Value) Not pertinent 5.5 Short-Term Inhalation Limits Not pertinent 5.6 Toxicity by Ingestion Grade II Data show no acute toxicity 5.7 Late Toxicity Not established 5.8 Vapor (Gas) Irritant Characteristics No irritation to the eye, nose, or throat 5.9 Liquid or Solid Irritant Characteristics No appreciable hazard. Practically non-toxic 5.10 Odor Threshold Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: 425 F (0 C) 6.2 Flammable Limits in Air Not pertinent 6.3 Fire Extinguishing Agents Dry powder, carbon dioxide, foam 6.4 Fire Extinguishing Agents Not to be Used Water or foams may cause frothing 6.5 Special Hazards of Combustion Products None 6.6 Behavior in Fire Not pertinent 6.7 Ignition Temperature Data not available 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity Data not available 8.2 Waterfowl Toxicity Data not available 8.3 Chemical Oxygen Demand (BOD) Data not available 8.4 Food Chain Concentration Potential None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water No reaction 7.2 Reactivity with Common Materials No reaction 7.3 Stability During Transport Stable 7.4 Neutralizing Agent Acids and Caustics Not pertinent 7.5 Polymerization Not pertinent 7.6 Inhibitor of Polymerization Not pertinent	9 SELECTED MANUFACTURERS 1. Allied Chemical Corp. Plastics Division Morrisdale, N. J. 07060 2. W. R. Grace & Co. Hulse Chemical Division Lordsburg, N. M. 88006 3. Monsanto Corp. Monsanto Industrial Chemicals Co. 800 N. Lindbergh Blvd. St. Louis, Mo. 63166
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-5) A T U X	10 SHIPPING INFORMATION 10.1 Grades or Purity Data not available 10.2 Storage Temperature Ambient 10.3 Inert Atmosphere No requirement 10.4 Venting Open drum carboys
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm Liquid 13.2 Molecular Weight 304.4 13.3 Boiling Point at 1 atm 721 F (384 C) 13.4 Freezing Point Not pertinent 13.5 Critical Temperature Not pertinent 13.6 Critical Pressure Not pertinent 13.7 Specific Gravity (0.980 at 25 C liquid) 13.8 Liquid Surface Tension (25 C) 31.5 dynes/cm (0.00315 N/m) 13.9 Liquid-Water Interfacial Tension (25 C) 18.5 dynes/cm (0.00185 N/m) 13.10 Vapor (Gas) Specific Gravity Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas) Not pertinent 13.12 Latent Heat of Vaporization Not pertinent 13.13 Heat of Combustion 15,130 Btu/lb = 8410 cal/g = 352 x 10 J/kg 13.14 Heat of Decomposition Not pertinent 13.15 Heat of Sorption Not pertinent 13.16 Heat of Polymerization Not pertinent
3 CHEMICAL DESIGNATIONS (Cont'd) 3.3 Chemical Formula C ₂₂ H ₃₈ O ₄ 3.4 IMCO United Nations Numerical Designation Not listed	

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DSS

DIOCTYL SODIUM SULFOSUCCINATE

Common Synonyms Bis(2-ethylhexyl) sodium sulfosuccinate Aerosol surfactant Alkower D65 Di(2-ethylhexyl) sulfosuccinate sodium salt Sodium dioctyl sulfosuccinate		Waxy solid or watery solution	Colorless to white	Odorless
Sinks and mixes slowly with water				
Fire	Not flammable			
Exposure	LIQUID OR SOLID Irritating to skin and eyes Harmful if swallowed			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446.4) Issue warning, water contaminant Disperse and flush		2. LABELS No label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Aerosol Surfactant Alkower D65, Bis(2-ethylhexyl) sodium sulfosuccinate, Di(2-ethylhexyl) sulfosuccinate sodium salt, Sodium dioctyl sulfosuccinate 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $C_{16}H_{34}O_6S$ 3.4 IMCO United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Waxy solid or water solution 4.2 Color: Colorless to off white 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical gloves, rubber gloves, full protective 5.2 Symptoms Following Exposure: Liquid is long persistent foxy and irritates skin by removing natural oils. Ingestion causes diarrhea and intestinal bloating 5.3 Treatment for Exposure: EYES: irrigate with copious volumes of water for at least 15 minutes with physician. SKIN: rinse off with water. INGESTION: drink large amounts of water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 1900 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Causes foaming and spreading of water. Assists in putting out fires by water. 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Procter Chemical Company, Inc. P.O. Box 199 Salisbury, N.C. 28144 2. American Cyanamid Co. Industrial Chemicals and Plastics Division Wayne, N.J. 07470 3. Ciba Geigy Corporation Dyes and Specialty Chemicals Division Bovonne, N.J. 07002
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Not pertinent. Grades contain inert diluents; concentration of compound may be as low as 50% by weight. Marks are water solutions. 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook CG 446.3: H 355	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or liquid 13.2 Molecular Weight: 434 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: (solid form) 33.3 °F = 1.55 °C = 428 °K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.1 at 20 °C solid or liquid 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES <i>(Continued on page 1 and 4)</i>	

1,4-DIOXANE

Common Synonyms Dioxane p-Dioxane		Liquid	Colorless	Slight alcohol odor
Sinks and mixes with water. Flammable, irritating vapor is produced. Freezing point is 53° F.				
Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus and rubber overalls including gloves. Shut off ignition sources and shut off equipment. Stop discharge if possible. May poison if swallowed. Symptoms: Irritation of skin and eyes. Nausea and vomiting. Headache and dizziness. Numbness of mouth and throat. Fatigue and weakness.				
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus and rubber overalls including gloves. Extinguish with dry chemical or carbon tetrachloride. Water may be effective on fire. Cool exposed container with water.			
Exposure	CARE FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. May be absorbed. If inhaled, get person to fresh air. If irritation persists, get medical aid. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Have water drunk slowly. IF SWALLOWED and a patient is UNCONSCIOUS OR HAVING CONVULSIONS: Do not give anything by mouth.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify health authorities if spilled in great quantities. Notify proper authorities if water is taken.			
1 RESPONSE TO DISCHARGE See Response Methods Handbook CG-446-4. Issue warning of high flammability. Disperse and flush.		2 LABEL 		
3 CHEMICAL DESIGNATIONS 31 Synonyms: Dioxolene oxides Dioxan p-Dioxane 32 Coast Guard Compatibility Classification Type I 33 Chemical Formula: (C ₄ H ₈ O) ₂ 34 IMCO United Nations Numerical Designation: 4200		4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Mild, somewhat alcoholic, like heated alcohol, ethereal.		
5 HEALTH HAZARDS 51 Personal Protective Equipment: Full mask, rubber gloves, goggles, rubber overalls including gloves. 52 Symptoms Following Exposure: No significant irritation after repeated exposure. Skin irritation, burn and blisters after repeated exposure. Irritation of eyes, nose and throat. Nausea and vomiting. Headache and dizziness. Numbness of mouth and throat. Fatigue and weakness. 53 Treatment for Exposure: INHALATION: Get person to fresh air. If irritation persists, get medical aid. If swallowed, do not induce vomiting. Have water drunk slowly. IF SWALLOWED and a patient is UNCONSCIOUS OR HAVING CONVULSIONS: Do not give anything by mouth. 54 Toxicity by Inhalation (Threshold Limit Value): 100 ppm. 55 Short-Term Inhalation Limits: 100 ppm for 60 min. 56 Toxicity by Ingestion: Toxic if swallowed. 57 Late Toxicity: Causes cancer in rats. 58 Vapor (Gas) Irritant Characteristics: Vapor causes a light irritation of eyes, nose and throat. 59 Liquid or Solid Irritant Characteristics: May cause a light irritation of eyes, nose and throat. 60 Odor Threshold: 620 mg/m.				

6 FIRE HAZARDS

6.1 **Flash Point** 54 F (C) 74 F (C)
 6.2 **Flammable Limits in Air** 1.9 - 23.8 % by vol
 6.3 **Fire Extinguishing Agents:** Alcohol, carbon dioxide, dry chemical
 6.4 **Fire Extinguishing Agents Not to be Used** None pertinent
 6.5 **Special Hazards of Combustion Products** Toxic vapors (e.g., CO) are evolved
 6.6 **Behavior in Fire** Vapors are readily ignited and may travel to source of ignition and flash back
 6.7 **Ignition Temperature** 550 F
 6.8 **Electrical Hazard** None pertinent
 6.9 **Burning Rate** Data not available

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:** No reaction
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** None pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization** None pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterfowl Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD)** 10, 20, 30 days
 8.4 **Food Chain Concentration Potential** None

9 SELECTED MANUFACTURERS

Dow Chemical Co.
 Midland, Mich. 48640
 E. I. du Pont Corp.
 Green Chemical Division
 12418 Seaside Highway
 Baton Rouge, La. 70821
 Union Carbide Corp.
 Chemical and Physical Division
 270 Park Ave.
 New York, N.Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Open flame atmosphere prohibited

11 HAZARD ASSESSMENT CODE

See also Assessment Handbook, 1974
 A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations** 29 CFR 1910.104
 12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Flammable	3
II	
Acute Toxicity	1
Ecological Soil Effects	1
Pesticides	3
Water Pollution	
Acute Toxicity	1
Chronic Toxicity	2
Acute Effects	3
Reactions	
Organic Chemicals	0
Water	0
Soil Reaction	0

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard	3
Flammability	3
Physical Hazard	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
 13.2 **Molecular Weight:** 88.11
 13.3 **Boiling Point at 1 atm:** 214.1 F = 101.7 C = 374.8 K
 13.4 **Freezing Point:** -12.1 F = 10.3 C = 283.5 K
 13.5 **Critical Temperature:** 397.1 F = 203.4 C = 476.5 K
 13.6 **Critical Pressure:** 750 psia = 51.4 bar = 5.14 MPa
 13.7 **Specific Gravity:** 1.036 at 20 C (68 F)
 13.8 **Liquid Surface Tension:** None pertinent
 13.9 **Liquid-Water Interfacial Tension:** None pertinent
 13.10 **Vapor (Gas) Specific Gravity:** 1.036 (air = 1)
 13.11 **Ratio of Specific Heats of Vapor (Gas):**
 $\gamma = C_p/C_v = 1.04$
 13.12 **Latent Heat of Vaporization:** 175 Btu/lb = 81.2 cal/g = 4.18 x 10⁵ J/kg
 13.13 **Heat of Combustion:** 15,500 Btu/lb = 7,140 cal/g = 29.0 x 10⁶ J/kg
 13.14 **Heat of Decomposition:** None pertinent
 13.15 **Heat of Solution:** 15.5 cal/g = 2.2 Btu/lb = 1.5 x 10⁵ J/kg
 13.16 **Heat of Polymerization:** None pertinent

Continued on page 2000

NOTES

DPN

DIPENTENE

Common Synonyms p-Menthyl 3-Diene Terpinene Terpinene delta 1,3-Terpene Phellandrene		Liquid Floats on water	Colorless to light yellow	Pleasant lemon like odor
Stop smoking if possible. Keep away from fire. Do not use near open flame. Do not use in confined spaces. Do not use in areas where smoking is prohibited. Do not use in areas where fire is a hazard.				
Fire		Combustible Containers may explode in fire Extinguish with water, foam, dry chemical, carbon dioxide Do not use water on burning liquid		
Exposure		VAPOR Irritating to eyes, nose and throat May cause dizziness LIQUID Irritating to skin and eyes Harmful if swallowed If swallowed, do not induce vomiting. If in eyes, flush with water. If on skin, wash with soap and water. If swallowed, seek medical attention.		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Not recommended for use in water		
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41 Mechanical containment Should be removed Chemical and physical treatment		2. LABELS Not labeled required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Terpinene; p-Menthyl 3-Diene; Phellandrene; Terpinene; delta 1,3-Terpene 3.2 Coast Guard Compatibility Classification: Oils (oil) 3.3 Chemical Formula: C ₁₀ H ₁₆ 3.4 IMCO/United Nations Numerical Designation: 33, 2052		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Pleasant, pheromone		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: No special gloves, safety glasses or face shield self-contained breathing apparatus for high concentrations 5.2 Symptoms Following Exposure: Liquid irritates eyes, prolonged contact with skin causes irritation. Ingestion causes irritation of the mouth and throat. 5.3 Treatment for Exposure: INHALATION: Remove victim from contaminated area and give artificial respiration if necessary. A physician. EYES: Flush with water for 15 minutes. If on skin, wash with soap and water. INGESTION: Induce vomiting if possible. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ in guinea pigs 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes slight irritation to eyes and throat system present in high concentrations. The effect is severe. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard threshold for liquid and solid irritant has not been established for this chemical. 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS		8 WATER POLLUTION																													
6.1	Flash Point: 115°F (40°C)	8.1	Aquatic Toxicity: Data not available																												
6.2	Flammable Limits in Air: 0.7% - 6.1%	8.2	Waterflow Toxicity: Data not available																												
6.3	Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide	8.3	Biological Oxygen Demand (BOD): Data not available																												
6.4	Fire Extinguishing Agents Not to be Used: Water may be ineffective	8.4	Food Chain Concentration Potential: None																												
6.5	Special Hazards of Combustion Products: Not pertinent	9 SELECTED MANUFACTURERS																													
6.6	Behavior in Fire: Containers may explode	1.	Hercules Incorporated Organics Department Wilmington, Del. 19899																												
6.7	Ignition Temperature: 458°F	2.	Reichhold Chemicals Inc. Newport Division P.O. Box 1455 Pensacola, Fla. 32506																												
6.8	Electrical Hazard: Data not available	3.	SCM Corporation Glidden Durlec Division P.O. Box 45 Jacksonville, Fla. 32201																												
6.9	Burning Rate: Not pertinent																														
7 CHEMICAL REACTIVITY																															
7.1	Reactivity with Water: No reaction																														
7.2	Reactivity with Common Materials: No reaction																														
7.3	Stability During Transport: Stable																														
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent																														
7.5	Polymerization: Not pertinent																														
7.6	Inhibitor of Polymerization: Not pertinent																														
		10 SHIPPING INFORMATION																													
		10.1	Grades or Purity: Several technical grades all having same chemical properties																												
		10.2	Storage Temperature: Ambient																												
		10.3	Inert Atmosphere: No requirement																												
		10.4	Venting: Open to the atmosphere																												
11 HAZARD ASSESSMENT CODE		13 PHYSICAL AND CHEMICAL PROPERTIES																													
(See Hazard Assessment Handbook, CG 446-3)		13.1	Physical State at 15°C and 1 atm: Liquid																												
A 1.1		13.2	Molecular Weight: 136.2																												
		13.3	Boiling Point at 1 atm: 151.1°C (304.0°F)																												
		13.4	Freezing Point: -20.3°C (-4°F)																												
		13.5	Critical Temperature: Not pertinent																												
		13.6	Critical Pressure: Not pertinent																												
		13.7	Specific Gravity: 0.84 at 21°C (guinea pig)																												
		13.8	Liquid Surface Tension: 26 dynes/cm at 20°C																												
		13.9	Liquid-Water Interfacial Tension: 45 dynes/cm at 20°C																												
		13.10	Vapor (Gas) Specific Gravity: 4.9																												
		13.11	Ratio of Specific Heats of Vapor (Gas): Not pertinent																												
		13.12	Latent Heat of Vaporization: 40 Btu/lb or 7.5 cal/g at 100°F (37.8°C)																												
		13.13	Heat of Combustion: 10,650 Btu/lb or 10,840 cal/g at 25°C																												
		13.14	Heat of Decomposition: Not pertinent																												
		13.15	Heat of Solution: Not pertinent																												
		13.16	Heat of Polymerization: Not pertinent																												
12 HAZARD CLASSIFICATIONS																															
12.1	Code of Federal Regulations: Not listed																														
12.2	NAS Hazard Rating for Bulk Water Transportation																														
	<table><tr><td>Category</td><td>Rating</td></tr><tr><td>Fire</td><td>2</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td></td></tr><tr><td>Liquid or Solid Irritant</td><td></td></tr><tr><td>Poisons</td><td>0</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td></td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Acute Toxicity</td><td>3</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td></td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self-Reaction</td><td>0</td></tr></table>	Category	Rating	Fire	2	Health		Vapor Irritant		Liquid or Solid Irritant		Poisons	0	Water Pollution		Human Toxicity		Aquatic Toxicity	1	Acute Toxicity	3	Reactivity		Other Chemicals		Water	0	Self-Reaction	0		
Category	Rating																														
Fire	2																														
Health																															
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Liquid or Solid Irritant																															
Poisons	0																														
Water Pollution																															
Human Toxicity																															
Aquatic Toxicity	1																														
Acute Toxicity	3																														
Reactivity																															
Other Chemicals																															
Water	0																														
Self-Reaction	0																														
12.3	NFPA Hazard Classifications:																														
	<table><tr><td>Category</td><td>Classification</td></tr><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>3</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	3	Reactivity (Yellow)	0																						
Category	Classification																														
Health Hazard (Blue)	0																														
Flammability (Red)	3																														
Reactivity (Yellow)	0																														
NOTES																															

DAM

DIPHENYLAMINE

Common Synonyms Anilino benzene N-Phenylaniline		Solid or liquid	Light tan to brown	Pleasant odor
		Sinks in water		
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE			
Exposure	DUST Irritating to eyes, nose and throat Harmful if inhaled LIQUID OR SOLID Irritating to skin and eyes Harmful if swallowed			
Water Pollution	Effect: Flow concentrations on aquatic life is unknown May be dangerous if it enters water intakes			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-6) Issue warning. Water contamination should be removed. Chemical and physical treatment.		2 LABELS No hazard label required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Anilino benzene, N-Phenylaniline 3.2 Coast Guard Compatibility Classification: Data not available 3.3 Chemical Formula: (C ₆ H ₅) ₂ NH 3.4 IMCO/United Nations Numerical Designation: Data not available		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or liquid 4.2 Color: Very pale tan amber, clear 4.3 Odor: Characteristic, pleasant		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Respirator, safety goggles or face shield, rubber gloves				
5.2 Symptoms Following Exposure: Inhalation may irritate mucous membranes. Eye exposure including ingestion of solid or skin contact may cause fatigue, hypertension and bladder trouble. Contact with dust may irritate.				
5.3 Treatment for Exposure: INHALATION: move victim to fresh air. INGESTION: get medical attention observe for methemoglobinemia. EYE: flush with plenty of water and soap. SKIN: wash with soap and water.				
5.4 Toxicity by Inhalation (Threshold Limit Value): 10 mg/m ³				
5.5 Short-Term Inhalation Limit: Data not available				
5.6 Toxicity by Ingestion: Grade 2, oral LD ₅₀ = 1000 mg/kg (rat)				
5.7 Late Toxicity: Causes birth defects in rats (polycystic kidneys)				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS

- 6.1 Flash Point (liquid): 50° F (10° C)
- 6.2 Flammable Limits in Air: Not pertinent
- 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide
- 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing
- 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire
- 6.6 Behavior in Fire: Dust may be explosive if mixed with air in correct proportions and in the presence of a source of ignition
- 6.7 Ignition Temperature: 1175° F
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: Not pertinent

9. SELECTED MANUFACTURERS

- 1. Unisol Chemical Division, Unisol Inc., Elm Street, Naugatuck, Conn. 06770
- 2. American Cyanamid Co., International Dept., Bound Brook, N.J. 08805
- 3. Eastman Organic Chemicals, Rochester, N.Y. 14650

10 SHIPPING INFORMATION

- 10.1 Grade or Purity: Technical, sometimes shipped as liquid
- 10.2 Storage Temperature: Ambient for solid, slightly elevated for liquid
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)

H

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid or liquid
- 13.2 Molecular Weight: 169.2
- 13.3 Boiling Point at 1 atm: 576° F = 303° C = 575° K
- 13.4 Freezing Point: 127° F = 53° C = 326° K
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.066 at 15° C (liquid)
- 13.8 Liquid Surface Tension: 59.3 dynes/cm at 20° C (estimated)
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: 16,400 Btu/lb = 9,190 cal/g = 72 x 10³ J/g
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

(continued on page 10)

NOTES

DPD

DIPHENYLDICHLOROSILANE

Common Synonyms Dichlorodiphenylsilane Dichlorodiphenylsilane Diphenyldichlorosilane		Liquid	Colorless	Sharp, irritating odor
		Reacts with water. Irritating vapor is produced.		
Fire		Combustible POSSIBLE GASES MAY BE PRODUCED IN FIRE		
Exposure		VAPOR Irritating to eyes, nose and throat LIQUID Will burn skin and eyes Harmful if swallowed		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444.4) Issue warning: Corrosive, water contamination. Restrictions: Disposal and flush with water.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dichlorodiphenylsilane Dichlorodiphenylsilane Diphenyldichlorosilane 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $(C_6H_5)_2SiCl_2$ 3.4 IMCO/United Nations Numerical Designation: 1509		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sharp hydrocarbon, sulfidic, pungent		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Avoid skin contact. Wear protective clothing, gloves, chemical goggles, and protective apron. Avoid unnecessary person-to-person contact. 5.2 Symptoms Following Exposure: Irritation of skin, eyes, nose, throat, and lungs. Severe burns, eyes, nose, throat, and lungs. 5.3 Treatment for Exposure: INHALATION: Remove to fresh air. Supply respiratory protection if needed. EYES: Flush with water for 15 minutes. SKIN: Flush with water for 15 minutes. INGESTION: Do not induce vomiting. Seek medical attention immediately. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ (Rat) 2.5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is a severe irritant to the respiratory tract. 5.9 Liquid or Solid Irritant Characteristics: Severe skin and eye irritation. Severe burns if swallowed. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS

- 6.1 Flash Point: 285.1 °C (545.2 °F)
 6.2 Flammable Limits in Air: 1.2% (L), 10.0% (U)
 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide
 6.4 Fire Extinguishing Agents Not to be Used: Water and foam
 6.5 Special Hazards of Combustion Products: Hydrochloric acid and phosgene gases are produced.
 6.6 Behavior in Fire: Difficult to extinguish. Reaction may occur if heated with water. If applied, it will produce irritating fumes and produce irritating hydrocarbon fumes.
 6.7 Ignition Temperature: Data not available.
 6.8 Electrical Hazard: Data not available.
 6.9 Burning Rate: Data not available.

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Reacts with water to generate hydrogen chloride (acidic fumes).
 7.2 Reactivity with Common Materials: Reacts with sulfuric acid to generate hydrogen chloride which is corrosive to common materials.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: If it reacts with water, use with sodium bicarbonate or a weak acid.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): Data not available.
 8.4 Ford Chain Concentration Potential: None.

9 SELECTED MANUFACTURERS

- Dow Corning Corporation
P.O. Box 592
Midland, MI 48686
 P.R. Inc.
P.O. Box 1494
Gainesville, TX 76702
 Vestor Corp.
Alfa Products
P.O. Box 159
Beverly, MA 01915

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: 96+
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 444.3
 A-O

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Corrosive
 12.2 HAS Hazard Rating for Bulk Water Transportation
- | Category | Rating |
|------------------|--------|
| Fire | 1 |
| Health | 3 |
| Acute Toxicity | 3 |
| Chronic Toxicity | 3 |
| Physical | 3 |
| Water Pollution | 3 |
| Human Toxicity | 3 |
| Aquatic Toxicity | 3 |
| Reactivity | 3 |
| Other Chemicals | 3 |
| Waste | 3 |
| Stability | 3 |
- 12.3 NFPA Hazard Classifications: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 266
 13.3 Boiling Point at 1 atm: 285.1 °C (545.2 °F)
 13.4 Freezing Point: Not pertinent
 13.5 Critical Temperature: Not pertinent
 13.6 Critical Pressure: Not pertinent
 13.7 Specific Gravity: 1.22 at 25 °C (liquid)
 13.8 Liquid Surface Tension: 34.5 dyne/cm at 20 °C
 13.9 Liquid-Water Interfacial Tension: Not pertinent
 13.10 Vapor (Gas) Specific Gravity: Not pertinent
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
 13.12 Latent Heat of Vaporization: 40.8 Btu/lb = 11.9 kJ/kg at 25 °C (liquid)
 13.13 Heat of Combustion: 10.8 Btu/lb = 2.5 kJ/kg at 25 °C (liquid)
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Data not available
 13.16 Heat of Polymerization: Not pertinent

NOTES

DPE

DIPHENYL ETHER

Common Synonyms Phenyl ether Diphenyl oxide Phenoxylbenzene		Liquid Colorless Mild pleasant odor May float or sink in water. Freezing point is 81°F
Stability: Stable if possible. Keep away from fire, heat, and light. Avoid contact with strong acids and strong oxidizing agents. Storage: Store in a cool, dry place.		
Fire	Combustible Flash point: 110°F (38°C) Boiling point: 294°F (151°C) Water solubility: Insoluble	
Exposure	LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. Keep away from children. Do not inhale dust or fumes. If in contact with eyes, wash with plenty of water. If swallowed, do not induce vomiting. Have a physician examine.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Not biodegradable. Not acutely toxic to fish.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-6. Mechanical containment. Should be removed. Chemical and physical treatment.		2. LABELS No label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Phenyl ether Diphenyl oxide Phenoxylbenzene 3.2 Coast Guard Competibility Classification: Not applicable 3.3 Chemical Formula: C ₁₂ H ₁₀ O 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weak, petroleum
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation may cause nausea because of direct contact with the eyes causes mild irritation. Prolonged exposure of skin may cause reddening and irritation. Ingestion produces nausea. 5.3 Treatment for Exposure: EYES: Flush with water for at least 15 min. SKIN: Wipe off, wash with soap and water. INHALATION: Induce vomiting and get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): ppm 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 3,370 mg/kg rat. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: 0.1 ppm		

6 FIRE HAZARDS 6.1 Flash Point 110°F (38°C) 6.2 Flammable Limits in Air 1.1-6.7% 6.3 Fire Extinguishing Agents Dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used Water or foam may cause nothing 6.5 Special Hazards of Combustion Products Not pertinent 6.6 Behavior in Fire Not pertinent 6.7 Ignition Temperature 1,145°F 6.8 Electrical Hazard Data not available 6.9 Burning Rate 12 in/min		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD) Data not available 8.4 Food Chain Concentration Potential: None									
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48040 2. Gravidan Corp. 100 Delaware Ave. Clifton, N.J. 07014 3. Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14650									
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3. A11111		10 SHIPPING INFORMATION 10.1 Grades or Purity: Pure grade Technical grade Petroleum grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open plan cabinets									
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><td>Category</td><td>Classification</td></tr><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>1</td></tr></table>		Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 170.2 13.3 Boiling Point at 1 atm: 294.1 ± 0.1°C (561.4 K) 13.4 Freezing Point: 81.1 ± 0.1°C (288.1 K) 13.5 Critical Temperature: 471.1 ± 0.1°C (203.8 K) 13.6 Critical Pressure: 47.5 psia = 3.25 atm = 340 MN/m ² 13.7 Specific Gravity: 1.07 at 15°C (liquid) 13.8 Liquid Surface Tension: 30.05 dynes/cm = 0.040 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 15.5 dynes/cm = 0.015 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 41,800 J/kg = 12 cal/g = 0.012 J/g 13.13 Heat of Combustion: 4,550 Btu/lb = 10,200 cal/g = 36 × 10 ³ J/g 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Classification										
Health Hazard (Blue)	1										
Flammability (Red)	2										
Reactivity (Yellow)	1										
NOTES											

DNA

Di-n-PROPYLAMINE

Common Synonyms N-propylpropanamine		Liquid	Colorless	Strong ammonia like odor
Floats and mixes with water				
<u>Fire</u>		FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area		
<u>Exposure</u>		VAPOR Irritating to eyes, nose and throat If inhaled will cause headache, dizziness, coughing, or difficult breathing LIQUID Will burn eyes If swallowed will cause nausea and vomiting		
<u>Water Pollution</u>		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-4 Issue warning: water containing contaminant: high flammability Restrict access Dispense and flush		2. LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: N-propylpropanamine 3.2 Coast Guard Compatibility Classification Not listed 3.3 Chemical Formula: C_3H_9N 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Strong ammonia like		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, nitrile rubber gloves, nitrile rubber apron, face shield 5.2 Symptoms Following Exposure: Inhalation causes severe coughing and chest pain due to irritation of air passages; can cause lung edema; may also cause headache, nausea, faintness and anxiety. Ingestion causes irritation and burning in mouth and stomach. Contact with eyes causes severe irritation and edema of the eye. Skin contact with this material causes severe irritation. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; the victim breathing alone is a great responsibility; breathing aid should be given over a self-administered INGESTION: give large amount of water; get medical attention; EYES: flush with water for 15 min; get medical attention to eyes; SKIN: flush with water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 irritant; LD ₅₀ 1.0 g/kg (rats) with mg/kg body weight 5.7 Late Toxicity: Causes permanent changes in liver and kidneys of rats and rabbits 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: 43°F (10°C)	8.1	Aquatic Toxicity: No response 24 hr. LC50 of fish or no response to water
6.2	Flammable Limits in Air: Data not available	8.2	Waterfowl Toxicity: Data not available
6.3	Fire Extinguishing Agents: Water, dry chemical, carbon dioxide	8.3	Biological Oxygen Demand (BOD): Data not available
6.4	Fire Extinguishing Agents Not to be Used: Water may be ineffective	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fires		
6.6	Behavior in Fire:		
6.7	Ignition Temperature: Data not available		
6.8	Electrical Hazard: Data not available		
6.9	Burning Rate: Not pertinent		
		9 SELECTED MANUFACTURERS	
		* Air Products and Chemicals, Inc. U.S. Highway 90 P.O. Box 114 Allentown, PA 18102	
		* Penwalt Corporation 1300 Parkway Philadelphia, Pa. 19102	
		* Eastman Organic Chemicals Rochester, N.Y. 14609	
7 CHEMICAL REACTIVITY			
7.1	Reactivity with Water: No reaction		
7.2	Reactivity with Common Materials: May react with some forms of plastics		
7.3	Stability During Transport: Stable		
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent		
7.5	Polymerization: Not pertinent		
7.6	Inhibitor of Polymerization: Not pertinent		
		10 SHIPPING INFORMATION	
		10.1 Grades or Purity: Technical, 95% Pure	
		10.2 Storage Temperature: Ambient	
		10.3 Inert Atmosphere: No requirement	
		10.4 Venting: Open to atmosphere	
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-3 APQ11		12 PHYSICAL AND CHEMICAL PROPERTIES	
		12.1 Physical State at 15°C and 1 atm: Liquid	
		12.2 Molecular Weight: 73.10	
		12.3 Boiling Point at 1 atm: 37.1°C (98.8°F) 37.1°C (98.8°F) = 300.25 K	
		12.4 Freezing Point: -81.1°C (-114.0°F) -81.1°C (-114.0°F) = 192.05 K	
		12.5 Critical Temperature: 147.1°C (306.8°F) 147.1°C (306.8°F) = 420.25 K	
		12.6 Critical Pressure: 45.6 psia = 3.04 atm = 3.14 MPa = 31.4 MN/m ²	
		12.7 Specific Gravity: 0.714 at 20°C (liquid)	
		12.8 Liquid Surface Tension: 25.5 dyne/cm = 0.0255 N/m at 20°C	
		12.9 Liquid-Water Interfacial Tension: Not pertinent	
		12.10 Vapor (Gas) Specific Gravity: 3.5	
		12.11 Ratio of Specific Heats of Vapor (Gas):	
		12.12 Latent Heat of Vaporization: 441 Btu/lb = 102,500 cal/g = 4.33 x 10 ⁶ J/kg	
		12.13 Heat of Combustion: -18,740 Btu/lb = -10,420 cal/g = -43,500 J/kg	
		12.14 Heat of Decomposition: Not pertinent	
		12.15 Heat of Solution: Not pertinent	
		12.16 Heat of Polymerization: Not pertinent	
12 HAZARD CLASSIFICATIONS			
12.1	Code of Federal Regulations: Flammable liquid		
12.2	NAS Hazard Rating for Bulk Water Transportation: Not listed		
12.3	NFPA Hazard Classifications:		
	Category Classification		
	Health Hazard: 2		
	Flammability: 2		
	Reactivity: 1		
NOTES			

DPG	DIPROPYLENE GLYCOL
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Common Synonyms	Thick liquid Colorless Odorless Sinks and mixes with water
Fire	Combustible
Exposure	LIQUID Irritating to eyes.
Water Pollution	Effect of 1% concentration on aquatic life is unknown May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Response Manual for instructions on use of DPG in discharge	2. LABELS See Standards Required for Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: None known 3.2 Coast Guard Compatibility Classification: None 3.3 Chemical Formula: <chem>C3H8O2</chem> 3.4 IMCO United Nations Numerical Designation: None	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: None
5 HEALTH HAZARDS	
5.1 Personal Protective Equipment: None 5.2 Symptoms Following Exposure: None 5.3 Treatment for Exposure: None SKIN & INGESTION 5.4 Toxicity by Inhalation (Threshold Limit Value): None 5.5 Short-Term Inhalation Limits: None 5.6 Toxicity by Ingestion: None 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: None	

6 FIRE HAZARDS 6.1 Flash Point: None 6.2 Flammable Limits in Air: None 6.3 Fire Extinguishing Agents: Water, alcohol, foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: None 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: None 6.7 Ignition Temperature: None 6.8 Electrical Hazard: None 6.9 Burning Rate: 2.0 mm/min 7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: None 7.2 Reactivity with Common Materials: None 7.3 Stability During Transport: None 7.4 Neutralizing Agents for Acids and Caustics: None 7.5 Polymerization: None 7.6 Inhibitor of Polymerization: None	8 WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None 9 SELECTED MANUFACTURERS Celanese Corp. Celanese Chemical Co. Division 245 Park Ave. New York, N.Y. 10017 DuPont Chemical Co. Midland Mainland 1500 E. 17th St. Tulsa, Okla. 74119 New York, N.Y. 10017																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual for instructions on use of APO 12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: None 12.2 NAS Hazard Rating for Bulk Water Transportation <table style="width: 100%; border-collapse: collapse;"><thead><tr><th style="width: 60%;">Category</th><th style="width: 40%;">Rating</th></tr></thead><tbody><tr><td>1.1</td><td></td></tr><tr><td>1.2</td><td></td></tr><tr><td>1.3</td><td></td></tr><tr><td>1.4</td><td></td></tr><tr><td>1.5</td><td></td></tr><tr><td>1.6</td><td></td></tr><tr><td>1.7</td><td></td></tr><tr><td>1.8</td><td></td></tr><tr><td>1.9</td><td></td></tr><tr><td>2.1</td><td></td></tr><tr><td>2.2</td><td></td></tr><tr><td>2.3</td><td></td></tr><tr><td>2.4</td><td></td></tr><tr><td>2.5</td><td></td></tr><tr><td>2.6</td><td></td></tr><tr><td>2.7</td><td></td></tr><tr><td>2.8</td><td></td></tr><tr><td>2.9</td><td></td></tr><tr><td>3.1</td><td></td></tr><tr><td>3.2</td><td></td></tr><tr><td>3.3</td><td></td></tr><tr><td>3.4</td><td></td></tr><tr><td>3.5</td><td></td></tr><tr><td>3.6</td><td></td></tr><tr><td>3.7</td><td></td></tr><tr><td>3.8</td><td></td></tr><tr><td>3.9</td><td></td></tr><tr><td>4.1</td><td></td></tr><tr><td>4.2</td><td></td></tr><tr><td>4.3</td><td></td></tr><tr><td>4.4</td><td></td></tr><tr><td>4.5</td><td></td></tr><tr><td>4.6</td><td></td></tr><tr><td>4.7</td><td></td></tr><tr><td>4.8</td><td></td></tr><tr><td>4.9</td><td></td></tr><tr><td>5.1</td><td></td></tr><tr><td>5.2</td><td></td></tr><tr><td>5.3</td><td></td></tr><tr><td>5.4</td><td></td></tr><tr><td>5.5</td><td></td></tr><tr><td>5.6</td><td></td></tr><tr><td>5.7</td><td></td></tr><tr><td>5.8</td><td></td></tr><tr><td>5.9</td><td></td></tr><tr><td>6.1</td><td></td></tr><tr><td>6.2</td><td></td></tr><tr><td>6.3</td><td></td></tr><tr><td>6.4</td><td></td></tr><tr><td>6.5</td><td></td></tr><tr><td>6.6</td><td></td></tr><tr><td>6.7</td><td></td></tr><tr><td>6.8</td><td></td></tr><tr><td>6.9</td><td></td></tr><tr><td>7.1</td><td></td></tr><tr><td>7.2</td><td></td></tr><tr><td>7.3</td><td></td></tr><tr><td>7.4</td><td></td></tr><tr><td>7.5</td><td></td></tr><tr><td>7.6</td><td></td></tr><tr><td>7.7</td><td></td></tr><tr><td>7.8</td><td></td></tr><tr><td>7.9</td><td></td></tr><tr><td>8.1</td><td></td></tr><tr><td>8.2</td><td></td></tr><tr><td>8.3</td><td></td></tr><tr><td>8.4</td><td></td></tr><tr><td>8.5</td><td></td></tr><tr><td>8.6</td><td></td></tr><tr><td>8.7</td><td></td></tr><tr><td>8.8</td><td></td></tr><tr><td>8.9</td><td></td></tr><tr><td>9.1</td><td></td></tr><tr><td>9.2</td><td></td></tr><tr><td>9.3</td><td></td></tr><tr><td>9.4</td><td></td></tr><tr><td>9.5</td><td></td></tr><tr><td>9.6</td><td></td></tr><tr><td>9.7</td><td></td></tr><tr><td>9.8</td><td></td></tr><tr><td>9.9</td><td></td></tr><tr><td>10.1</td><td></td></tr><tr><td>10.2</td><td></td></tr><tr><td>10.3</td><td></td></tr><tr><td>10.4</td><td></td></tr><tr><td>10.5</td><td></td></tr><tr><td>10.6</td><td></td></tr><tr><td>10.7</td><td></td></tr><tr><td>10.8</td><td></td></tr><tr><td>10.9</td><td></td></tr><tr><td>11.1</td><td></td></tr><tr><td>11.2</td><td></td></tr><tr><td>11.3</td><td></td></tr><tr><td>11.4</td><td></td></tr><tr><td>11.5</td><td></td></tr><tr><td>11.6</td><td></td></tr><tr><td>11.7</td><td></td></tr><tr><td>11.8</td><td></td></tr><tr><td>11.9</td><td></td></tr><tr><td>12.1</td><td></td></tr><tr><td>12.2</td><td></td></tr><tr><td>12.3</td><td></td></tr><tr><td>12.4</td><td></td></tr><tr><td>12.5</td><td></td></tr><tr><td>12.6</td><td></td></tr><tr><td>12.7</td><td></td></tr><tr><td>12.8</td><td></td></tr><tr><td>12.9</td><td></td></tr><tr><td>13.1</td><td></td></tr><tr><td>13.2</td><td></td></tr><tr><td>13.3</td><td></td></tr><tr><td>13.4</td><td></td></tr><tr><td>13.5</td><td></td></tr><tr><td>13.6</td><td></td></tr><tr><td>13.7</td><td></td></tr><tr><td>13.8</td><td></td></tr><tr><td>13.9</td><td></td></tr><tr><td>14.1</td><td></td></tr><tr><td>14.2</td><td></td></tr><tr><td>14.3</td><td></td></tr><tr><td>14.4</td><td></td></tr><tr><td>14.5</td><td></td></tr><tr><td>14.6</td><td></td></tr><tr><td>14.7</td><td></td></tr><tr><td>14.8</td><td></td></tr><tr><td>14.9</td><td></td></tr><tr><td>15.1</td><td></td></tr><tr><td>15.2</td><td></td></tr><tr><td>15.3</td><td></td></tr><tr><td>15.4</td><td></td></tr><tr><td>15.5</td><td></td></tr><tr><td>15.6</td><td></td></tr><tr><td>15.7</td><td></td></tr><tr><td>15.8</td><td></td></tr><tr><td>15.9</td><td></td></tr><tr><td>16.1</td><td></td></tr><tr><td>16.2</td><td></td></tr><tr><td>16.3</td><td></td></tr><tr><td>16.4</td><td></td></tr><tr><td>16.5</td><td></td></tr><tr><td>16.6</td><td></td></tr><tr><td>16.7</td><td></td></tr><tr><td>16.8</td><td></td></tr><tr><td>16.9</td><td></td></tr><tr><td>17.1</td><td></td></tr><tr><td>17.2</td><td></td></tr><tr><td>17.3</td><td></td></tr><tr><td>17.4</td><td></td></tr><tr><td>17.5</td><td></td></tr><tr><td>17.6</td><td></td></tr><tr><td>17.7</td><td></td></tr><tr><td>17.8</td><td></td></tr><tr><td>17.9</td><td></td></tr><tr><td>18.1</td><td></td></tr><tr><td>18.2</td><td></td></tr><tr><td>18.3</td><td></td></tr><tr><td>18.4</td><td></td></tr><tr><td>18.5</td><td></td></tr><tr><td>18.6</td><td></td></tr><tr><td>18.7</td><td></td></tr><tr><td>18.8</td><td></td></tr><tr><td>18.9</td><td></td></tr><tr><td>19.1</td><td><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13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 118.1 13.3 Boiling Point at 1 atm: 188.3°C (351°F) 13.4 Freezing Point: -34.5°C (-30.1°F) 13.5 Critical Temperature: 305.1°C (581°F) 13.6 Critical Pressure: 34.0 atm (500 psia) 13.7 Specific Gravity: 1.126 13.8 Liquid Surface Tension: 34.0 dyne/cm 13.9 Liquid-Water Interfacial Tension: None 13.10 Vapor (Gas) Specific Gravity: None 13.11 Ratio of Specific Heats of Vapor (Gas): None 13.12 Latent Heat of Vaporization: 4470 cal/g (18.7 kJ/mol) 13.13 Heat of Combustion: 11,650 Btu/lb (44,700 cal/g) (187.1 kJ/mol) 13.14 Heat of Decomposition: None 13.15 Heat of Solution: None 13.16 Heat of Polymerization: None	Category	Rating	1.1		1.2		1.3		1.4		1.5		1.6		1.7		1.8		1.9		2.1		2.2		2.3		2.4		2.5		2.6		2.7		2.8		2.9		3.1		3.2		3.3		3.4		3.5		3.6		3.7		3.8		3.9		4.1		4.2		4.3		4.4		4.5		4.6		4.7		4.8		4.9		5.1		5.2		5.3		5.4		5.5		5.6		5.7		5.8		5.9		6.1		6.2		6.3		6.4		6.5		6.6		6.7		6.8		6.9		7.1		7.2		7.3		7.4		7.5		7.6		7.7		7.8		7.9		8.1		8.2		8.3		8.4		8.5		8.6		8.7		8.8		8.9		9.1		9.2		9.3		9.4		9.5		9.6		9.7		9.8		9.9		10.1		10.2		10.3		10.4		10.5		10.6		10.7		10.8		10.9		11.1		11.2		11.3		11.4		11.5		11.6		11.7		11.8		11.9		12.1		12.2		12.3		12.4		12.5		12.6		12.7		12.8		12.9		13.1		13.2		13.3		13.4		13.5		13.6		13.7		13.8		13.9		14.1		14.2		14.3		14.4		14.5		14.6		14.7		14.8		14.9		15.1		15.2		15.3		15.4		15.5		15.6		15.7		15.8		15.9		16.1		16.2		16.3		16.4		16.5		16.6		16.7		16.8		16.9		17.1		17.2		17.3		17.4		17.5		17.6		17.7		17.8		17.9		18.1		18.2		18.3		18.4		18.5		18.6		18.7		18.8		18.9		19.1		19.2		19.3		19.4		19.5		19.6		19.7		19.8		19.9		20.1		20.2		20.3		20.4		20.5		20.6		20.7		20.8		20.9		21.1		21.2		21.3		21.4		21.5		21.6		21.7		21.8		21.9		22.1		22.2		22.3		22.4		22.5		22.6		22.7		22.8		22.9		23.1		23.2		23.3		23.4		23.5		23.6		23.7		23.8		23.9		24.1		24.2		24.3		24.4		24.5		24.6		24.7		24.8		24.9		25.1		25.2		25.3		25.4		25.5		25.6		25.7		25.8		25.9		26.1		26.2		26.3		26.4		26.5		26.6		26.7		26.8		26.9		27.1		27.2		27.3		27.4		27.5		27.6		27.7		27.8		27.9		28.1		28.2		28.3		28.4		28.5		28.6		28.7		28.8		28.9		29.1		29.2		29.3		29.4		29.5		29.6		29.7		29.8		29.9		30.1		30.2		30.3		30.4		30.5		30.6		30.7		30.8		30.9		31.1		31.2		31.3		31.4		31.5		31.6		31.7		31.8		31.9		32.1		32.2		32.3		32.4		32.5		32.6		32.7		32.8		32.9		33.1		33.2		33.3		33.4		33.5		33.6		33.7		33.8		33.9		34.1		34.2		34.3		34.4		34.5		34.6		34.7		34.8		34.9		35.1		35.2		35.3		35.4		35.5		35.6		35.7		35.8		35.9		36.1		36.2		36.3		36.4		36.5		36.6		36.7		36.8		36.9		37.1		37.2		37.3		37.4		37.5		37.6		37.7		37.8		37.9		38.1		38.2		38.3		38.4		38.5		38.6		38.7		38.8		38.9		39.1		39.2		39.3		39.4		39.5		39.6		39.7		39.8		39.9		40.1		40.2		40.3		40.4		40.5		10 SHIPPING INFORMATION 10.1 Grades or Purity: None 10.2 Storage Temperature: None 10.3 Inert Atmosphere: None 10.4 Venting: None
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NOTES

DFF	DISTILLATES: FLASHED FEED STOCKS
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DSR

DISTILLATES: STRAIGHT RUN

Common Synonyms Straight run gasoline		Watery liquid	Colorless	Gasoline-like odor
		Floats on water. Flammable; irritating vapor is produced.		
Very flammable liquid. See the Safety Data Sheet for the full text of the hazard statements. See the Material Safety Data Sheet for the full text of the hazard statements. See the Material Safety Data Sheet for the full text of the hazard statements.				
Fire		FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with water spray or foam. Water may be used to extinguish the fire.		
Exposure		CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. May cause dizziness, headache, nausea, vomiting, and diarrhea. LIQUIDS Irritating to eyes. Harmful if swallowed. Do not swallow. If swallowed, do not induce vomiting. If inhaled, get fresh air immediately. If symptoms persist, seek medical attention. If swallowed, drink water and seek medical attention.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline. May be dangerous if it enters water intakes. Do not discharge into water.		
1 RESPONSE TO DISCHARGE See Response to Discharge section of the MSDS.		2 LABEL		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Petroleum distillate. 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures. 3.3 Chemical Formula: N/A. 3.4 IMCO United Nations Numerical Designation: N/A.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Gasoline-like.		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Do not use. 5.2 Symptoms Following Exposure: INHALATION - Irritation of nose and throat, dizziness, headache, nausea, vomiting, and diarrhea. ASPIRATION - May cause aspiration pneumonia. INGESTION - May cause nausea, vomiting, and diarrhea. SKIN - May cause irritation.				
5.3 Treatment for Exposure: INHALATION - Move to fresh air. If symptoms persist, seek medical attention. ASPIRATION - Do not induce vomiting. Seek medical attention. INGESTION - Do not induce vomiting. Seek medical attention. SKIN - Wash with soap and water.				
5.4 Toxicity by Inhalation (Threshold Limit Value): N/A. 5.5 Short-Term Inhalation Limits: N/A. 5.6 Toxicity by Ingestion: N/A. 5.7 Late Toxicity: N/A. 5.8 Vapor (Gas) Irritant Characteristics: N/A. 5.9 Liquid or Solid Irritant Characteristics: N/A. 5.10 Odor Threshold: N/A.				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point: N/A.	6.2 Flammable Limits in Air: N/A.	8.1 Aquatic Toxicity: N/A.	8.2 Waterfowl Toxicity: N/A.
6.3 Fire Extinguishing Agents: N/A.	6.4 Fire Extinguishing Agents Not to be Used: N/A.	8.3 Biological Oxygen Demand (BOD): N/A.	8.4 Food Chain Concentration Potential: N/A.
6.5 Special Hazards of Combustion Products: N/A.		6.6 Behavior in Fire: N/A.	
6.7 Ignition Temperature: N/A.		6.8 Electrical Hazard: N/A.	
6.9 Burning Rate: N/A.		6.10 Selected Manufacturers: N/A.	
7 CHEMICAL REACTIVITY			
7.1 Reactivity with Water: N/A.			
7.2 Reactivity with Common Materials: N/A.			
7.3 Stability During Transport: N/A.			
7.4 Neutralizing Agents for Acids and Caustics: N/A.			
7.5 Polymerization: N/A.			
7.6 Inhibitor of Polymerization: N/A.			
9 SHIPPING INFORMATION			
9.1 Grades or Purity: N/A.			
9.2 Storage Temperature: N/A.			
9.3 Inert Atmosphere: N/A.			
9.4 Venting: N/A.			
11 HAZARD ASSESSMENT CODE See Hazard Assessment Code section of the MSDS.		13 PHYSICAL AND CHEMICAL PROPERTIES	
11.1 Physical State at 15°C and 1 atm: N/A.		13.1 Physical State at 15°C and 1 atm: N/A.	
11.2 Molecular Weight: N/A.		13.2 Molecular Weight: N/A.	
11.3 Boiling Point at 1 atm: N/A.		13.3 Boiling Point at 1 atm: N/A.	
11.4 Freezing Point: N/A.		13.4 Freezing Point: N/A.	
11.5 Critical Temperature: N/A.		13.5 Critical Temperature: N/A.	
11.6 Critical Pressure: N/A.		13.6 Critical Pressure: N/A.	
11.7 Specific Gravity: 0.71 at 15°C (liquid).		13.7 Specific Gravity: 0.71 at 15°C (liquid).	
11.8 Liquid Surface Tension: N/A.		13.8 Liquid Surface Tension: N/A.	
11.9 Liquid-Water Interfacial Tension: N/A.		13.9 Liquid-Water Interfacial Tension: N/A.	
11.10 Vapor (Gas) Specific Gravity: 4.		13.10 Vapor (Gas) Specific Gravity: 4.	
11.11 Ratio of Specific Heats of Vapor (Gas): N/A.		13.11 Ratio of Specific Heats of Vapor (Gas): N/A.	
11.12 Latent Heat of Vaporization: N/A.		13.12 Latent Heat of Vaporization: N/A.	
11.13 Heat of Combustion: N/A.		13.13 Heat of Combustion: N/A.	
11.14 Heat of Decomposition: N/A.		13.14 Heat of Decomposition: N/A.	
11.15 Heat of Solution: N/A.		13.15 Heat of Solution: N/A.	
11.16 Heat of Polymerization: N/A.		13.16 Heat of Polymerization: N/A.	
12 HAZARD CLASSIFICATIONS			
12.1 Code of Federal Regulations: N/A.			
12.2 NAS Hazard Rating for Bulk Water Transportation:			
Category		Rating	
1.1		1.1	
1.2		1.2	
1.3		1.3	
1.4		1.4	
1.5		1.5	
1.6		1.6	
1.7		1.7	
1.8		1.8	
1.9		1.9	
1.10		1.10	
1.11		1.11	
1.12		1.12	
1.13		1.13	
1.14		1.14	
1.15		1.15	
1.16		1.16	
1.17		1.17	
1.18		1.18	
1.19		1.19	
1.20		1.20	
12.3 NFPA Hazard Classifications: N/A.			
NOTES			

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DDN

DODECANOL

Common Synonyms: Lauryl alcohol Dodecyl alcohol		Thick liquid Colorless Sweet odor Floats on water. Freezing point is 75° F.
Fire	Combustible	
Exposure	LIQUID Irritating to skin Will burn eyes	
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes.	
1 RESPONSE TO DISCHARGE See Response Methods (page 10) - 1-10-4 Disperse and flush		2 LABELS See Labeling (page 10) - 1-10-4 DANGER IRRITANT
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Dodecyl alcohol Dodecan-1-ol 3.2 Coast Guard Compatibility Classification: A-1 3.3 Chemical Formula: $C_{12}H_{26}O$ 3.4 IMCO United Nations Numerical Designation: 2802		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Faint, sweet, waxy
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: None required 5.2 Symptoms Following Exposure: Irritation to skin and eyes 5.3 Treatment for Exposure: SKIN OR EYES: Wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): None 5.5 Short-Term Inhalation Limits: None 5.6 Toxicity by Ingestion: None 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: None		

6 FIRE HAZARDS 6.1 Flash Point: 240° F 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Alcohol, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water (foam may be washing) 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 271° F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 47% BOD in day 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS Continental Oil Co. Conoco Chemical Division Petroleum Products Saddle Brook, N.J. 07061 Gulf Refining Co. Mobile Chemical Division P.O. Box 111 Houston, Texas 77001 Phillips Petroleum P.O. Box 218 Bartlesville, Oklahoma 74003
11 HAZARD ASSESSMENT CODE See Hazard Assessment Method (page 10) - 1-10-4 A11		10 SHIPPING INFORMATION 10.1 Grades or Purities: 99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: When Filled
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 186 13.3 Boiling Point at 1 atm: 251.1°C (474°F) 13.4 Freezing Point: -16.0°C (7°F) 13.5 Critical Temperature: 381.1°C (718°F) 13.6 Critical Pressure: 29.1 atm (4240 psi) 13.7 Specific Gravity: 0.825 (at 20°C) 13.8 Liquid Surface Tension: 27.4 dyne/cm (at 20°C) 13.9 Liquid-Water Interfacial Tension: 1.5 dyne/cm (at 20°C) 13.10 Vapor (Gas) Specific Gravity: 2.0 13.11 Ratio of Specific Heats of Vapor (Gas): None 13.12 Latent Heat of Vaporization: 44,000 cal/g (184,000 Btu/lb) 13.13 Heat of Combustion: 13,800 cal/g (57,700 Btu/lb) 13.14 Heat of Decomposition: None 13.15 Heat of Solution: None 13.16 Heat of Polymerization: None
NOTES		

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DOD

DODECENE

Common Synonyms Propylene tetramer		Watery liquid	Colorless	Pleasant odor
		Floats on water		
Sp. Gr. 0.832 @ 15°C Cal. of heat of vaporization A.S.T.M. D-155 U.S. Environmental Protection Agency National Fire Protection Association				
Fire	Combustible. Flash point: 120°F (43°C)			
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed If in eyes, flush with copious amounts of water If in mouth, spit out and wash with plenty of water If SWALLOWED, victim is CONSCIOUS, have victim drink water DO NOT INDUCE VOMITING.			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes No effect on health and wildlife if adults No reproductive effects on water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Mechanical containment Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dodecene (non linear) Propylene tetramer Tetrapropylene 3.2 Coast Guard Compatibility Classification Oilfin 3.3 Chemical Formula: C ₁₂ H ₂₄ 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Characteristic		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Protective gloves; no respiratory protection needed if ventilation is adequate				
5.2 Symptoms Following Exposure: No inhalation hazard expected. Aspiration hazard if ingested. Minor skin and eye irritation				
5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air. INGESTION: do NOT induce vomiting. Do NOT try to force vegetable oil and demulcents with physician. EYE CONTACT: flush with water for 15 min. SKIN CONTACT: wash with soap and water				
5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade 0 LD ₅₀ above 1 g/kg				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Slight stinging of eyes and respiratory system at high concentrations. The effect is temporary				
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause stinging and reddening of skin				
5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: 120°F (43°C) (134°F) (C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Water fog foam, carbon dioxide, dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 400°F (test). 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.		3 WATER POLLUTION 3.1 Aquatic Toxicity: Data not available. 3.2 Waterfowl Toxicity: Data not available. 3.3 Biological Oxygen Demand (BOD): Data not available. 3.4 Food Chain Concentration Potential: None.																													
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9 SELECTED MANUFACTURERS 1. Atlantic Richfield Co. ARCO Chemical Division 260 S. Broad St. Philadelphia, Pa. 19101 2. Continental Oil Co. Conoco Chemicals Division Park 80 Plaza East Saddle Brook, N.J. 07662 3. Sun Oil Co. St. Davids, Pa. 19087.																													
		10 SHIPPING INFORMATION 10.1 Grades or Purity: 98.5-99+%, olefin. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arrester.																													
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A L L		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 168.34. 13.3 Boiling Point at 1 atm: 365-365°F = 185-196°C = 455-469 K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.77 at 20°C (liquid). 13.8 Liquid Surface Tension: 23.0 dynes/cm = 0.0230 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: -19,100 Btu/lb = -10,600 cal/g = -444 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.																													
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><td>Category</td><td>Rating</td></tr><tr><td>Fire</td><td>2</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>0</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>1</td></tr></table>		Category	Rating	Fire	2	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	0	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	1		
Category	Rating																														
Fire	2																														
Health																															
Vapor Irritant	1																														
Liquid or Solid Irritant	1																														
Poisons	1																														
Water Pollution																															
Human Toxicity	0																														
Aquatic Toxicity	1																														
Aesthetic Effect	2																														
Reactivity																															
Other Chemicals	1																														
Water	0																														
Self Reaction	1																														
12.3 NFPA Hazard Classifications <table><tr><td>Category</td><td>Classification</td></tr><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0																						
Category	Classification																														
Health Hazard (Blue)	0																														
Flammability (Red)	2																														
Reactivity (Yellow)	0																														
Continued on pages 3 and 4 NOTES																															

DDC

1-DODECENE

Common Synonyms alpha-Dodecylene		Water: liquid	Colorless	Mild, pleasant odor
		Floats on water		
Stop discharge if possible Call fire department Avoid contact with liquid Isolate and remove discharged material Notify local health and pollution control agencies				
Fire		Combustible Extinguish with foam, dry chemical or carbon dioxide		
Exposure		CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk DO NOT INDUCE VOMITING		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Not to local health and wildlife officials Notify operators of nearby water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 444-4) Mechanical containment Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Adacene 12 alpha-Dodecylene 3.2 Coast Guard Compatibility Classification: Olefin 3.3 Chemical Formula: $\text{CH}_3(\text{CH}_2)_{10}\text{CH}=\text{CH}_2$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild, pleasant		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles or face shield 5.2 Symptoms Following Exposure: No inhalation hazard expected. Aspiration hazard if ingested. Minor skin and eye irritation 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting! Do NOT lavage! Give vegetable oil and demulcent; call physician. EYE CONTACT: flush with water for 15 min. SKIN CONTACT: wash with soap and water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Slight stinging of eyes and respiratory system at high concentration. The effect is temporary 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of skin 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: 174°F (approx.) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 491°F 6.8 Electrical Hazard: Not pertinent 6.9 Burn-in Rate: 5.8 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Gulf Oil Chemicals Co. Petrochemicals Division Houston, Tex. 77001 2 Humphreys Chemical Co. Deering St. North Haven, Conn. 06474 3 Phillips Petroleum Co. Bartlesville, Okla. 74004
	10 SHIPPING INFORMATION 10.1 Grades or Purity: 93-98% normal alpha olefins 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arresters
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 444-3) A 1 1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 168.3 13.3 Boiling Point at 1 atm: 415°F = 213°C = 436°K 13.4 Freezing Point: -41°F = -45°C = 233°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.758 at 20°C (liquid) 13.8 Liquid Surface Tension: 25.6 dynes/cm = 0.0256 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0 13.12 Latent Heat of Vaporization: 110 Btu/lb = 7.0 cal/g = $2.88 \times 10^3 \text{ J/kg}$ 13.13 Heat of Combustion: -18,911 Btu/lb -10,506 cal/g = $-439.87 \times 10^3 \text{ J/kg}$ 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
(Continued on pages 5 and 6)	
NOTES	

DDB

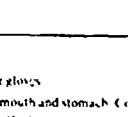
DODECYLBENZENE

Common Synonyms 1 Phenyldecane n-Dodecylbenzene Laurylbenzene Detergent alkylate #2 Dodecylbenzene (linear)		Liquid	Colorless	Weak oily odor
Floats on water				
Not in the range of possible Keep in a cool, dry place. Avoid contact with skin. Avoid contact with liquid. Do not use in the presence of fire. Do not use in the presence of fire.				
Fire		Combustible Extinguish with dry chemical, carbon dioxide, or water. Water may be ineffective in fire.		
Exposure		Call for medical aid. LIQUID Irritating to skin and eyes. Harmful if swallowed. Re: Skin: Irritating to skin and eyes. Re: Eyes: Irritating to eyes. Re: Ingestion: Harmful if swallowed. Re: Inhalation: Irritating to respiratory tract. Re: Water: Harmful to aquatic life.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and welfare officials. Notify operator of nearby water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3) Mechanical containment Should be removed See local and physical treatment		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Detergent Alkylate #2 n-Dodecylbenzene, Dodecylbenzene (linear), Laurylbenzene, 1-Phenyldecane, U.C.A.S. Alkylate 12 3.2 Coast Guard Compatibility Classification: Aromatic hydrocarbon 3.3 Chemical Formula: $(C_{12}H_{25})_2C_6H_5$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weak oily		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Liquid causes mild irritation of eyes and may cause allergic responses on repeated contact with skin. Ingestion causes nausea. 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min; get medical attention for persistent irritation. SKIN: wash with soap and water. INGESTION: do NOT induce vomiting; get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade I LD ₅₀ 5 to 5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: 275°F (135°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical foam 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 1" min/min		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																													
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. Witco Chemical Corporation, Wifield Division, 21001 22nd Street, Carson, Calif. 90745 2. Union Carbide Corporation, Chemicals and Plastics Division, 270 Park Avenue, New York, N.Y. 10017 3. Continental Oil Company, Conoco Chemicals, Park Heights Plaza West One, Saddle Brook, N.J. 07662																													
		10 SHIPPING INFORMATION 10.1 Grades or Purity: Various mixtures containing 70-80% of undecyl plus dodecyl benzene along with 10% decylbenzene and other analogous hydrocarbons 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arresters)																													
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) V T 1		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 240 13.3 Boiling Point at 1 atm: 280°F = 288°C = 561°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.860 at 20°C (liquid) 13.8 Liquid Surface Tension: 30.12 dynes/cm = 0.0091 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 30 dynes/cm = 0.030 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 15.3 Btu/lb = 82 cal/g = 3.4×10^5 J/kg 13.13 Heat of Combustion: 18,100 Btu/lb = 10,000 cal/g = 4.18×10^7 J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																													
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>0</td></tr><tr><td>Liquid or Solid Irritant</td><td>0</td></tr><tr><td>Poisons</td><td>0</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>1</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table> 12.3 NFPA Hazard Classifications: Not listed		Category	Rating	Fire	1	Health		Vapor Irritant	0	Liquid or Solid Irritant	0	Poisons	0	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0		
Category	Rating																														
Fire	1																														
Health																															
Vapor Irritant	0																														
Liquid or Solid Irritant	0																														
Poisons	0																														
Water Pollution																															
Human Toxicity	1																														
Aquatic Toxicity	1																														
Aesthetic Effect	1																														
Reactivity																															
Other Chemicals	1																														
Water	0																														
Self Reaction	0																														
<i>(continued on pages 5 and 6)</i>																															
NOTES																															

DCS	DODECYLBENZENESULFONIC ACID, CALCIUM SALT
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DCS	DODECYLBENZENESULFONIC ACID, CALCIUM SALT
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Common Synonyms Calcium alkylaromatic sulfonate Calcium alkylbenzenesulfonate	Liquid May float or sink in water	Yellowish brown	Solvent odor
MSDS Worksheet: The following information is provided for the purpose of completing the MSDS Worksheet. It is not intended to be used as a substitute for the actual MSDS.			
Fire	FLAMMABLE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Extinguish with dry chemical, carbon dioxide, or alcohol resistant foam Do not use water		
Exposure	ALL FORMS OF EXPOSURE LIQUID Irritating to skin and eyes If swallowed will cause nausea For severe irritation, wash with water If on affected area, wash with water IF IN EYES, flush with water for at least 15 min. Do not use eye drops IF SWALLOWED, DO NOT INDUCE VOMITING. Give water to drink. Call physician for advice. Do not eat, drink, or smoke. Do not inhale vapors.		
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes Notify appropriate authorities Notify appropriate authorities		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG #44-4) Issue warning - high flammability Mechanical containment Should be removed Chemical and physical treatment		2. LABEL 	
3. CHEMICAL DESIGNATIONS 1. Synonyms: Calcium alkylaromatic sulfonate, Calcium alkylbenzenesulfonate 2. Coast Guard Compatibility Classification: Not listed 3. Chemical Formula: (C₁₀-C₁₈)H₂₀SO₃-Ca solvent 4. IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Amber 4.3 Odor: Hydrocarbon solvent	
5. HEALTH HAZARDS			
5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Has a drying effect on skin. Prolonged contact may cause irritation. 5.3 Treatment for Exposure: INGESTION: Give large amount of water. Do NOT induce vomiting. EYES: Flush with water for at least 15 min. SKIN: Wipe off. Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS 6.1 Flash Point: <100°F () 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: ≥ 4 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 The Richardson Company Organic Chemicals Division Melling Park "II" (60160) 2 Waco Chemical Corp. Organics Division 277 Park Avenue New York, N. Y. 10017 3 ICI United States Inc. Corporation Pike and New Memphis Road Wilmington, Del. 19809
	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.6% remainder is hydrocarbon solvent that is combustible or flammable 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Open flame arresters

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Data not available</p> <p>8.4 Food Chain Concentration Potential:
None</p> |
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11. HAZARD ASSESSMENT CODE	13. PHYSICAL AND CHEMICAL PROPERTIES
(See Hazard Assessment Handbook, CG 446-3)	
A-I-I	
12. HAZARD CLASSIFICATIONS	
12.1 Code of Federal Regulations.	13.1 Physical State at 15°C and 1 atm
Flammable liquid	Liquid
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed	13.2 Molecular Weight: Not pertinent (mixture)
12.3 NFPA Hazard Classifications: Not listed	13.3 Boiling Point at 1 atm: Not pertinent (decomposes)
	13.4 Freezing Point: Not pertinent
	13.5 Critical Temperature: Not pertinent
	13.6 Critical Pressure: Not pertinent
	13.7 Specific Gravity:
	1.04 at 25°C (liquid solute/solvent)
	0.9 at 25°C (solvent)
	13.8 Liquid Surface Tension:
	Data not available
	13.9 Liquid-Water Interfacial Tension
	Data not available
	13.10 Vapor (Gas) Specific Gravity:
	Not pertinent
	13.11 Ratio of Specific Heats of Vapor (Gas):
	Not pertinent
	13.12 Latent Heat of Vaporization:
	Not pertinent
	13.13 Heat of Combustion: Not pertinent
	13.14 Heat of Decomposition: Not pertinent
	13.15 Heat of Solution: Not pertinent
	13.16 Heat of Polymerization: Not pertinent

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12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid	13.5 Critical Temperature: Not pertinent
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed	13.6 Critical Pressure: Not pertinent
12.3 NFPA Hazard Classifications: Not listed	13.7 Specific Gravity: 1.04 at 25°C (liquid solute/solvent) 0.9 at 25°C (solvent)
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	13.16 Heat of Polymerization: Not pertinent

NOTES

DBS

DODECYLBENZENESULFONIC ACID, TRIETHANOLAMINE SALT

Common Synonyms: Triethanolamine dodecylbenzenesulfonate	Liquid Yellowish brown Sinks and mixes with water
Avoid contact with liquid. Keep people away. No breathing of possible dusts and aerosols. Do not get on skin. No skin contact. Do not get on clothing.	
Fire	Combustible Extinguish with water. Do not use foam or dry chemical.
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyes open and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Have victim drink water or milk. IF SWALLOWED: Do not induce vomiting. Have victim drink water or milk. IF SWALLOWED: Do not induce vomiting. Have victim drink water or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Do not discharge into water through sewer pipes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Disperse and flush.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Triethanolamine dodecylbenzenesulfonate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_{12}H_{25}SO_3N(CH_2CH_2O)_3$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Amber 4.3 Odor: Data not available
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, face mask or goggles. 5.2 Symptoms Following Exposure: Ingestion may cause irritation of mouth and stomach. Contact with eyes or prolonged contact with skin may cause irritation. 5.3 Treatment for Exposure: INGESTION: Give large amount of water; consult a doctor if large amount was ingested. EYES: flush with water; consult a doctor if irritation persists. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen and irritating oxides of sulfur may form in fire. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. The Richardson Company Organic Chemicals Division Melrose Park, Ill. 60160 2. Ashland Chemical Co. P. O. Box 2219 Columbus, Ohio 43216 3. Step-Chemical Co. Idens and Winnetka Northfield, Ill. 60093
10. SHIPPING INFORMATION 10.1 Grade or Purity: 60% solution in water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A P	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 475.6 (solute) 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: (test 11.2 at 20°C (liquid)) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 MFPA Hazard Classifications: Not listed	NOTES (continued on pages 1 and 2)

DSD

DODECYL SULFATE, DIETHANOLAMINE SALT

Common Synonyms: Diethanolamine lauryl sulfate solution Lauryl sulfate, diethanolamine salt solution	Liquid Clear to pale yellow Mild odor May float or sink and mix with water
Avoid contact with liquid. Keep people away. Stop discharge if possible. Isolate and remove discharge material. Notify local health and pollution control agencies.	
Fire	Not flammable
Exposure	• ALL FOR MEDICAL USE LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing as soon as possible. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, do not induce vomiting. Have victim drink water or milk. IF SWALLOWED, do not induce vomiting UNLESS ADVISED BY A PHYSICIAN. IF SWALLOWED, do not induce vomiting UNLESS ADVISED BY A PHYSICIAN.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify local health and pollution control agencies.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Diethanolamine lauryl sulfate solution Lauryl sulfate, diethanolamine salt solution 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_{12}H_{25}NO_2 \cdot H_2NCH_2CH_2NH_2 \cdot H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed	
2. LABELS No hazard label required by Code of Federal Regulations	
4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Clear, pale yellow 4.3 Odor: Mild fatty	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Ingestion causes mild irritation of stomach. Liquid irritates eyes and causes some corneal damage after prolonged contact. Prolonged contact with skin causes mild irritation. 5.3 Treatment for Exposure: INGESTION: consult a doctor if large amount was ingested. EYES: wash well with water; consult a doctor if irritation persists. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flesh Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic vapors of diethanolamine and oxides of nitrogen may form in fires. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Henkel Inc. Chemical Specialties Div. 480 Alfred Avenue Teaneck, N.J. 07666 2. E. I. duPont de Nemours & Co. Inc. Dyes and Chemicals Division 1007 Market Street Wilmington, Del. 19898 3. Ashland Chemical Co. P.O. Box 2219 Columbus, Ohio 43216
10. SHIPPING INFORMATION 10.1 Grades or Purity: 15-40% solution in water 10.2 Storage Temperature: Below 10°C (50°F) 10.3 Inert Atmosphere: No requirement 10.4 Venting: Oxygen	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-4) A P	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent (solution) 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.01 at 20°C (liquids) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 MFPA Hazard Classification: Not listed	
NOTES	

(continued on pages 4 and 5)

DSM

DODECYL SULFATE, MAGNESIUM SALT

Common Synonyms Magnesium dodecyl sulfate Magnesium lauryl sulfate Lauryl sulfate, magnesium salt		Liquid	Light yellow	Mild odor
May float or sink and mix with water				
Soluble in water, alcohol, and acetone.				
Not flammable				
Fire				
Exposure		LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Dispense and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Laurylmagnesium sulfate Lauryl sulfate, magnesium salt Magnesium dodecyl sulfate Magnesium lauryl sulfate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $(C_{12}H_{25}O_2S)_2Mg \cdot H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light yellow 4.3 Odor: Pungent		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Ingestion causes mild irritation of stomach. Contact with liquid causes mild irritation of eyes. Skin is mildly irritated with prolonged contact. 5.3 Treatment for Exposure: INGESTION: Consult a doctor if large amount was ingested. EYES: Flush with water; consult a doctor if irritation persists. SKIN: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS Solutia 24711 E. 1st Rd. Baltimore, Md. 21226 Surfact Co., Inc. 2400 South Seelye Avenue Blue Island, Ill. 60406 Stapan Chemical Co. 10000 W. 10th Ave. Northfield, Ill. 60091	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) N P		10. SHIPPING INFORMATION 10.1 Grades or Purity: 25% solution in water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 352.54 g/mol 12.3 Boiling Point at 1 atm: Not pertinent 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: Not pertinent 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 1.04 at 20°C (liquid) 12.8 Liquid Surface Tension: Data not available 12.9 Liquid-Water Interfacial Tension: Not pertinent 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 12.12 Latent Heat of Vaporization: Not pertinent 12.13 Heat of Combustion: Not pertinent 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: Not pertinent 12.16 Heat of Polymerization: Not pertinent	

Continued on pages 5 and 6

NOTES

(continued on pages 2 and 3)

DDS

DODECYL SULFATE, SODIUM SALT

Common Synonyms: Sodium lauryl sulfate Linear Sodium sulfate Sodium dodecyl sulfate		Solid paste or liquid White to pale yellow Mild odor Sinks and mixes with water
Fire		
Exposure		
Water Pollution		
1. RESPONSE TO DISCHARGE (See Response Summary Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Lauryl sodium sulfate laurylsulfate, sodium salt, Sodium dodecyl sulfate, Sodium lauryl sulfate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_{12}H_{25}OSO_2Na$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White to pale yellow 4.3 Odor: Mild fatty
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, dust mask or face shield 5.2 Symptoms Following Exposure: Inhalation of dust causes sneezing and coughing. Ingestion of large amounts causes irritation of stomach. Dust irritates eyes and may cause burns on prolonged contact. Contact with skin causes severe irritation. Continued exposure to water solutions causes drying out and cracking. 5.3 Treatment for Exposure: INHALATION: remove from exposure. INGESTION: consult a doctor if large amounts have been ingested. EYES: flush well with water; consult doctor if irritation persists. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 6.4 g/kg rat 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperatures: Not pertinent 6.8 Electrical Hazards: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: 6.5 ppm 24 hr. plaice, LC ₅₀ 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 50% of theoretical in 6 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor or Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Hessel, Inc. Chemical Specialties Division 480 Alfred Avenue Teaneck, N.J. 07666 2. E. I. du Pont de Nemours & Co., Inc. Dyes and Chemicals Division 1607 Market Street Wilmington, Del. 19899 3. Ashland Chemical Co. P.O. Box 2,19 Columbus, Ohio 43216
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NS		10. SHIPPING INFORMATION 10.1 Grades or Purities: Technical 80-90% pharmaceutical grade, also shipped as 75-90% solutions in water 10.2 Storage Temperature: Below 38°C (100°F) 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 HFA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 288 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: > 1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heat of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES		

(Continued on page 1 and 2)

DODECYLTRICHLOROSILANE

6. FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical or foam 6.4 Fire Extinguishing Agents Not to be Used: Water 6.5 Special Hazards of Combustion Products: Hydrochloric acid and phosphoric acid mists 6.6 Behavior in Fire: Difficult to extinguish; a special method must be utilized with water applied to adjacent fires produces irritating hydrogen chloride fumes 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterbody Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Feed Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Generates hydrogen chloride and hydrochloric acids 7.2 Reactivity with Common Materials: Reacts with surface moisture to generate hydrogen chloride which is corrosive on contact 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water using weak sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Dow Chemical Corporation P.O. Box 1902 Midland, Mich. 48640 P.P.C. Inc. P.O. Box 206 Greenfield, N.J. 07030																												
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 446-3 A 11	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Pressure Vessel																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td></td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td> Vapor Irritant</td> <td>2</td> </tr> <tr> <td> Liquid or Solid Irritant</td> <td>4</td> </tr> <tr> <td> Poisons</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td> Human Toxicity</td> <td></td> </tr> <tr> <td> Aquatic Toxicity</td> <td></td> </tr> <tr> <td> Acute Effects</td> <td>1</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td> Other Chemicals</td> <td>1</td> </tr> <tr> <td> Water</td> <td>4</td> </tr> <tr> <td> Self Reaction</td> <td></td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not used	Category	Rating	Fire		Health		Vapor Irritant	2	Liquid or Solid Irritant	4	Poisons	1	Water Pollution		Human Toxicity		Aquatic Toxicity		Acute Effects	1	Reactivity		Other Chemicals	1	Water	4	Self Reaction		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 106.1 13.3 Boiling Point at 1 atm: $94.00^{\circ}\text{F} = 34.44^{\circ}\text{C} = 273.15^{\circ}\text{K}$ 13.4 Freezing Point: Not pertinent 13.5 Storage Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.0 at 20°C liquid 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: $10.1 \times 10^3 \text{ Btu/lb}$ or $4.1 \times 10^4 \text{ J/g}$ 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire																													
Health																													
Vapor Irritant	2																												
Liquid or Solid Irritant	4																												
Poisons	1																												
Water Pollution																													
Human Toxicity																													
Aquatic Toxicity																													
Acute Effects	1																												
Reactivity																													
Other Chemicals	1																												
Water	4																												
Self Reaction																													

Continued on pages 7 and 8

NOTES

DTH

DOWTHERM

Common Synonyms		Liquid	Light to dark brown	Fragrant odor
		May float or sink in water. Freezing point is 54° F.		
Fire	Combustible Flash point: 100°F (38°C) Boiling point: 200°F (93°C) Autoignition temperature: 400°F (204°C) Fire extinguishing agents: Water, carbon dioxide, dry chemical			
Exposure	LIQUID Irritating to skin and eyes. Harmful if swallowed. Inhalation of vapors may irritate the respiratory tract. Chronic effects: May cause skin irritation and dermatitis. Environmental effects: May be harmful to aquatic life if released into water.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Biodegradable.			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, 10-2-66, 4. If leaking, water containment should be initiated. Chemical should be treated.		2. LABELS See Hazard Summary, 10-2-66, 4. Code of Federal Regulation.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Diphenyl ether 3.2 Coast Guard Compatibility Classification: Volatile Hydrocarbon 3.3 Chemical Formula: C ₁₂ H ₁₀ O 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Gray 4.3 Odor: Aromatic, pungent		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Not required				
5.2 Symptoms Following Exposure: Irritation of the eyes, nose, throat, and skin. May cause dizziness and headache.				
5.3 Treatment for Exposure: INHALATION: If inhaled, remove person to fresh air and provide rest. If irritation persists, seek medical attention. INGESTION: Rinse mouth with water and give milk or water to swallow. If symptoms persist, seek medical attention. SKIN: Wash with soap and water. If irritation persists, seek medical attention.				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Data not available				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Vapor irritates the eyes, nose, throat, and skin. May cause dizziness and headache.				
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing, remove clothing immediately and wash skin.				
5.10 Odor Threshold: 0.1 ppm				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point: 100 F (38 C)		8.1 Aquatic Toxicity: Data not available	
6.2 Flammable Limits in Air: Vapor 1.1% - 6.2% Air 1.1% - 6.2%		8.2 Waterford Toxicity: Data not available	
6.3 Fire Extinguishing Agents: Water, carbon dioxide, dry chemical		8.3 Biological Oxygen Demand (BOD): Data not available	
6.4 Fire Extinguishing Agents Not to be Used: Data not available		8.4 Food Chain Concentration Potential: Data not available	
6.5 Special Hazards of Combustion Products: Irritation to eyes, nose, throat, and skin			
6.6 Behavior in Fire: Not pertinent			
6.7 Ignition Temperature: 400 F (204 C)			
6.8 Electrical Hazard: Not pertinent			
6.9 Burning Rate: Data not available			
7 CHEMICAL REACTIVITY		9 SELECTED MANUFACTURERS	
7.1 Reactivity with Water: Not pertinent		Dow Chemical Midland, Mich. 48667	
7.2 Reactivity with Common Materials: Not pertinent			
7.3 Stability During Transport: Not pertinent			
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent			
7.5 Polymerization: Not pertinent			
7.6 Inhibitor of Polymerization: Not pertinent			
		10. SHIPPING INFORMATION	
		10.1 Grades or Purity: 99.5% Diphenyl ether 99.5% Diphenyl ether	
		10.2 Storage Temperature: Ambient	
		10.3 Inert Atmosphere: Not required	
		10.4 Venting: Open flame arrester	
11 HAZARD ASSESSMENT CODE		13 PHYSICAL AND CHEMICAL PROPERTIES	
See Hazard Assessment Handbook, 10-2-66, 4. ATA 100		13.1 Physical State at 15°C and 1 atm: Liquid	
		13.2 Molecular Weight: 162	
		13.3 Boiling Point at 1 atm: 200 F (93 C)	
		13.4 Freezing Point: 54 F (12 C)	
		13.5 Critical Temperature: 400 F (204 C)	
		13.6 Critical Pressure: 20.0 atm (20.0 MPa)	
		13.7 Specific Gravity: 1.02 (20 C)	
		13.8 Liquid Surface Tension: 30.0 dyne/cm (20 C)	
		13.9 Liquid-Water Interfacial Tension: 30.0 dyne/cm (20 C)	
		13.10 Vapor (Gas) Specific Gravity: Not pertinent	
		13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent	
		13.12 Latent Heat of Vaporization: Not pertinent	
		13.13 Heat of Combustion: 40.0 kJ/mol	
		13.14 Heat of Decomposition: Not pertinent	
		13.15 Heat of Solution: Not pertinent	
		13.16 Heat of Polymerization: Not pertinent	
12 HAZARD CLASSIFICATIONS			
12.1 Code of Federal Regulations: Not listed			
12.2 HAS Hazard Rating for Bulk Water Transportation:			
Category	Rating		
Fire			
Health			
Vapor Irritant			
Liquid or Solid Irritant			
Poison			
Water Pollution			
Human Toxicity			
Aquatic Toxicity			
Acute Toxicity			
Reactivity			
Other Chemicals			
Water			
Self-Reaction			
12.3 NFPA Hazard Classifications: Not listed			
NOTES			

EDR

ENDRIN

Common Synonyms 1, 2, 3, 4, 10, 10-Hexachloro-6, 7-epoxy 1, 4, 4a, 5, 6, 7, 8-Hexachloroendo-cis-1, 4, 5, 8-dimethanonaphthalene Hexadrin Mendrin		Solid or solution	Colorless to tan	Odorless
AVOID CONTACT WITH SOLID, LIQUID AND DUST. KEEP PEOPLE AWAY. Wash thoroughly with soap and water after exposure to dusts. Wash hands and face after contact with liquid. Do not eat, drink, or smoke while using. Do not get dust in eyes.		Sinks in water		
Fire	Combustible solution or non flammable solid POISONOUS GASES ARE PRODUCED IN FIRE. Fight fires with dry chemical, carbon dioxide or water. Water may be ineffective on fire.			
	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED Irritating to eyes, nose and throat May cause dizziness Run nose and flush eyes with plenty of water. Do not get dust in eyes. LIQUID OR SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes Remove contaminated clothing Flush affected area with plenty of water If IN EYES, hold eyelids open and flush with plenty of water If SWALLOWED, DO NOT INDUCE VOMITING. Give 1-2 glasses of milk and 1-2 glasses of water If SWALLOWED, ADVISE A PHYSICIAN FOR TREATMENT, CONSULT PHYSICIAN about possible poisoning			
Exposure				
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Notify local health and waste officials Notify local water pollution control agency			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning - poison water contaminant Restrict access Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 31 Synonyms: 1, 2, 3, 4, 10, 10-Hexachloro-6, 7-epoxy 1, 4, 4a, 5, 6, 7, 8-Hexachloroendo-cis-1, 4, 5, 8-dimethanonaphthalene, Hexadrin, Mendrin 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: C ₁₂ H ₆ Cl ₆ O 34 IMCO/United Nations Numerical Designation: 6.1/1615		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid (Sometimes shipped as an emulsifiable concentrate in xylene solution) 42 Color: Colorless to tan 43 Odor: None		
5. HEALTH HAZARDS 51 Personal Protective Equipment: Respirator for spray, fog or dust, rubber gloves and boots 52 Symptoms Following Exposure: Inhalation causes moderate irritation of nose and throat; prolonged breathing may cause same toxic symptoms as for ingestion. Contact with liquid causes moderate irritation of eyes and skin. Prolonged contact with skin may cause same toxic symptoms as for ingestion. Ingestion causes frothing of the mouth, facial congestion, convulsions, violent muscular contractions, dizziness, weakness, nausea 53 Treatment for Exposure: Get medical attention after all exposures to this compound INHALATION: remove from exposure. EYES: flush with water for at least 15 min. SKIN: wash with plenty of soap and water, but do not scrub. INGESTION: remove from the gastrointestinal tract either by inducing vomiting (unless hydrocarbon solvents are involved and the amount of emulsicide is well below the toxic amount) or by gastric lavage with saline solution. Saline cathartics may also be beneficial. Fats and oils should be avoided. Sedation with barbiturates is indicated if signs of CNS irritation are present; patient should have an absolute quiet, expert nursing care, and a minimum of external stimuli to reduce danger of convulsions. epinephrine is contraindicated in view of the danger of precipitating ventricular fibrillation; if material ingested was dissolved in a hydrocarbon solvent, observe patient for possible development of hydrocarbon pneumonitis 54 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ 55 Short-Term Inhalation Limits: 0.5 mg/m ³ for 10 min 56 Toxicity by Ingestion: Grade 4, oral LD ₅₀ = 3 mg/kg (rat) 57 Late Toxicity: None known				

6 FIRE HAZARDS 61 Flash Point: Non flammable solid or combustible solution >80 F O.C. (xylene) 62 Flammable Limits in Air: 1.1 - 7.7 (xylene) 63 Fire Extinguishing Agents (Solution): Dry chemical, foam, carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective on solution fire 65 Special Hazards of Combustion Products: Toxic hydrogen chloride and phosgene may be generated when solution burns 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Not pertinent 68 Electrical Hazard: Not pertinent 69 Burning Rate: 4 mm/min (xylene)	8 WATER POLLUTION 81 Aquatic Toxicity: 0.005 ppm 48 hr catp; 11 m fresh water 0.0025 ppm 48 hr brown shrimp 11% salt water 82 Waterfowl Toxicity: 1 D₅₀ = 5.64 mg/kg 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: Probable															
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Valvol Chemical Corp 441 East Ohio St Chicago, Ill 60611 2 Shell Chemical Co 1 Shell Plaza Houston, Texas 77002															
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 95-98 Dry formulations up to 75% endrin liquid formulations up to 25% in flammable xylene 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open															
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 380.92 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 392 F = 200°C = 573 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.65 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent															
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th colspan="2">Classification</th></tr><tr><td></td><td>Solution</td><td>Dry</td></tr><tr><td>Health Hazard (Blue)</td><td>3</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>1</td><td>0</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td><td>0</td></tr></table>	Category	Classification			Solution	Dry	Health Hazard (Blue)	3	2	Flammability (Red)	1	0	Reactivity (Yellow)	0	0	
Category	Classification															
	Solution	Dry														
Health Hazard (Blue)	3	2														
Flammability (Red)	1	0														
Reactivity (Yellow)	0	0														
	5 HEALTH HAZARDS (Cont'd.) 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent (solid)															

(Continued on pages 5 and 6)

EPC

EPICHLOROHYDRIN

Common Synonyms 1-Chloro-2,3-epoxypropane 3-Chloro-1,2-propylene oxide		Watery liquid	Colorless	Sweet garlic odor
		Sinks and mixes with water Poisonous, flammable vapor is produced		
AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Stay upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Combustible POISONOUS GASES ARE PRODUCED IN FIRE Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Confine fires from safe distance or protected location. Extinguish with water, dry chemical, alcohol foam or carbon dioxide. Cool exposed containers with water.		
		CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED Irritating to eyes. Move to fresh air. If breathing has stopped, get artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk, and have vomiting induced. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
Exposure				
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning - water contaminant. Restrict access. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Chloro-2,3-epoxypropane Chloromethylolurane gamma-Chloropropylene oxide 1-Chloro-1,2-propylene oxide 3.2 Coast Guard Compatibility Classification: Epichlorohydrin 3.3 Chemical Formula: C ₃ H ₅ Cl 3.4 IMCO/United Nations Numerical Designation: 6.1 2021		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent garlic, sweet, pungent like chloroform		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air-pick or organic canister mask, protective gloves and goggles. 5.2 Symptoms Following Exposure: Vapor is irritating to eyes, nose, and throat; may cause headache, nausea, vomiting, and central nervous system depression. Rapidly fatal if swallowed; i.e. nausea, vomiting, and collapse. Skin contact is irritating. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; keep him warm and quiet and get medical attention immediately; if breathing stops, start artificial respiration. INGESTION: induce vomiting (but only if victim is conscious and without convulsions) and call a physician promptly; no specific antidote known. EYES OR SKIN: immediately flush with water for at least 15 min. and get medical attention; remove contaminated clothing and wash before reuse. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm 5.5 Short-Term Inhalation Limits: 10 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 50 to 500 mg/kg 5.7 Late Toxicity: Causes cancer in experimental animals. 5.8 Vapor (Gas) Irritant Characteristics: vapor is moderately irritating such that personnel will usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Early severe skin irritant. May cause pain and second degree burns after a few minutes contact. 5.10 Odor Threshold: 10 ppm				

6. FIRE HAZARDS

6.1 **Flash Point:** 92°F (3°C) 100°F (4°C)

6.2 **Flammable Limits in Air:** 1.8% - 21.0%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, carbon dioxide, water spray

6.4 **Fire Extinguishing Agents Not to be Used:** Avoid use of dry chemical if fire occurs in container with confined vent

6.5 **Special Hazards of Combustion Products:** Toxic, irritating vapors are generated when heated

6.6 **Behavior in Fire:** Containers may explode in fire because of polymerization

6.7 **Ignition Temperature:** 504°F

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** 2.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Mild reaction, not likely to be hazardous

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Can polymerize in presence of strong acids and bases, particularly when hot

7.6 **Inhibitor of Polymerization:** None used

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 36 ppm/48 hrs/Rashbow (fish)/TL_m/freshwater

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland, Mich. 48640

2. Shell Chemical Co.
Industrial Chemicals Division
Houston, Texas 77001

3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.0%

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure/vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446.3)

A-PQ

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations, Poison Class B**

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	3
Liquid or Solid Irritant	3
Poisons	4
Water Pollution	
Human Toxicity	3
Aquatic Toxicity	3
Aesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	1
Sol. Reaction	2

12.3 **NFPA Hazard Classifications**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 92.53

13.3 **Boiling Point at 1 atm:** 29.4°F = 15.2°C = 388.4 K

13.4 **Freezing Point:** -72.6°F = -58.1°C = 215.1 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.18 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 37.0 dynes/cm = 0.037 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.155

13.12 **Latent Heat of Vaporization:** 176 Btu/lb = 97.9 cal/g = 4.10 × 10³ J/kg

13.13 **Heat of Combustion:** -8143 Btu/lb = -4521 cal/g = -189.4 × 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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EVO

EPOXIDIZED VEGETABLE OILS

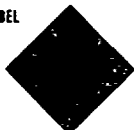
Common Synonyms Epoxidized drying oils Epoxidized oils		Only liquid	Pale yellow	Odorless
		Floats on water		
Stop discharge if possible Call fire department Isolate and remove discharged material Notify local health and pollution control agencies				
Fire		Combustible. Extinguish with foam, dry chemical or carbon dioxide		
Exposure		Not harmful		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Drying oil epoxides Epoxidized drying oils Epoxidized oils 3.2 Coast Guard Compatibility Classification: Glycol ethers 3.3 Chemical Formula: (OCCRIICIRCOO)C ₁₈ H 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to yellow 4.3 Odor: Very weak		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Data not available 5.2 Symptoms Following Exposure: Data not available 5.3 Treatment for Exposure: Data not available 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 0-1 Dose above 15 g/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: None expected 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Over Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point: 588°F (OC) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: 240 ppm/24 hr/bnne shrimp/TL_m 8.2 Waterfowl Toxicity: 8.3 Biological Oxygen Demand (BOD): 4% of theoretical in 5 days, fresh water, acclimated seed 8.4 Food Chain Concentration Potential:
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Ashland Oil, Inc. Chemical Products Division Columbus, Ohio 43216 2. Swift & Co. Swift Agricultural Chemicals Corp. Wilmington, N. C. 28401 3. Witco Chemical Corp. Argus Chemical Corp. Division 633 Court St. Brooklyn, N. Y. 11231
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-T-L	10. SHIPPING INFORMATION 10.1 Grades or Purity: Epoxidized vegetable oil Epoxidized soybean oil 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Oper
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.0 at 20°C (liquid) 13.8 Liquid Surface Tension: 36.2 dynes/cm = 0.0362 N/m at 24°C 13.9 Liquid-Water Interfacial Tension: 50 dynes/cm = 0.05 N/m at 22.7°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (cal) = -13,000 Btu/lb = -7,000 cal/g = -300 X 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
<i>(Continued on pages 5 and 6)</i>	
NOTES	

(Continued on pages 5 and 6)

ETH

ETHANE

Common Synonyms		Liquefied compressed gas Colorless Mild gasoline-like odor	
		Floats and boils on water Flammable visible vapor cloud is produced	
Supplies first aid possible. Keep people away. Get to fresh air. Get to safe area. Call fire department. Stop if breathing device will expire. Use knowledge of vapor. As it is not water, it will not flow down a drain. Notify fire department for proper disposal.			
Fire		FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Stop flow of gas if possible Get to fresh air. Get to safe area. Call fire department. Let fire burn	
Exposure		CALL FOR MEDICAL AID VAPOR If inhaled will cause difficult breathing Not irritating to eyes, nose or throat May cause frostbite If breathing is stopped, get artificial respiration If breathing is difficult, give oxygen LIQUID Will cause frostbite. Flush affected areas with plenty of water DO NOT RUB AFFECTED AREAS	
Water Pollution		Not harmful	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: high flammability Evacuate area		2. LABEL 	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Methanimethane 3.2 Coast Guard Compatibility Classification: Paraffin 3.3 Chemical Formula: C ₂ H ₆ 3.4 IMCO United Nations Numerical Designation: 2.0.1035		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid or compressed gas 4.2 Color: Colorless 4.3 Odor: Weak, sweetish	
5. HEALTH HAZARDS			
5.1 Personal Protective Equipment: Self contained breathing apparatus for high vapor concentrations			
5.2 Symptoms Following Exposure: In high vapor concentrations, can act as simple asphyxiant. Liquid causes severe frostbite			
5.3 Treatment for Exposure: Remove from exposure; support respiration			
5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent			
5.5 Short-Term Inhalation Limits: Not pertinent			
5.6 Toxicity by Ingestion: Not pertinent			
5.7 Late Toxicity: None			
5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat			
5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly			
5.10 Odor Threshold: 500 ppm			

6 FIRE HAZARDS 6.1 Flash Point: -211°F 6.2 Flammable Limits in Air: 2.9 - 13.0% 6.3 Fire Extinguishing Agents: Stop flow of gas 6.4 Fire Extinguishing Agents Not to be Used: Data not available 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 940°F 6.8 Electrical Hazard: Class I group D 6.9 Burning Rate: 3 mm/min		8 WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None	
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. Atlantic Richfield Co. ARCO Chemical Co. Division 260 South Broad St. Philadelphia, Pa. 19101 2. Cities Service Co., Inc. Petrochemicals Division 60 Wall St. New York, N.Y. 10005 3. Phillips Petroleum Co. Bartlesville, Okla. 74004	
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3. A B C D E F G		10 SHIPPING INFORMATION 10.1 Grade or Purity: Research pure 10.2 Storage Temperature: -128°F 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief	
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 30.07 13.3 Boiling Point at 1 atm: -127.5°F = -88.6°C = 264.6 K 13.4 Freezing Point: -279.9°F = -183.3°C = 89.9 K 13.5 Critical Temperature: 90.1°F = 32.3°C = 305.5 K 13.6 Critical Pressure: 708.0 psia = 48.16 atm = 4.816 MN/m² 13.7 Specific Gravity: 0.546 at -88.6°C (liquid) 13.8 Liquid Surface Tension: 16.4 dyne/cm = 0.016 N/m at -88.6°C 13.9 Liquid-Water Interfacial Tension: 16.4 dyne/cm = 0.016 N/m at -88.6°C 13.10 Vapor (Gas) Specific Gravity: 1.1 13.11 Ratio of Specific Heats of Vapor (Gas): 1.091 13.12 Latent Heat of Vaporization: 211 Btu/lb = 117 cal/g = 4.90 x 10³ J/kg 13.13 Heat of Combustion: -20,293 Btu/lb = -11,274 cal/g = -472.02 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
(Continued on pages 5 and 6)			
NOTES			

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EHP

ETHOXYDIHYDROPYRAN

Common Synonyms 2 Ethoxy 3,4-dihydro-2H-pyran		Liquid Colorless Floats on water
See Hazard Assessment Handbook (CG 446-3) for information on the following hazards: 1. Personal Protective Equipment: Goggles or face shield, rubber gloves 2. Symptoms Following Exposure: Contact with liquid irritates eyes. Also irritates skin on prolonged contact 3. Treatment for Exposure: EYES: flush with water for at least 15 min. SKIN: wipe off, wash well with soap and water. INGESTION: induce vomiting, get medical attention 4. Toxicity by Inhalation (Threshold Limit Value): Data not available 5. Short-Term Inhalation Limits: Not pertinent 6. Toxicity by Ingestion: Data not available 7. Late Toxicity: Data not available 8. Vapor (Gas) Irritant Characteristics: Data not available 9. Liquid or Solid Irritant Characteristics: Data not available 10. Odor Threshold: Data not available		
Fire	Combustible Flash point: 98°F (37°C) Boiling point: 145°C (300°F)	
Exposure	Exposure data not available	
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-ethoxy-3,4-dihydro-2H-pyran 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: <chem>COC1=CC=CC=C1C2=CC=CC=C2</chem> 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Data not available
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Contact with liquid irritates eyes. Also irritates skin on prolonged contact 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min. SKIN: wipe off, wash well with soap and water. INGESTION: induce vomiting, get medical attention 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS 6.1 Flash Point: 98 F (37 C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 4.5 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Union Carbide Corporation Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017 2. Guardian Chemical Corporation Eastern Chemical Division P.O. Box 2400-B Hempstead, N.Y. 11757								
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) V 11	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 128.17 13.3 Boiling Point at 1 atm: 289.1 ± 14.5 C = 416.6 K 13.4 Freezing Point: -145.1 ± 10.0 C = -173.2 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.875 at 20 C (liquids) 13.8 Liquid Surface Tension: (test 1) 25 dynes/cm = 0.025 N/m at 20 C 13.9 Liquid-Water Interfacial Tension: (test 1) 30 dynes/cm = 0.030 N/m at 20 C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: (test 1) 120 Btu/lb = 69 cal/g = 2.9 x 10⁵ J/kg 13.13 Heat of Combustion: (test 1) -14,000 Btu/lb = -7,900 cal/g = -33.0 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>1</td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	1	
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	2								
Reactivity (Yellow)	1								
NOTES									

Continued on pages 5 and 6

EOD

ETHOXYLATED DODECANOL

Common Synonyms Ethoxylated dodecyl alcohol Ethoxylated lauryl alcohol Tergitol nonoxnic TMN		Only liquid Colorless to yellow Pleasant odor Mixes slowly with water. Freezing point is 61° F
Avoid contact with liquid. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible Extinguish with water, foam, dry chemical, or carbon dioxide.	
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin. Will burn eyes. Harmful if swallowed. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445-4) Disperse and flush.		2 LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms Ethoxylated dodecyl alcohol Ethoxylated lauryl alcohol Polyoxyethyl dodecyl ether Polyoxyethyl lauryl ether Tergitol Nonoxnic TMN 3.2 Coast Guard Compatibility Classification Alcohol		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild and pleasant.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Plastic gloves, goggles. 5.2 Symptoms Following Exposure: Liquid causes eye injury and irritates the skin, causing irritation. 5.3 Treatment for Exposure: Flush eyes with water for at least 15 min. Wash skin well with water. Get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 1 to 1.5 kg rats. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: None. 5.9 Liquid or Solid Irritant Characteristics: Liquid causes eye injury. Contact with skin may cause irritation. 5.10 Odor Threshold: Not pertinent.		

6 FIRE HAZARDS 6.1 Flash Point: 470°F O.C. 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, or alcohol foam 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Acute Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 BASF Wyandotte Corp. Industrial Chemicals Group Wyandotte, Mich. 48192 2 Arco Chemical Co. 4346 Richmond Ave. Houston, Tex. 77052 3 Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Usually 100% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arresters)
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-1 V P Q	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 450-620 13.3 Boiling Point at 1 atm: Varies high 13.4 Freezing Point: 61°F = 16°C = 289°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.0 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (cal/g) = 1200 Btu/lb. = -6200 cal/g = -2600 Btu/lb. 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
3 CHEMICAL DESIGNATIONS (Cont'd) 3.3 Chemical Formula: $C_{12}H_{25}O_{12}H_{25}CH_2OH$ n = 6 to 10 (average) 3.4 IMCO United Nations Numerical Designation: Not listed	

ENP

ETHOXYLATED NONYLPHENOL

Common Synonyms		Liquid or solid	White	Mild odor
		May float or sink in water		
When mixed with liquid and solid, keep people away. Stop discharge if possible. Call fire department. Isolate and remove/flush large fire material. Notify local health and pollution control agencies.				
Fire		Combustible Extinguish with dry chemicals from a carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
Exposure		SAFETY FOR MEDICAL AID LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with water. IF IN EYES: Hold eye also open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: Have victim drink water, if possible. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: Do not throw up or keep victim awake.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution officials. Notify operators of nearby water intake.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush.		2 LABELS No hazard label required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: (miscellaneous) 3.3 Chemical Formula: $C_nH_{2n+1}EO_x$ where $n = 4-10$ 3.4 IMCO/United Nations Numerical Designation: Not listed.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid or solid. 4.2 Color: White. 4.3 Odor: Mild aromatic.		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles and safety glasses. 5.2 Symptoms Following Exposure: Contact with eyes causes irritation. Prolonged contact with skin causes irritation. 5.3 Treatment for Exposure: No treatment required for inhalation or ingestion. EYES: flush with copious quantities of tap water for 15 min. and seek appropriate medical attention. SKIN: wash affected areas with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion, Grade 2 oral LD_{50} : 1-3100 mg/kg rats. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: (burns with difficulty) 150-160°F (60-70°C) > 140°F (60°C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8 WATER POLLUTION 8.1 Aquatic Toxicity: 1.5 to 1,000 ppm 96 hr bluegill LC ₅₀ (increased emphysema, edema - length gives decreased toxicity) 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0.520% of theoretical in 5 days 8.4 Food Chain Concentration Potential: None																													
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Diamond Shamrock Chemical Co. 1100 Superior Avenue Cleveland, Ohio 44114 2. GAF Corp. 140 West 51 St. New York, N.Y. 10020 3. Monsanto Company 800 North Lindbergh Blvd. St. Louis, Mo. 63166																													
		10 SHIPPING INFORMATION 10.1 Grade or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open																													
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) (liquid) A P (solid) S		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or liquid 13.2 Molecular Weight: > 400 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.89-1.07 at 25°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent																													
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><td>Category</td><td>Rating</td></tr><tr><td>Fire</td><td></td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>0</td></tr><tr><td>Liquid or Solid Irritant</td><td>2</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>2</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>0</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table> 12.3 NFPA Hazard Classifications: Not listed		Category	Rating	Fire		Health		Vapor Irritant	0	Liquid or Solid Irritant	2	Poisons	1	Water Pollution		Human Toxicity	2	Aquatic Toxicity	1	Aesthetic Effect	0	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	(continued on pages 4 and 5)	
Category	Rating																														
Fire																															
Health																															
Vapor Irritant	0																														
Liquid or Solid Irritant	2																														
Poisons	1																														
Water Pollution																															
Human Toxicity	2																														
Aquatic Toxicity	1																														
Aesthetic Effect	0																														
Reactivity																															
Other Chemicals	1																														
Water	0																														
Self Reaction	0																														
NOTES																															

ECP

ETHOXYLATED PENTADECANOL

Common Synonyms Ethoxylated penta-decylalcohol Terpolyl alcohol 45-S-10		Liquid Colorless to yellow Pleasant odor Mixes slowly with water. Freezing point is 59° F
Avoid contact with liquid. Skin irritation is possible. Contact with eyes may cause irritation. No known health and public hazards.		
Fire	Combustible Flammable liquid (F+). Flash point: 100° F (38° C). Boiling point: 300° F (149° C). Evaporation rate: Moderate.	
Exposure	ALL FOR MEDICAL USE LIQUID Irritating to skin. Will burn eyes. No known health and public hazards.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. No known health and public hazards.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-A) Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 31 Synonyms: Ethoxylated penta-decylalcohol; Polyethoxylated penta-decyl ether; Terpolyl alcohol 45-S-10. 32 Coast Guard Compatibility Classification: Alcohol. 33 Chemical Formula: $C_{15}H_{31}O(CH_2CH_2O)_8CH_2CH_2OH$ (with stearate). 34 IMCO United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid. 42 Color: Colorless. 43 Odor: Mild, pleasant.
5. HEALTH HAZARDS 51 Personal Protective Equipment: Plastic gloves, goggles. 52 Symptoms Following Exposure: Liquid causes eye irritation and de-fats the skin, causing irritation. 53 Treatment for Exposure: Flush eyes with water for at least 15 min. Wash skin with soap and water. Get medical attention. 54 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 55 Short-Term Inhalation Limits: Not pertinent. 56 Toxicity by Ingestion: Data not available. 57 Late Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: None. 59 Liquid or Solid Irritant Characteristics: Liquid causes eye irritation. Contact with skin may cause irritation. 510 Odor Threshold: Not pertinent.		

6. FIRE HAZARDS 61 Flash Point: 47° F (8° C). 62 Flammable Limits in Air: Not pertinent. 63 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires; alcohol foam and water for large fires. 64 Fire Extinguishing Agents Not to be Used: Not pertinent. 65 Special Hazards of Combustion Products: Not pertinent. 66 Behavior in Fire: Not pertinent. 67 Ignition Temperature: Data not available. 68 Electrical Hazards: Not pertinent. 69 Burning Rate: Data not available.		8. WATER POLLUTION 81 Aquatic Toxicity: Data not available. 82 Waterlow Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): Data not available. 84 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: No reaction. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Not pertinent. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1 BASF Wyandotte Corp. Industrial Chemicals Group Wyandotte, Mich. 48192 2 Jefferson Chemical Co. 4316 Richmond Ave. Houston, Texas 77052 3 Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-A) A P Q		10. SHIPPING INFORMATION 101 Grade or Purity: Usually 100%. 102 Storage Temperature: Ambient. 103 Inert Atmosphere: No requirement. 104 Venting: Open flame arresters.
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed. 122 NAS Hazard Rating for Bulk Water Transportation: Not listed. 123 NFPA Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid. 132 Molecular Weight: 444. 133 Boiling Point at 1 atm: 300° F (149° C). 134 Freezing Point: 59° F (15° C). 135 Critical Temperature: Not pertinent. 136 Critical Pressure: Not pertinent. 137 Specific Gravity: 0.812 at 15° C. 138 Liquid Surface Tension: Not pertinent. 139 Liquid-Water Interfacial Tension: Not pertinent. 1310 Vapor (Gas) Specific Gravity: Not pertinent. 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 1312 Latent Heat of Vaporization: Not pertinent. 1313 Heat of Combustion: 14,500 Btu/lb (6,580 kJ/kg). 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: 10,000 Btu/lb (4,540 kJ/kg). 1316 Heat of Polymerization: Not pertinent.
NOTES		

EOT

ETHOXYLATED TETRADECANOL

Common Synonyms Ethoxylated tetradecyl Alcohol Ethoxylated myristyl alcohol Tergitol nonoxol 45-S-10	Liquid Colorless to yellow Pleasant odor Mixes slowly with water. Freezing point is 59° F
Fire	Combustible
Exposure	LIQUID Irritating to skin Will burn eyes
Water Pollution	Effect of low concentrations in aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE See Response Methods Handbook (CG 446-4) Dispense and Lock	2. LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethoxylated myristyl alcohol Ethoxylated tetradecyl alcohol Puroxone 45 myristyl ether Puroxone ethyl tetradecyl ether Tergitol Nonoxol 45-S-10 3.2 Coast Guard Competibility Classification: A1 alcohol 3.3 Chemical Formula $C_{14}H_{30}OCH_2CH_2OCH_2CH_2OH$ n.m. (Trasvaper) (continued on page 4)	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild pleasant
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Plastic gloves, goggles 5.2 Symptoms Following Exposure: Liquid causes eye, nose and delicate skin irritation 5.3 Treatment for Exposure: Flush eyes with water for at least 15 min. Wash skin well with water. Get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: Liquid causes eye irritation. Contact with skin may irritate. 5.10 Oral Threshold: Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: 470° F (0°) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires; alcohol foam and water for large fires. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 BASF Wyandotte Corp. Industrial Chemicals Group Wyandotte, Mich. 48192 2 Jefferson Chemical Co. 4346 Richmond Ave. Houston, Texas 77052 3 Union Carbide Corp. Chemicals and Plastics Div. 270 Park Ave. New York, N.Y. 10017
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook (CG 446-3) A P Q	10 SHIPPING INFORMATION 10.1 Grades or Purity: Usually 100% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arresters)
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 244 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: -11.4 ± 0.2 ° C 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity (liquid at 15°C): 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas) Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: test $\Delta H = 11,000$ Btu/lb $\Delta H_{cal} = 240 \times 10^3$ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: test $\Delta H = 9$ Btu/lb $\Delta H_{cal} = 20 \times 10^3$ J/kg 13.16 Heat of Polymerization: Not pertinent
3. CHEMICAL DESIGNATIONS (Cont'd) 3.4 IMCO United Nations Numerical Designation: Not listed	

ETD

ETHOXYLATED TRIDECANOL

Common Synonyms: Ethoxylated tridecyl alcohol Tergitol acetate 3-A-6		Liquid	Colorless to yellow	Pleasant odor
Avoid contact with liquid. If liquid is on face, wash with soap and water. If liquid is on skin, wash with soap and water. If liquid is in eyes, flush with water for 15 minutes. If liquid is in mouth, spit out and wash mouth with water.				
Fire		Combustible Extinguish with water. Do not use carbon dioxide. Extinguish with foam.		
Exposure		CALL FOR MEDICAL AID LIQUID Irritating to skin Will burn eyes Harmful if swallowed If swallowed, do not induce vomiting. Drink water. If inhaled, move to fresh air. If severe, seek medical attention. If swallowed, do not induce vomiting. Drink water.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not recommended for use in water.		
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-1. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethoxylated tridecyl alcohol Polyoxyethyl tridecyl ether Tergitol 3-A-6 Nonox 3.2 Coast Guard Competitibility Classification: Alcohol 3.3 Chemical Formula: $C_{13}H_{27}O(CH_2CH_2O)_n$ n = average 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild, pleasant		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Plastic gloves, goggles. 5.2 Symptoms Following Exposure: Liquid causes eye irritation and dermatitis, causing irritation. 5.3 Treatment for Exposure: In case of contact with eyes, immediately flush with plenty of water for at least 15 minutes. Get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion (Grade 2 LD50): Not pertinent. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: None. 5.9 Liquid or Solid Irritant Characteristics: Liquid causes eye irritation. Contact with skin may cause irritation. 5.10 Odor Threshold: Not pertinent.				

6. FIRE HAZARDS 6.1 Flash Point: 188°F (87°C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires; alcohol foam and water for large fires 6.4 Fire Extinguishing Agents Not to be Used: Data not available 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Not pertinent 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. BASF Wyandotte Corp. Industrial Chemicals Group Wyandotte, Mich. 48192 2. Jefferson Chemical Co. 3316 Richmond Ave. Houston, Texas 77052 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017	
11. HAZARD ASSESSMENT CODE See Hazard Assessment Map (CG 444-2) A P Q		10. SHIPPING INFORMATION 10.1 Grades or Purities: Usual 100% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arresters	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NFPA Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 404 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Data not available 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.81 at 15°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 10,000 Btu/lb (3,000 kcal/kg) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 10,000 Btu/lb (3,000 kcal/kg) 13.16 Heat of Polymerization: Not pertinent	
NOTES			

ETG

ETHOXY TRIGLYCOL

Common Synonyms: Ethoxystyrenyl glycol Triethyleneglycol monomethyl ether		Liquid Colorless Odorless
Sinks and mixes with water		
No discharge if possible Call fire department Isolate and remove discharged material Notify local health and pollution control agencies		
Fire	Combustible Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water and foam may be ineffective in fire. Confined spaces: Ventilate with water.	
Exposure	Not harmful	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 666-4. Evacuate and flush		2. LABELS No hazard label required by United States Federal Regulation
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Diethylene Glycol Dimethyl Ether Triethylene Glycol Dimethyl Ether Triethylene Glycol Methyl Ether 3.2 Coast Guard Compatibility Classification: Green 3.3 Chemical Formula: <chem>CH3OCH2CH2OCH2CH2OCH2CH2OH</chem> 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Practically odorless, characteristic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety goggles and adequate protective clothing. 5.2 Symptoms Following Exposure: No appreciable hazard in ordinary handling or use. 5.3 Treatment for Exposure: Wash affected parts with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade I LD ₅₀ swallowing agents. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Not pertinent.		

6 FIRE HAZARDS

6.1 **Flash Point:** 225 F (100 C)
 6.2 **Flammable Limits in Air:** Not pertinent.
 6.3 **Fire Extinguishing Agents:** Dry chemical, carbon dioxide, or alcohol foam.
 6.4 **Fire Extinguishing Agents Not to be Used:** Water, or any material which is not effective.
 6.5 **Spills: Hazards of Combustion Products:** Not pertinent.
 6.6 **Behavior in Fire:** Not pertinent.
 6.7 **Ignition Temperature:** Data not available.
 6.8 **Electrical Hazard:** Not pertinent.
 6.9 **Burning Rate:** Data not available.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.
 7.2 **Reactivity with Common Materials:** No reaction.
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
 7.5 **Polymerization:** Not pertinent.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.
 8.2 **Waterfowl Toxicity:** Data not available.
 8.3 **Biological Oxygen Demand (BOD):** Data not available.
 8.4 **Food Chain Concentration Potential:** None.

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
Midland Main Road
2. Olin Corp.
Chemical Division
20 Long Ridge Rd.
Stamford, Conn. 06904
3. Union Carbide Corp.
Chemical and Plastics Division
270 Park Ave.
New York, N. Y. 10017

10 SHIPPING INFORMATION

10.1 **Grade or Purity:** Data not available.
 10.2 **Storage Temperature:** Ambient.
 10.3 **Inert Atmosphere:** Not recommended.
 10.4 **Venting:** Open flame or spark.

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 666-5.

A P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed.
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	0
Aquatic Toxicity	0
Airborne Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self-Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid.
 13.2 **Molecular Weight:** 188.
 13.3 **Boiling Point at 1 atm:** 265 F (130 C) (NTP).
 13.4 **Freezing Point:** -12 F (10 C) (NTP).
 13.5 **Critical Temperature:** Not pertinent.
 13.6 **Critical Pressure:** Not pertinent.
 13.7 **Specific Gravity:** 1.26 at 15°C (60 F).
 13.8 **Liquid Surface Tension:** Not pertinent.
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.00.
 13.12 **Latent Heat of Vaporization:** 10.5 Btu/lb (23.5 kcal/kg) (NTP).
 13.13 **Heat of Combustion:** 10.5 Btu/lb (23.5 kcal/kg) (NTP).
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** Not pertinent.
 13.16 **Heat of Polymerization:** Not pertinent.

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NOTES

ETA

ETHYL ACETATE

Common Synonyms: Acetic acid ethyl ester Acetic ester Vinegar naptha		Waters: liquid Colorless Pleasant, fruity odor Floats on water. Flammable; irritating vapor is produced.
Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.	
Exposure	VAPOR: Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, nausea or loss of consciousness. LIQUID: Irritating to skin and eyes. Harmful if swallowed.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.	
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41. Toxic warning: High flammable. Environmental: Dispense and flush.		2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetic acid ethyl ester Acetic ester Vinegar ester Ethyl acetate 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: CH ₃ COOCH ₂ CH ₃ 3.4 IMCO United Nations Numerical Designation: 1.2		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pleasant, fruity
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor cartridge, maximum exposure in unshielded. 5.2 Symptoms Following Exposure: Headache, irritation of respiratory passages and eyes, dizziness, and nausea, weakness, loss of consciousness. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air. Give artificial respiration if breathing is difficult. If necessary, administer oxygen. INGESTION: Flush with water. Do not induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm 5.5 Short-Term Inhalation Limits: 1000 ppm - 15 min 5.6 Toxicity by Ingestion: Toxic (LD ₅₀ 1.1 g/kg) 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irrit and Characteristics: Vapor is irritating to the eyes, nose and throat. It is also a skin irritant at high concentrations. The liquid is non-irritating. 5.9 Liquid or Solid Irritant Characteristics: Very mildly irrit. If ingested will cause nausea and vomiting. It may also cause mouth and reddening of the skin. 5.10 Odor Threshold: 100 ppm		

6 FIRE HAZARDS 6.1 Flash Point: 24 F (4.4 C) 6.2 Flammable Limits in Air: 2.2 - 11.7% 6.3 Fire Extinguishing Agents: Any, but foam or carbon dioxide is dry chemical 6.4 Fire Extinguishing Agents Not to be Used: None permitted 6.5 Special Hazards of Combustion Products: None permitted 6.6 Behavior in Fire: None known 6.7 Ignition Temperature: 490 F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: None known	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 1.0 mg/l (1 day) 8.4 Food Chain Concentration Potential: None																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: None known 7.2 Reactivity with Common Materials: None known 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: None permitted 7.5 Polymerization: None permitted 7.6 Inhibitor of Polymerization: None permitted	9 SELECTED MANUFACTURERS 1 Eastman Kodak Co. Tennesset Eastman Chemicals Kingsport, Tenn. 37602 2 Monsanto Co. Monsanto Industrial Chemicals 800 North Lindbergh Blvd. St. Louis, Mo. 63166 Union Carbide Corp. Chemical and Plastics Div. 270 Park Ave. New York, N.Y. 10017																																				
	10 SHIPPING INFORMATION 10.1 Grades or Purities: 99.5% min. 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: If open flame atmosphere, provide ventilation																																				
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A P O	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 88 13.3 Boiling Point at 1 atm: 77.1 F (25.6 C) 13.4 Freezing Point: -112 F (-80 C) 13.5 Critical Temperature: 242 F (122 C) 13.6 Critical Pressure: 55.8 psia (3.93 atm) 13.7 Specific Gravity: 0.902 (20 C) 13.8 Liquid Surface Tension: 22.5 dyne/cm (20 C) 13.9 Liquid-Water Interfacial Tension: 6.79 dyne/cm = 0.00679 N/m at 30°C 13.10 Vapor (Gas) Specific Gravity: 3.0 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0 13.12 Latent Heat of Vaporization: 10.8 Btu/lb (200 cal/g) at 100 F (37.8 C) 13.13 Heat of Combustion: -11.8 Btu/lb (22.2 cal/g) at 100 F (37.8 C) 13.14 Heat of Decomposition: None permitted 13.15 Heat of Solution: None permitted 13.16 Heat of Polymerization: None permitted																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 HAS Hazard Rating for Bulk Water Transportation:<table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>1</td></tr><tr><td>Reactivity</td><td>1</td></tr><tr><td>Vapor Pressure</td><td>1</td></tr><tr><td>Liquid or Solid Surface</td><td>1</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td>1</td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>2</td></tr><tr><td>Acute Toxicity</td><td>2</td></tr><tr><td>Reactivity</td><td>1</td></tr><tr><td>Other Chemical</td><td>1</td></tr><tr><td>Water</td><td>1</td></tr><tr><td>Self-Reaction</td><td>1</td></tr></table> 12.3 NFPA Hazard Classifications:<table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>1</td></tr></table>	Category	Rating	Fire	1	Reactivity	1	Vapor Pressure	1	Liquid or Solid Surface	1	Poisons	1	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	2	Acute Toxicity	2	Reactivity	1	Other Chemical	1	Water	1	Self-Reaction	1	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	1	
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Flammability (Red)	2																																				
Reactivity (Yellow)	1																																				
NOTES																																					

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EAA

ETHYL ACETOACETATE

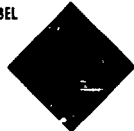
Common Synonyms Acetoacetic acid ethylester Acetoacetic ester Ethyl acetoacetate EAA		Liquid Mixes with water	Colorless Pleasant fruity odor
Stop discharge if possible. Keep people away. Call fire department. Evacuate and remove to isolated area. Notify local health and public utility commissions.			
Fire	Combustible Extinguish with foam, soda ash, dry chemical, carbon dioxide.		
Exposure	Liquid LIQUID Irritating to eyes. Harmful if swallowed. Irritates to skin. Irritates to skin with contact. IF IN EYES: Flush eyes with water for 15 minutes. IF SWALLOWED: Do not induce vomiting. Drink water.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and public utility commissions.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Evacuate and isolate water contamination. Decontaminate and flush.		2. LABELS No label required by U.S. Dept. of Federal Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetoacetic acid ethylester Acetoacetic ester, Diethyl ether Ethyl acetoacetate, EAA 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CH ₃ COCH ₂ COOCH ₂ CH ₃ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Acetoacetic, Fruity	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, gloves, shield, other proper. 5.2 Symptoms Following Exposure: Liquid may cause mild irritation to eyes. 5.3 Treatment for Exposure: Flush with water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, No ED ₀₁ , 3.5 g/kg acute LD ₅₀ . 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.			

6 FIRE HAZARDS 6.1 Flash Point: 110°F (43°C) (TSCA) 6.2 Flammable Limits in Air: 4.5-11.5% 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, water (not recommended). 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not listed. 6.8 Electrical Hazards: Data not available. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: Not pertinent.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive. 7.2 Reactivity with Common Materials: Not reactive. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Bases: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS Eastman Chemical Products, Inc. Kingsport, Tenn. 37602 Eastman 2200 Ridge Dr. Kingsport, Tenn. 37602 Aldrich Chemical Co. 540 West St., P.O. Box 168 Milwaukee, Wis. 53233								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3 A P G	10 SHIPPING INFORMATION 10.1 Grades or Purities: Not pertinent. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirements. 10.4 Venting: Open during transport.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table data-bbox="966 1444 1209 1530"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>1</td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 100 13.3 Boiling Point at 1 atm: 102°F (39°C) 13.4 Freezing Point: -112°F (-80°C) 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.875 at 20°C (liquid) 13.8 Liquid Surface Tension: 27.5 dynes/cm at 20°C (liquid) 13.9 Liquid-Water Interfacial Tension: 15.5 dynes/cm at 20°C (liquid) 13.10 Vapor (Gas) Specific Gravity: 4.45 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 60 Btu/lb (146 kJ/kg) at 100°F (38°C) 13.13 Heat of Combustion: -14,428 Btu/lb (34,100 kJ/kg) at 100°F (38°C) 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	2								
Reactivity (Yellow)	1								
NOTES									

(continued on page 7 and 8)

EAL

ETHYL ALCOHOL

Common Synonyms Ethanol Alcohol Grain alcohol Denatured alcohol		Watery liquid	Colorless	Alcohol odor
Floats and mixes with water. Flammable irritating vapor is produced.				
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water, pressure, knockdown vapor to dilute and remove the largest material. Notify local health and pollution control agencies.				
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alkali, foam or carbon dioxide. Water may be ineffective in some cases. Do not expose containers with water.			
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. Slightly irritating to skin. LIQUID Not harmful.			
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify appropriate authorities for release.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 445.4) Issue warning - high flammability. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Alcohol Fermentation alcohol Cologne spirit Grain alcohol Denatured alcohol Spirit Ethanol Spirits of wine 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: C ₂ H ₅ OH 3.4 IMCO/United Nations Numerical Designation: 1.2/1170		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild, rather pleasant, like wine or whiskey. (Denatured alcohol may be unpleasant.)		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: All purpose canister safety goggles. Avoid contact with liquid and inhalation of vapors. 5.2 Symptoms Following Exposure: Irritation of eyes, nose and throat. Headache and dizziness may occur. Liquid causes intoxication. 5.3 Treatment for Exposure: INHALATION: If breathing is affected, remove victim to fresh air, call physician, administer oxygen. Speed is of primary importance. EYES OR SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1000 ppm 5.5 Short-Term Inhalation Limits: 9000 ppm for 15 min 5.6 Toxicity by Ingestion: Grade I LD ₅₀ is 15 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: 10 ppm				

6 FIRE HAZARDS 6.1 Flash Point: 55°F (13°C) 64°F (18°C) 6.2 Flammable Limits in Air: 3.3% - 19% 6.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical, water spray, alcohol foam 6.4 Fire Extinguishing Agents Not to be Used: None 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 689°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 3.9 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: 250 ppm/6 hr. goldenfish lethal fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 12% 5 days, 44.2% (theoretical) 5 days, 71.2% (theoretical) 20 days 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Commercial Solvents Corp. 245 Park Ave. New York, N.Y. 10017 2. National Distillers and Chemical Corp. U.S. Industrial Chemicals Co. Division Tuscola Ill. 61953 3. Publiker Industries, Inc. 1429 Walnut St. Philadelphia, Pa. 19102																																				
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Anhydrous (200 proof), 190 proof, specially denatured, completely denatured 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester) or pressure vacuum																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 445.3) A P Q R S	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 46.07 13.3 Boiling Point at 1 atm: 172.9°F = 78.3°C = 351.5°K 13.4 Freezing Point: -173°F = -114°C = 159°K 13.5 Critical Temperature: 469.6°F = 243.1°C = 516.3°K 13.6 Critical Pressure: 926 psia = 63.0 atm = 6.38 MN/m² 13.7 Specific Gravity: 0.790 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.6 13.11 Ratio of Specific Heats of Vapor (Gas): 1.12 13.12 Latent Heat of Vaporization: 309 Btu/lb = 200 cal/g = 8.37 × 10³ J/kg 13.13 Heat of Combustion: -11,570 Btu/lb = -6425 cal/g = -268 × 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -99 Btu/lb = -554 cal/g = -2.3 × 10³ J/kg 13.16 Heat of Polymerization: Not pertinent																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation <table> <tr> <th>Category</th><th>Rating</th></tr> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>0</td></tr> <tr> <td>Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>1</td></tr> <tr> <td>Aquatic Toxicity</td><td>1</td></tr> <tr> <td>Aesthetic Effect</td><td>1</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </table> 12.3 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>0</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	0	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	3	Reactivity (Yellow)	0	Continued on pages 4 and 6 NOTES
Category	Rating																																				
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Flammability (Red)	3																																				
Reactivity (Yellow)	0																																				

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EAD

ETHYLALUMINUM DICHLORIDE

Common Synonyms EAD Aluminum ethyl dichloride	Liquid heated Colorless to light yellow IGNITES WHEN EXPOSED TO AIR Reacts violently with water Poisonous gas is produced on contact with water. Freezing point is 90°F.
Call fire department Wear goggles and self-contained breathing apparatus Stop discharges if possible. Keep people away Isolate and remove discharged material Notify local health and pollution control agencies	
Fire	IGNITES WHEN EXPOSED TO AIR Irritating gases are produced when heated Extinguish with dry graphite, soda ash, or other inert powder DO NOT USE WATER TO AM CARBON DIOXIDE, DRY CHEMICAL OR VAPORIZING LIQUID ON FIRE DO NOT USE WATER ON ADJACENT FIRES
 Exposure	CALL FOR MEDICAL AID GAS PRODUCED IN REACTION WITH WATER *POISONOUS IF INHALED* Irritating to eyes, nose and throat Move to fresh air If breathing has stopped, give artificial respiration If breathing is difficult, give oxygen LIQUID (HEATED) Will burn skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water If IN EYES, hold eyelids open and flush with plenty of water If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445-4) Issue warning: high flammability Confine Restrict access Evaluate area	2. LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Aluminum ethyl dichloride EAD 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₂ H ₄ AlCl ₂ 3.4 IMCO/United Nations Numerical Designation: 4.2 1924	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light amber, yellow 4.3 Odor: Not pertinent
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Full protective clothing, preferably of aluminized glass cloth goggles, face shield, gloves, in case of fire, all purpose canister or self-contained breathing apparatus 5.2 Symptoms Following Exposure: Inhalation of smoke from fire causes metal fume fever (flu like symptoms); acid fumes irritate nose and throat. Contact with liquid (which is spontaneously flammable) causes severe burns of eyes and skin 5.3 Treatment for Exposure: INHALATION: only fumes from fire need be considered; metal fume fever is not critical and lasts less than 36 hrs.; irritation of nose and throat by acid vapors may require treatment by a physician. EYES: flush gently with water for 15 min.; treat burns if fire occurred; get medical attention. SKIN: wash with water; treat burns caused by fire; get medical attention 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Metal fume fever may develop after breathing smoke from fire 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes 5.10 Odor Threshold: Not pertinent	

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (ignites spontaneously) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry chemical, inert dry powders such as sand, limestone 6.4 Fire Extinguishing Agents Not to be Used: Water, foam, halogenated agents or carbon dioxide 6.5 Special Hazards of Combustion Products: Intense smoke may cause metal fume fever. Irritating hydrogen chloride also formed 6.6 Behavior in Fire: Contact with water applied to adjacent fires will cause formation of irritating smoke containing aluminum oxide and hydrogen chloride 6.7 Ignition Temperature: Ignites spontaneously in air at ambient temperature 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently to form hydrogen chloride fumes and flammable ethane gas 7.2 Reactivity with Common Materials: Reacts with surface moisture to generate hydrogen chloride, which is corrosive to common metals 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Rinse with sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Ethyl Corporation Industrial Chemicals Division Ethyl Tower 451 Florida Baton Rouge, La. 70801 2 Texas Alkyls Incorporated P. O. Box 600 Deer Park, Texas 77536 3 Ventron Corp. Alfa Products P. O. Box 159 Beverly, Mass. 01915								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) 1107	10. SHIPPING INFORMATION 10.1 Grades or Purity: Pure (total) 24% or less by weight if benzene, hexane or heptane. Solutions are not pyrophoric 10.2 Storage Temperature: 35-40°C 10.3 Inert Atmosphere: Inerted dry nitrogen at 5 psig 10.4 Venting: Safety relief with rupture disc								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>3</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>3</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	3	Reactivity (Yellow)	3	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 130.0 13.3 Boiling Point at 1 atm: 194°C = 367°K 13.4 Freezing Point: 90°F = 32°C = 305°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.227 at 35°C (liquids) 13.8 Liquid Surface Tension (test): 30 dynes/cm = 0.030 N/m at 35°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion (test): 5,600 Btu/lb = 3,100 cal/g = 130 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	3								
Flammability (Red)	3								
Reactivity (Yellow)	3								
NOTES (Continued on pages 5 and 6)									

EAS

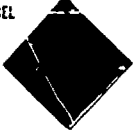
ETHYLALUMINUM SESQUICHLORIDE

Common Synonyms EASC	Liquid Colorless to yellow IGNITES WHEN EXPOSED TO AIR. Reacts violently with water. Poisonous and flammable gases are produced on contact with water.
Call fire department. Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves). Stop discharge if possible. Keep people away. Isolate to remove discharged material. Notify local health and pollution control agencies.	
Fire	IGNITES WHEN EXPOSED TO AIR. If in water, let fire burn. If not in water, extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER FOAM, CARBON DIOXIDE, DRY CHEMICALS, OR VAPORIZING LIQUIDS ON FIRE. DO NOT USE WATER ON ADJACENT FIRES.
Exposure	Call for medical aid. VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas as with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3) Issue warning: high flammability, corrosive. Restrict access. Evacuate area.	2. LABELS  
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: EASC 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $(C_2H_5)_3Al_2Cl_3$ 3.4 IMCO/United Nations Numerical Designation: 4.2 1925	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: yellow, colorless 4.3 Odor: Not pertinent
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Full protective clothing, preferably of aluminized glass cloth goggles, face shield, gloves. In case of fire, all-purpose canister or self-contained breathing apparatus. 5.2 Symptoms Following Exposure: Inhalation of smoke from fire causes metal fume fever (flu like symptoms); acid fumes irritate nose and throat. Contact with liquid, which is spontaneously flammable, causes severe burns of eyes and skin. 5.3 Treatment for Exposure: INHALATION: Only fumes from fire need be considered; metal fume fever is not critical and lasts less than 36 hr.; irritation of nose and throat by acid vapors may require treatment by a physician. EYES: Flush gently with water for 15 min. Treat burns if fire occurred; get medical attention. SKIN: Wash with water; treat burns caused by fire; get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Metal fume fever may develop after breathing smoke from fire. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Not pertinent.	

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (ignites spontaneously). 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Dry chemical, inert dry powders such as sand or limestone. 6.4 Fire Extinguishing Agents Not to be Used: Water, foam, halogenated agents, or carbon dioxide. 6.5 Special Hazards of Combustion Products: Intense smoke may cause metal fume fever. Irritating hydrogen chloride also formed. 6.6 Behavior in Fire: Contact with water from adjacent fires will cause formation of irritating smoke containing aluminum oxide and hydrogen chloride. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently to form hydrogen chloride fumes and flammable ethane gas. 7.2 Reactivity with Common Materials: Reacts with surface moisture to generate hydrogen chloride, which is corrosive to common metals. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Rinse with sodium bicarbonate or lime solution. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1 Ethel Corporation Industrial Chemicals Division Ethel Tower 451 Florida Baton Rouge, La. 70801 2 Texas Alkyls Incorporated P.O. Box 600 Deer Park, Texas 77566 3 Ventron Corp. Alfa Products P.O. Box 159 Beverly, Mass. 01915								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) VOZ	10. SHIPPING INFORMATION 10.1 Grades or Purity: Pure (neat) 25% less by weight in benzene, hexane, or heptane. Solutions are nonpyrophoric. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Inerted dry nitrogen at 5 psig. 10.4 Venting: Safety relief with rupture disc.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transport: Not listed. 12.3 NFPA Hazard Classifications <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>4</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	4	Flammability (Red)	3	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 247.5. 13.3 Boiling Point at 1 atm: 109.1 = 204 °C = 400 °F. 13.4 Freezing Point: -4.1 = -20 °C = 28 °F. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.02 at 25 °C (liquid). 13.8 Liquid Surface Tension: 32 dynes/cm = 0.032 N/m at 20 °C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: (est.) -8,693 Btu/lb = -48,000 cal/g = -200 × 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	4								
Flammability (Red)	3								
Reactivity (Yellow)	2								
NOTES (Continued on page 5 and 6)									

EAM

ETHYLAMINE

Common Synonyms Aminoethane Monoethylamine		Liquid Colorless Strong ammonia like odor
		Mixes with water. Boiling point is 62°F. Flammable, irritating vapor is produced.
Short- and long-term sources: Call fire department. Stop discharge if possible. Evacuate area and use of toxic substances. Stay down and use water spray to knock down vapors. Isolate and secure discharged material. Notify local health and pollution control agencies.		
Fire	FLAMMABLE Irritating gases are produced when heated. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol, foam, or carbon dioxide. Water may be ineffective or cause a violent reaction if exposed containers with water.	
Exposure	Call for medical aid. VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. May be irritating to fresh air. Breathing is difficult if inhaled. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open. Flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Drink water or milk.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and water pollution officials if it enters nearby water intakes.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability Air contaminant: water contaminant Restrict access Evacuate area Disperse and flush		2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Aminoethane Monoethylamine 3.2 Coast Guard Compatibility Classification: Amines (4) 3.3 Chemical Formula: C ₂ H ₅ NH ₂ 3.4 IMCO/United Nations Numerical Designation: 2.1046		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent, strong ammoniacal
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Amine type or ammonia type mask, plastic gloves, face shield and goggles. 5.2 Symptoms Following Exposure: Inhalation causes irritation of respiratory tract and lungs; pulmonary edema may result. Liquid causes severe irritation and burns of eyes and skin and can permanently injure eyes after 1 second's contact. Ingestion causes severe burns of mouth and stomach; can be fatal. 5.3 Treatment for Exposure: Get prompt medical attention for anyone overcome or injured by exposure to this compound. INHALATION: remove victim to fresh air; keep him warm and administer oxygen until medical help arrives. EYES: wash for 15 min. with water; avoid pressure on eyelids. SKIN: wash with soap and water; do not use ointments for at least 24 hrs.; do not cover burned area with dry clothing; keep moist with physiological saline solution. INGESTION: if victim is conscious, give large amount of water; then induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 5.5 Short-Term Inhalation Limits: 2 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3 oral LD ₅₀ = 400 mg/kg (rats) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 5.9 Liquid or Solid Irritant Characteristics: Causes smothering of the skin and first degree burns on short exposure and may cause second degree burns on long exposure. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS

- 6.1 Flash Point: 0°F (0°C)
 6.2 Flammable Limits in Air: 3.5% - 14%
 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide
 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.
 6.5 Special Hazards of Combustion Products: Irritating and toxic oxides of nitrogen may be formed.
 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Containers may explode when heated.
 6.7 Ignition Temperature: 724°F
 6.8 Electrical Hazard: Data not available
 6.9 Burning Rate: 50 mm/min

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: 40 ppm, 24 hr. shub. 11 m. fresh water
 8.2 Waterfowl Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD): Data not available
 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1. Virginia Chemicals Inc.
 3340 West Norfolk Road
 Portsmouth Va. 23703
 2. Pennwalt Corporation
 Three Parkway
 Philadelphia Pa. 19102
 3. Union Carbide Corporation
 Chemicals and Plastics Division
 270 Park Avenue
 New York, N.Y. 10017

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Anhydrous (98.5+%) 50 - 72% in water
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A B C D E F M N

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable liquid
 12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Fire | 4 |
| Health | |
| Vapor Irritant | 3 |
| Liquid or Solid Irritant | 2 |
| Poisons | 3 |
| Water Pollution | |
| Human Toxicity | 3 |
| Aquatic Toxicity | 3 |
| Aesthetic Effect | 3 |
| Reactivity | |
| Other Chemicals | 2 |
| Water | 3 |
| Self Reaction | 0 |
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 3 |
| Flammability (Red) | 3 |
| Reactivity (Yellow) | 0 |

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 45.1
 13.3 Boiling Point at 1 atm: 61.7°F = 16.5°C = 289°K
 13.4 Freezing Point: -114°F = -81°C = 192°K
 13.5 Critical Temperature: 361°F = 183°C = 456°K
 13.6 Critical Pressure: 82.7 psia = 5.62 atm = 5.70 MPa (m)
 13.7 Specific Gravity: 0.687 at 15°C (liquid)
 13.8 Liquid Surface Tension: 20.5 dynes/cm = 0.0205 N/m at 15°C
 13.9 Liquid-Water Interfacial Tension: Not pertinent
 13.10 Vapor (Gas) Specific Gravity: 1.5
 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1181
 13.12 Latent Heat of Vaporization: 253 Btu/lb = 146 cal/g = 6.11 x 10⁵ J/kg
 13.13 Heat of Combustion: -16,160 Btu/lb = -8,990 cal/g = -3.76 x 10⁷ J/kg
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Data not available
 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

NOTES

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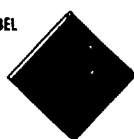
EBT	ETHYL BUTANOL
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EBT	ETHYL BUTANOL
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Common Synonyms Pseudoethyl alcohol sec-Pentyl carbinol	Liquid Floats on water	Colorless	Mild alcohol odor
Stop discharge if possible Call fire department Avoid contact with liquid Isolate and remove discharged material Notify local health and pollution control agencies			
Fire	Combustible Extinguish with dry chemical foam or carbon dioxide Cool exposed containers with water		
Exposure	CALL FOR MEDICAL AID LIQUID Will burn eyes Harmful if swallowed IF IN EYES: hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk		
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445-4) Disperse and flush		2 LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2 Ethyl 1 butanol 2 Ethylbutyl alcohol sec. Hexylalcohol sec. Pentylalcohol Pseudoethyl alcohol 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: (C ₄ H ₉) ₂ CHOH 3.4 IMCO United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild and nonresidual	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Fresh air mask, plastic gloves, cover all goggles, safety shower and eye bath 5.2 Symptoms Following Exposure: Liquid causes eye burns. Vapors may be mildly irritating to nose and throat 5.3 Treatment for Exposure: Remove to fresh air. Remove contaminated clothing. Wash affected skin areas with water. Flush eyes with water for at least 15 min. and get medical care 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 6.5 g/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary 5.9 Liquid or Solid Irritant Characteristics: Irritates eyes, moderate irritation of skin 5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS 61 Flash Point: 128°F (4°C) 62 Flammable Limits in Air: 1.9% - 8.0% 63 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires; alcohol foam for large fires 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: 700°F (calc.) 68 Electrical Hazard: Data not available 69 Burning Rate: Data not available	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017								
11 HAZARD ASSESSMENT CODE SEE HAZARD ASSESSMENT MANUAL, CLOUDES, 3 A 1-1	10 SHIPPING INFORMATION 101 Grades or Purity: Data not available 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open (flame arrester) or pressure vacuum								
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Combustible Liquid 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 60%;">Category</th> <th style="text-align: left; width: 40%;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: 1 - solid 132 Molecular Weight: 102.17 133 Boiling Point at 1 atm: 293°F = 146°C = 419°K 134 Freezing Point: -173°F = -114°C = 159°K 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 0.834 at 20°C (liquid) 138 Liquid Surface Tension: 24 dyne/cm = 0.0243 N/m at 25°C 139 Liquid-Water Interfacial Tension: (est.) 40 dyne/cm = 0.04 N/m at 20°C 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: 136.0 Btu/lb = 105.9 kJ/kg = 3.559 × 10³ J/kg 1313 Heat of Combustion: (est.) -16,600 Btu/lb = -9,200 cal/g = -38.7 × 10³ J/kg 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	2								
Reactivity (Yellow)	0								

ETHYL BUTYRATE

Common Synonyms Ethyl butanoate Butyric acid ethyl ester Butyric ether		Liquid	Colorless	Fruity odor
		Floats on water		
Shut off ignition sources. Call fire department at Avoid contact with liquid and vapor. Keep people away. Stop discharge if possible. Stay upwind. Use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	FLAMMABLE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Extinguish with dry chemical, alcohol foam, or carbon dioxide Water may be ineffective on fire Cool exposed containers with water			
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled will cause headache or dizziness If eyes closed, hold eyelids open and flush with plenty of water If breathing has stopped, give artificial respiration If breathing is difficult, give oxygen LIQUID Irritating to skin and eyes If swallowed will cause nausea, vomiting, dizziness or headache Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES: Hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS: Have victim drink water or milk and have victim induce vomiting IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: Do nothing except keep victim warm			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Spills (oil barrel) and wet like (drum) Spills operate as nearby water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-1) Issue warning - high flammability Restrict access Mechanical containment Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Butyric acid ethyl ester Butyric ether Ethyl butanoate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: CH ₃ CH ₂ CH ₂ COOC ₂ H ₅ 3.4 IMCO/United Nations Numerical Designation: 1.1.1.1.1.0		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like apple or pineapple		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: All purpose canister mask or chemical cartridge respirator, glasses or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation or ingestion causes headache, dizziness, nausea, vomiting, and narcosis. Contact with liquid irritates eyes. 5.3 Treatment for Exposure: INHALATION: move victim to fresh air and call a physician, give artificial respiration if necessary. INGESTION: induce vomiting and call a physician. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1, oral LD ₅₀ = 13 g/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: 0.015 ppm				

6. FIRE HAZARDS 6.1 Flash Point: 88°F (31°C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode in fire. 6.7 Ignition Temperature: 465°F 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 4.72 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: May attack some forms of plastics. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Ertzschke Dodge and Olcott Inc. 76 Ninth Avenue New York, N.Y. 10011 2. Northwestern Chemical Co. 120 N. Aurora St. West Chicago, Ill. 60185 3. Aldrich Chemical Co. 941 W. Saint Paul Ave. Milwaukee, Wis. 53233								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) A-T-L	10. SHIPPING INFORMATION 10.1 Grades or Purities: Commercial 95+%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arrester).								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>0</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 116.16. 13.3 Boiling Point at 1 atm: 140°F = 121°C = 394°K. 13.4 Freezing Point: -135°F = -93°C = 180°K. 13.5 Critical Temperature: 449°F = 231°C = 506°K. 13.6 Critical Pressure: 460 psia = 31 atm = 3.2 MN/m. 13.7 Specific Gravity: 0.879 at 20°C (liquid). 13.8 Liquid Surface Tension: 24.5 dynes/cm = 0.0245 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: 4.0. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 124 Btu/lb = 71 cal/g = 3.0 x 10 ⁵ J/kg. 13.13 Heat of Combustion: -13,200 Btu/lb = -7340 cal/g = -306 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	3								
Reactivity (Yellow)	0								
NOTES (Continued on pages 7 and 8)									

ECL

ETHYL CHLORIDE

Common Synonyms Chloroethane Ether hydrochloric		Liquid	Colorless	Pleasant odor
Floats and may boil on water. Flammable. Irritating vapor is produced. Boiling point is 54° F.				
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid. Stay up wind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Stop flow of gas or liquid if possible. Cool exposed containers and men efforts using shut-off with water. Let fire burn.			
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Will cause frostbite. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. DO NOT RUB AFFECTED AREAS.			
Water Pollution	Not harmful to aquatic life. May be dangerous if it enters water intakes. Notify operators of nearby water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1.) Issue warning: high flammability. Restrict access. Evaluate area.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Chloroethane Monochloroethane 3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon 3.3 Chemical Formula: C ₂ H ₅ Cl 3.4 IMCO/United Nations Numerical Designation: 2.0 101		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Ethereal, pungent, ethereal ether like		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Non-enc rubber clothing where liquid contact is likely; chemical worker's goggles. RESPIRATORY PROTECTION: for 1000 ppm to 25 for 1-2 hr or less; full face mask and organic vapor canister for greater levels; self-contained breathing apparatus or equivalent. 5.2 Symptoms Following Exposure: Vapor causes drunkenness, anesthesia, possible lung injury. Liquid may cause frostbite on eyes and skin. 5.3 Treatment for Exposure: INHALATION: get person to fresh air; keep warm and quiet; get medical attention. SKIN: treat frostbite. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1000 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Not pertinent. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS

- 6.1 Flash Point: -58°F (-50°C)
 6.2 Flammable Limits in Air: 3.6% - 12%
 6.3 Fire Extinguishing Agents: Water fog, carbon dioxide, dry chemical. For large fires it is best to allow material to burn while cooling surrounding equipment. Stop flow of ethyl chloride.
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent.
 6.5 Special Hazards of Combustion Products: Toxic and irritating gases are generated in fires.
 6.6 Behavior in Fire: Containers may explode.
 6.7 Ignition Temperature: 966°F
 6.8 Electrical Hazard: Not pertinent.
 6.9 Burning Rate: 3.8 mm/min

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
 7.2 Reactivity with Common Materials: No reaction.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
 8.2 Waterlow Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): Data not available.
 8.4 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

1. Ethyl Corp.
 Industrial Chemicals Division
 451 Florida
 Baton Rouge, La. 70801
 2. PPG Industries Inc.
 Industrial Chemical Division
 Lake Charles, La. 70601

10. SHIPPING INFORMATION

- 10.1 Grades or Purity:
 Technical 98% - 100%
 USP 100%
 10.2 Storage Temperature: Ambient.
 10.3 Inert Atmosphere: No requirement.
 10.4 Venting: Safety relief.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3.)
 A BC-DE FG

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable liquid.
 12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Fire | 4 |
| Health | |
| Vapor Irritant | 1 |
| Liquid or Solid Irritant | 1 |
| Poisons | 1 |
| Water Pollution | |
| Human Toxicity | 0 |
| Aquatic Toxicity | 1 |
| Aesthetic Effect | 1 |
| Reactivity | |
| Other Chemical | 1 |
| Water | 0 |
| Self Reaction | 0 |
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 4 |
| Reactivity (Yellow) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm.: Liquid.
 13.2 Molecular Weight: 64.52
 13.3 Boiling Point at 1 atm.:
 -40°F = -22.2°C = -8.4°F
 13.4 Freezing Point:
 -133°F = -91.6°C = -127.7 K
 13.5 Critical Temperature:
 169°F = 77.2°C = 300.4°K
 13.6 Critical Pressure:
 758 psia = 51.6 atm = 5.21 MN/m²
 13.7 Specific Gravity: 0.906 at 12.2°C (liquid)
 13.8 Liquid Surface Tension:
 19.5 dynes/cm = 0.0195 N/m at 20°C
 13.9 Liquid-Water Interfacial Tension:
 18.1 dyne/cm = 0.0181 N/m at 0°C
 13.10 Vapor (Gas) Specific Gravity: 2.2
 13.11 Ratio of Specific Heats of Vapor (Gas):
 1.3
 13.12 Latent Heat of Vaporization:
 163 Btu/lb = 90 kcal/g = 179 X 10³ J/kg
 13.13 Heat of Combustion: -1100 Btu/lb
 = -4900 cal/g = -188.4 X 10³ J/kg
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: Not pertinent.

NOTES

ECHA

ETHYL CHLOROACETATE

Common Synonyms Chloroacetic acid ethyl ester Ethyl chloroacetate Ethyl chloroacetate Monochloroacetic acid ethyl ester Monochloroethanoic acid ethyl ester	Liquid	Colorless to light brown	Irritating or fruity odor								
AVOID CONTACT WITH EYES, SKIN AND CLOTHING. KEEP THEM AWAY FROM HEAT AND FLAMES. DO NOT BREATHE VAPORS. DO NOT GET ON SKIN OR CLOTHING. DO NOT GET IN EYES. DO NOT SWALLOW. DO NOT INHALE VAPORS.											
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Ethyl chloroacetate decomposes to form toxic and corrosive gases.										
 Exposure	CAUTION FOR MEDICAL AND VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, or nausea. May irritate the respiratory tract. Treatment: If inhaled, get fresh air. If on skin, wash with plenty of water. If swallowed, drink plenty of water. Do not induce vomiting. If in eyes, flush with plenty of water. LIQUID POISONOUS IF SWALLOWED Irritating to skin and eyes. Keep away from heat and flames. Do not breathe vapors. Do not get on skin or clothing. Do not get in eyes. Do not swallow. Do not inhale vapors. IF SWALLOWED DO NOT INDUCE VOMITING NOR PAIN-RELIEVING MEASURES.										
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not recommended for use in waterways. Not recommended for use in sewage treatment plants.										
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant. Should be removed. Chemical and physical treatment.		2. LABELS No label required by Code of Federal Regulations.									
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Chloroacetic acid, ethyl ester; Ethyl chloroacetate; Ethyl chloroethanoate; Monochloroacetic acid ethyl ester; Monochloroethanoic acid ethyl ester. 3.2 Coast Guard Competibility Classification: Not applicable. 3.3 Chemical Formula: C ₄ H ₇ ClO ₂ . 3.4 IMCO/United Nations Numerical Designation: 1111.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless, light straw to tan. 4.3 Odor: Extremely irritating, fruity pungent.									
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic canister mask, rubber gloves, chemical goggles. 5.2 Symptoms Following Exposure: Inhalation causes irritation of mucous membrane, headache and nausea. Contact with liquid causes extreme eye irritation and conjunctivitis, irritates skin if not removed at once. Ingestion causes irritation of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: remove patient to fresh air, get medical attention. EYES: flush with copious quantities of water for at least 15 min, get medical attention if irritation persists. SKIN: wash with soap and water. INGESTION: give large amounts of water and induce vomiting, get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 4 LD ₅₀ <50 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.											
6. FIRE HAZARDS 6.1 Flash Point: 129 F (50 C) (100 F CC). 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Water fog foam dry chemical carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Irritating toxic hydrogen chloride and phosgene may be generated in fires. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 2.4 mm/min.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Very slow, not hazardous. 7.2 Reactivity with Common Materials: Slow hydrolysis to acidic products will cause slow corrosion of common metals. No hazard involved. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Kvaerner Chemicals Inc., 360 Lexington Avenue, New York, N.Y. 10017. 2. Monsanto Company, Monsanto Industrial Chemicals, 500 North Lindbergh Boulevard, St. Louis, Mo. 63166. 3. Dow Chemical Co., Midland, Mich. 48640.									
11. HAZARD ASSESSMENT CODE (See HAZARD ASSESSMENT MANUAL, CG 446-3): XXX		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 122.6. 13.3 Boiling Point at 1 atm: 249 F = 121 C = 416°K. 13.4 Freezing Point: -15 F = -26 C = 247°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.15 at 20°C (liquids). 13.8 Liquid Surface Tension: (rest) 24 dynes/cm = 0.024 N/m at 20 C. 13.9 Liquid-Water Interfacial Tension: (rest) 24 dynes/cm = 0.024 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: 4.3. 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available. 13.12 Latent Heat of Vaporization: 188 Btu/lb = 428 cal/g = 1.68 X 10 ³ J/g. 13.13 Heat of Combustion: -17240 Btu/lb = -4028 cal/g = -168 X 10 ³ J/g. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>3</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	2	Reactivity (Yellow)	0	(Continued on pages 5 and 6)	
Category	Classification										
Health Hazard (Blue)	3										
Flammability (Red)	2										
Reactivity (Yellow)	0										

NOTES

ECF

ETHYL CHLOROFORMATE

Common Synonyms Chloroformic acid ethyl ester Ethyl chloroformate		Liquid Reacts slowly with water. Irritating vapor is produced.	Colorless to light yellow Irritating odor
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear goggles, self-contained breathing apparatus and rubber overboots including gaiters. Shut off ignition sources. Call fire department. Stop discharges if possible. For water areas, close off larger discharges. Stay upwind. Use water spray to knock down vapors. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gaiters). Extinguish with dry chemical or carbon dioxide. Cool exposed containers with water.		
	CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is conscious, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Exposure			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4.) Issue warning: corrosive, high Flammability: poison Restrict access Disperse and flush		2. LABELS  	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Chloroformic acid ethyl ester; Ethyl chloroformate 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₂ H ₃ ClO ₂ 3.4 IMCO/United Nations Numerical Designation: 12 1102		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Irritating, sharp, like hydrochloric acid	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air line mask, self-contained breathing apparatus or organics and acid gas mask; full protective clothing 5.2 Symptoms Following Exposure: Inhalation causes mucous membrane irritation, coughing and sneezing. Vapor causes severe lacrimation; liquid causes acid type burns of eyes and skin like those of hydrochloric acid. Ingestion causes severe burns of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: Remove to fresh air; use artificial respiration if breathing has stopped; call a doctor; keep victim quiet and administer oxygen if needed. EYES: Flush with water for at least 15 min.; see a doctor. SKIN: Wash liberally with water for at least 15 min.; then rinse; dilute solution of sodium bicarbonate or commercially prepared neutralizer. INGESTION: do NOT induce vomiting; give large amount of water; get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 oral LD ₅₀ : 50 mg/kg rats 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure and may cause second degree burns on long exposure. 5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS

6.1 **Flash Point:** 82 F (30 C) (E.C.)

6.2 **Flammable Limits in Air:** Data not available

6.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:**
Toxic chlorine and phosgene gases may be formed in fires

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** 932 F

6.8 **Electrical Hazard:** Data not available

6.9 **Burning Rate:** 2.6 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Slow reaction with water, evolving hydrogen chloride (hydrochloric acid)

7.2 **Reactivity with Common Materials:** Slow evolution of hydrogen chloride from surface moisture reaction can cause corrosion

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; rinse with sodium bicarbonate or lime solution

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available

8.2 **Waterlow Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** Data not available

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Storz Chemical Corporation
Ott Division
580 Ayard Road
Muskegon, Mich. 49445
2. Chemetron Corporation
Chemicals Group
693 Seventh Avenue
New York, N.Y. 10019
3. EMC Corporation
Industrial Chemical Division
633 Third Avenue
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purities:** Technical 94+

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446.3)
A XXX

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	4
Vapor - Irritant	4
Liquid or Solid Irritant	4
Poisons	4
Water Pollution	4
Human Toxicity	4
Aquatic Toxicity	4
Anesthetic Effect	4
Reactivity	2
Other Chemicals	2
Water	2
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	4
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 108.5

13.3 **Boiling Point at 1 atm:**
201 F = 94 C = 367 K

13.4 **Freezing Point:** -14 F = -10 C = 192 K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.135 at 20°C (liquids)

13.8 **Liquid Surface Tension:**
27.5 dynes/cm = 0.0275 N/m at 15°C

13.9 **Liquid-Water Interfacial Tension:**
Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** 4.7

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.1044

13.12 **Latent Heat of Vaporization (est.):**
140 Btu/lb = 79 cal/g = 3.3 X 10³ J/kg

13.13 **Heat of Combustion (est.):** -6,900 Btu/lb
= -3,900 cal/g = -160 X 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Data not available

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

ECS

ETHYLDICHLOROSILANE

Common Synonyms		Liquid	Colorless	Sharp, irritating odor
Reacts violently with water. Irritating gas is produced on contact with water.				
Shut off reaction sources. Call fire department. Avoid contact with liquid. Keep people away. Stop discharge if possible. Isolate and remove if charged materials. Notify local health and pollution control agencies.				
Fire	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear flameproof protective suit with self-contained breathing apparatus. DO NOT USE WATER OR FOAM ON FIRE.			
Exposure	Call for medical aid. VAPOR Irritating to eyes, nose and throat. May irritate lungs. If breathing is difficult, use oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove person immediately to fresh air and water. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED, do NOT induce vomiting. Have victim drink water or milk. DO NOT INDUCE VOMITING.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify appropriate local water intakes.			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41. Issue warning: high flammability and odor. Restrict access. Evaluate area. Disperse and flush with water.			2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $C_2H_5SiCl_2$ 3.4 IMCO/United Nations Numerical Designation: 12.11X1			4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Sharp, hydrochloric acid and acetic acid.	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Acid vapor type respirator, protective rubber gloves, chemical worker's goggles, other equipment as necessary to protect ears and eyes. 5.2 Symptoms Following Exposure: Inhalation irritates mucous membranes. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach. 5.3 Treatment for Exposure: Get medical attention following all exposures to this compound. INHALATION: remove to fresh air, give artificial respiration if required. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; give large amounts of water, followed by milk or milk of magnesia. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: (Grade 3) LD ₅₀ 500 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: See eye skin irritant. Causes severe and third degree burns on short contact and is very injurious to the eyes. 5.10 Ocor Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: 5-11°C 6.2 Flammable Limits in Air: 2.9% (LFL) 6.3 Fire Extinguishing Agents: Dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water foam 6.5 Special Hazards of Combustion Products: Toxic hydrogen chloride and phosgene gases may be formed 6.6 Behavior in Fire: Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires produces irritating hydrogen chloride fumes and flammable hydrogen gas 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: <2 mm/min		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																													
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously evolving hydrogen chloride (hydrochloric acid) 7.2 Reactivity with Common Materials: Reaction with surface moisture will generate hydrogen chloride which corrodes common metals 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flood with water, rinse with sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS Dow Corning Corporation P.O. Box 592 Midland, Mich. 48640																													
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) A O		10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum																													
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td>1</td></tr><tr><td>Vapor Irritant</td><td>4</td></tr><tr><td>Liquid or Solid Irritant</td><td>4</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td>1</td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>1</td></tr><tr><td>Reactivity</td><td>1</td></tr><tr><td>Reactive Chemicals</td><td>1</td></tr><tr><td>Acid</td><td>4</td></tr><tr><td>Self-Reaction</td><td>1</td></tr></table> 12.3 NFPA Hazard Classifications: Not listed		Category	Rating	Fire	1	Health	1	Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	1	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity	1	Reactive Chemicals	1	Acid	4	Self-Reaction	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 129.1 13.3 Boiling Point at 1 atm: 15.5°C = 59.9°F = 427°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.092 at 20°C (liquid) 13.8 Liquid Surface Tension: 21.7 dynes/cm = 0.0217 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 4.5 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available 13.12 Latent Heat of Vaporization: (est.) 104 Btu/lb = 47°K x 2.42 x 10 ³ J/kg 13.13 Heat of Condensation: (est.) 6.98 Btu/lb = 1.68 J/cal = 150 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent	
Category	Rating																														
Fire	1																														
Health	1																														
Vapor Irritant	4																														
Liquid or Solid Irritant	4																														
Poisons	1																														
Water Pollution	1																														
Human Toxicity	1																														
Aquatic Toxicity	1																														
Aesthetic Effect	1																														
Reactivity	1																														
Reactive Chemicals	1																														
Acid	4																														
Self-Reaction	1																														
(continued on page 1 and 2)																															
NOTES																															

ETL

ETHYLENE

Common Synonyms Ethene Defiant gas		Liquefied compressed gas Colorless Sweet odor Floats and boils on water. Flammable visible vapor cloud is produced.
Wear self-contained breathing apparatus. Avoid contact with eyes, nose, mouth, and skin. Avoid contact with clothing. Avoid contact with water. Avoid contact with food and drink. Avoid contact with children.		
Fire		FLAMMABLE Flashback along vapor trail may occur. May explode if ignited in an enclosed area. May cause fire if ignited in an enclosed area. May cause fire if ignited in an enclosed area. May cause fire if ignited in an enclosed area. May cause fire if ignited in an enclosed area.
Exposure		VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause headache, dizziness, or loss of consciousness. May cause fire if ignited in an enclosed area. May cause fire if ignited in an enclosed area. May cause fire if ignited in an enclosed area. May cause fire if ignited in an enclosed area. May cause fire if ignited in an enclosed area. LIQUID Will cause frostbite. If in contact with skin, will cause frostbite. DO NOT RUB AFFECTED AREA.
Water Pollution		Not harmful to aquatic life.
1. RESPONSE TO DISCHARGE See Response Methods Manual, CG 444-4. Evacuate area. High flammability. Report release. Evacuate area.		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethene Defiant gas 3.2 Coast Guard Competibility Classification: Other 3.3 Chemical Formula: C_2H_4 3.4 IMCO United Nations Numerical Designation: 2015 (compressed) 2015 (liquefied)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied 4.2 Color: Colorless 4.3 Odor: Sweet, and faintly ethereal.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: High pressure container. Use compressed gas. 5.2 Symptoms Following Exposure: Moderate concentration may cause dizziness, headache, and unconsciousness. The vapor is a severe irritant to the respiratory tract. 5.3 Treatment for Exposure: Remove victim to fresh air. If in contact with liquid, wash with water. If in contact with vapor, use self-contained breathing apparatus. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not permitted. 5.5 Short-Term Inhalation Limits: Not permitted. 5.6 Toxicity by Ingestion: Not permitted. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is not irritating to the eyes and skin. 5.9 Liquid or Solid Irritant Characteristics: Not irritating to the eyes and skin. 5.10 Odor Threshold: 100 ppm (100 mg/m ³).		

6. FIRE HAZARDS		8. WATER POLLUTION	
6.1 Flash Point: $-20^{\circ}C$ (suppression)		8.1 Aquatic Toxicity: 22 ppm (48 hr) in fish and fresh water	
6.2 Flammable Limits in Air: 2.5% - 36%		8.2 Waterfowl Toxicity: Data not available	
6.3 Fire Extinguishing Agents: Not possible. Use water to cool dry chemical water.		8.3 Biological Oxygen Demand (BOD): Data not available	
6.4 Fire Extinguishing Agents Not to be Used: Not permitted		8.4 Food Chain Concentration Potential: None	
6.5 Special Hazards of Combustion Products: Vapors are asphyxiants.			
6.6 Behavior in Fire: Container may explode			
6.7 Ignition Temperature: $420^{\circ}C$			
6.8 Electrical Hazard: Class I, Group 1			
6.9 Burning Rate: 74 mm/min			
7. CHEMICAL REACTIVITY		9. SELECTED MANUFACTURERS	
7.1 Reactivity with Water: No reaction		1. Exxon Chemical Co. Houston, Tex. 77001	
7.2 Reactivity with Common Materials: No reaction		2. Phillips Petroleum Co. Bartlesville, Okla. 74604	
7.3 Stability During Transport: Stable		3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017	
7.4 Neutralizing Agents for Acids and Caustics: Not permitted			
7.5 Polymerization: Not permitted			
7.6 Inhibitor of Polymerization: Not permitted			
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 444-7. ABC DEFG		10. SHIPPING INFORMATION	
		10.1 Grades or Purities: 99.99%	
		10.2 Storage Temperature: Ambient (gas) $-150^{\circ}C$ (liquid)	
		10.3 Inert Atmosphere: Not required	
		10.4 Venting: Safety relief	
12. HAZARD CLASSIFICATIONS		13. PHYSICAL AND CHEMICAL PROPERTIES	
12.1 Code of Federal Regulations: Flammable compressed gas		13.1 Physical State at $15^{\circ}C$ and 1 atm: Gas	
12.2 NAS Hazard Rating for Bulk Water Transportation:		13.2 Molecular Weight: 28.05	
		13.3 Boiling Point at 1 atm: $-84.7^{\circ}C$ ($-120.5^{\circ}F$)	
		13.4 Freezing Point: $-162.2^{\circ}C$ ($-260^{\circ}F$)	
		13.5 Critical Temperature: $32.8^{\circ}C$ ($91^{\circ}F$)	
		13.6 Critical Pressure: 742 psia (50.5 atm) ≈ 5.0 MPa	
		13.7 Specific Gravity: 0.89 at $-103.5^{\circ}C$ (liquid)	
		13.8 Liquid Surface Tension: 16.5 dynes/cm (0.016 N/m) at $-103.5^{\circ}C$	
		13.9 Liquid-Water Interfacial Tension: 16.5 dyne/cm (0.016 N/m) at $-103.5^{\circ}C$	
		13.10 Vapor (Gas) Specific Gravity: 1.25	
		13.11 Ratio of Specific Heats of Vapor (Gas): 1.24	
		13.12 Latent Heat of Vaporization: 207 Btu/lb (114 kJ/kg)	
		13.13 Heat of Combustion: 2028 Btu/lb (1127 kJ/kg)	
		13.14 Heat of Decomposition: Not permitted	
		13.15 Heat of Solution: Not permitted	
		13.16 Heat of Polymerization: Not permitted	
12.3 NFPA Hazard Classifications:			

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ECH

ETHYLENE CHLOROHYDRIN

Common Synonyms 2-Chloroethanol 2-Chloroethanol 2-Chloroethyl alcohol Ethylene chlorohydrin Glycol chlorohydrin	Physical State Liquid Color Colorless Odor Faint sweet pleasant odor Miscibility Mixes with water. Irritating vapor is produced.
First Aid No special first aid measures are required. May cause eye irritation. Flush with water. In case of ingestion, do not induce vomiting. No special first aid measures are required.	Fire Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Extinguish with water or other suitable agent.
Exposure VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. LIQUID Irritating to skin and eyes. Harmful if swallowed. DO NOT INHALE VAPOR.	Water Pollution Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Do not discharge into water bodies.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning: water contaminant. Restrict access. Dispose and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Chloroethanol 2-Chloroethanol 2-Chloroethyl alcohol Ethylene chlorohydrin Glycol chlorohydrin 3.2 Coast Guard Compatibility Classification: To be developed. 3.3 Chemical Formula: C ₂ H ₄ Cl ₂ OH 3.4 IMCO/United Nations Numerical Designation: 1.1, 1.2	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Faint, sweet
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor mask or self-contained breathing apparatus; goggles or face shield; rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes irritation of upper respiratory system; nausea; headache; dizziness; coma; collapse. Liquid causes irritation of eyes and skin; prolonged contact with skin may allow penetration into body and cause same symptoms as following ingestion or inhalation. Ingestion causes nausea; headache; dizziness; coma; and collapse. 5.3 Treatment for Exposure: INHALATION: Remove from exposure; give artificial respiration if breathing has stopped; call physician. EYES: Flush with water for at least 15 min.; get medical attention if irritation persists. SKIN: Wash off with copious amounts of water; call physician if irritation has been prolonged. INGESTION: Give large amounts of water; get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): None. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3 oral LD ₅₀ (mg/kg body wt). 5.7 Late Toxicity: Damage to central nervous system and liver in humans. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: (None)	

6. FIRE HAZARDS 6.1 Flash Point: 100°F (38°C) 6.2 Flammable Limits in Air: 4.9% - 15.9% 6.3 Fire Extinguishing Agents: Water, alcohol foam, dry chemical or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic; hydrogen chloride and phosgene gases may be formed. 6.6 Behavior in Fire: Vapors are heavier than air and may flash back to a source of ignition. 6.7 Ignition Temperature: 700°F 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Typical	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 150 mg/l (5 days) 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Eastman Organic Chemicals Chemical and Physical Division 270 Park Avenue New York, N.Y. 10017 Platts and Baser, Inc. 12504 Northern Boulevard Flushing, N.Y. 11356 Eastman Organic Chemicals Kitchener, N.Y. 14860								
11. HAZARD ASSESSMENT CODE See Major Hazard Assessment Handbook, CG 446-3 A1, F2	10. SHIPPING INFORMATION 10.1 Grades or Purities: None. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not required. 10.4 Venting: Open if fumes are present.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poison, Class II. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not rated. 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard</td> <td>2</td> </tr> <tr> <td>Flammability</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> </tbody> </table>	Category	Classification	Health Hazard	2	Flammability	2	Reactivity	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Liquid. 13.2 Molecular Weight: 98.96. 13.3 Boiling Point at 1 atm.: 123.1°C (253.6°F). 13.4 Freezing Point: -111.3°C (-168.3°F). 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.274 (20°C liquid). 13.8 Liquid Surface Tension: Data not available. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 2.8. 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available. 13.12 Latent Heat of Vaporization: 221 Btu/lb or 21.4 cal/g or 89.5 kJ/kg. 13.13 Heat of Combustion: 14.48 Btu/lb or 1.448 cal/g or 59.8 kJ/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard	2								
Flammability	2								
Reactivity	1								
NOTES									

(continued on pages 2 and 3)

ETC

ETHYLENE CYANOHYDRIN

Common Synonyms Acrylonitrile 2-Cyanoethanol Glycid cyanohydrin 3-Hydroxypropionitrile		Liquid Colorless to yellow brown Weak odor to odorless
		Sinks and mixes with water
If you discharge it, please call your Department of Environmental Control and/or your local health department.		
Fire	Combustible POISONOUS GASES MAY BE PRODUCED WHEN HEATED When heated, it can decompose to form highly toxic gases. These gases may be deadly if inhaled. When exposed to flame, it will burn.	
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. Harmful if swallowed. Removes contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, flush immediately with plenty of water. If SWALLOWED, do not induce vomiting. If SWALLOWED, drink plenty of water. IF SWALLOWED, DO NOT INDUCE VOMITING OR HAVE AN EMESIS INDUCED.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water bodies. No data available on aquatic toxicity. No data available on aquatic water intake.	
1. RESPONSE TO DISCHARGE See Appendix Methods Handbook, CG 444.41 Discharge and Test		2. LABELS No hazard label required by U.S. Dept. of Federal Regulation
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Cyanoethanol Glycid cyanohydrin Hydroxy 2-cyanoethane Hydroxy acrylonitrile 3-Hydroxypropionitrile 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: $\text{H}_2\text{NCH}_2\text{CH}_2\text{CN}$ 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light colored 4.3 Odor: Pleasant, chemical character
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: An approved mask, plastic gloves, rubber clothing, rubber boots, goggles. 5.2 Symptoms Following Exposure: Liquid, colorless to light yellow, odorless, irritant. 5.3 Treatment for Exposure: Inhalation: Remove person to fresh air. If in eyes, flush with flowing water for at least 15 MIN. Flush exposure area with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not permitted 5.5 Short-Term Inhalation Limit: Not permitted 5.6 Toxicity by Ingestion: Grade 2.2 Data not available 5.7 Late Toxicity: Ingestion of liquid may cause severe burns, staining. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are irritating to eyes, nose and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Pleasantly soluble in water. 5.10 Odor Threshold: Not permitted		

6. FIRE HAZARDS 6.1 Flash Point: 26°F (3°C) 6.2 Flammable Limits in Air: 2.1 to 11.6% (2.1 to 11.6%) 6.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical, foam, halon, water, not recommended for use on electrical equipment 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Toxic gases are generated when heated 6.6 Behavior in Fire: Decomposes, generates toxic gas 6.7 Ignition Temperature: 422°F 6.8 Electrical Hazard: Not permitted 6.9 Burning Rate: Data not available		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																													
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: Not reactive 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not permitted 7.5 Polymerization: Not permitted 7.6 Inhibitor of Polymerization: Not permitted		9. SELECTED MANUFACTURERS American Alcolac & Extract Co., Inc. Venable and Street Philadelphia, Pa. 19104 Union Carbide Corp. Chemical and Plastics Division 270 Park Avenue New York, N.Y. 10017																													
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444 A P Q		10. SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open flame atmosphere																													
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Flammable</td><td>1</td></tr><tr><td>Explosive</td><td>1</td></tr><tr><td>Corrosive</td><td>1</td></tr><tr><td>Acute Toxicity</td><td>1</td></tr><tr><td>Chronic Toxicity</td><td>1</td></tr><tr><td>Reproductive</td><td>1</td></tr><tr><td>Other Hazards</td><td>1</td></tr><tr><td>Water</td><td>1</td></tr><tr><td>Non-Reaction</td><td>1</td></tr></tbody></table> 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazards</td><td>2</td></tr><tr><td>Flammability</td><td>2</td></tr><tr><td>Reactivity</td><td>2</td></tr></tbody></table>		Category	Rating	Flammable	1	Explosive	1	Corrosive	1	Acute Toxicity	1	Chronic Toxicity	1	Reproductive	1	Other Hazards	1	Water	1	Non-Reaction	1	Category	Classification	Health Hazards	2	Flammability	2	Reactivity	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 71.08 13.3 Boiling Point at 1 atm: 24.4°C = 75.9°F = 297.6°K 13.4 Freezing Point: -12.2°C = 9.0°F = 257.0°K 13.5 Critical Temperature: 124.7°C = 256.5°F = 397.9°K 13.6 Critical Pressure: 33.0 atm = 49.2 psi = 4.9 MPa 13.7 Specific Gravity: 0.92 at 20°C (68°F) 13.8 Liquid Surface Tension: Not permitted 13.9 Liquid-Water Interfacial Tension: Not permitted 13.10 Vapor (Gas) Specific Gravity: Not permitted 13.11 Ratio of Specific Heats of Vapor (Gas): Not permitted 13.12 Latent Heat of Vaporization: Not permitted 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not permitted 13.15 Heat of Solution: Not permitted 13.16 Heat of Polymerization: Not permitted	
Category	Rating																														
Flammable	1																														
Explosive	1																														
Corrosive	1																														
Acute Toxicity	1																														
Chronic Toxicity	1																														
Reproductive	1																														
Other Hazards	1																														
Water	1																														
Non-Reaction	1																														
Category	Classification																														
Health Hazards	2																														
Flammability	2																														
Reactivity	2																														
NOTES																															

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EDA

ETHYLENEDIAMINE

Common Synonyms 1,2-Diaminoethane 1,2-Ethanediamine		Liquid Colorless Mild ammonia odor
Fire		Flammable Flammable liquid, vapor and gas. Irritating vapor is produced. Freezing point is 52°F.
Exposure		Health Hazards Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.
Water Pollution		Harmful to Aquatic Life in Very Low Concentrations May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Do, pers. and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,2-Diaminoethane 1,2-Ethanediamine 3.2 Coast Guard Compatibility Classification Aliphatic amine 3.3 Chemical Formula: $\text{NH}_2\text{CH}_2\text{CH}_2\text{NH}_2$ 3.4 IMCO/United Nations Numerical Designation: N.O. 1041		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Strong ammoniacal when ammonia free, mild and ammoniacal when
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Full rubber protective clothing, incl. gloves and boots, chemical worker's goggles, face shield where contact with face is likely. If necessary to enter closed areas for 1-2 hr or less with mist, wear full faced gas mask with canister approved by Bureau of Standards for use with ammonia. 5.2 Symptoms Following Exposure: High concentration of vapor burns eyes and irritates nose and throat. Liquid burns eyes and skin. 5.3 Treatment for Exposure: Get medical help immediately. INGESTION: drink large amounts of water or milk quickly, induce vomiting only if instructed by physician. EYES: flush immediately and thoroughly with flowing water for at least 15 min. SKIN: remove clothing and flush affected area with copious amounts of flowing water, then wash with soap and water. Severe exposure may require showering. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 5.5 Short-Term Inhalation Limits: 20 ppm for 5 min 5.6 Toxicity by Ingestion: Grade 2.1 Dose 0.5 to 5 g/kg (Female rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant, may cause pain and second degree burns after a few minutes' contact. 5.10 Odor Threshold: 10 ppm		

6. FIRE HAZARDS		8. WATER POLLUTION	
5.1	Flash Point: 99°F (37°C) (NTP)	8.1	Aquatic Toxicity: 10 ppm, 24 hr, chub-killed, fresh water
6.2	Flammable Limits in Air: 3.3 - 11.1%	8.2	Waterfowl Toxicity: Data not available
6.3	Fire Extinguishing Agents: Carbon dioxide, dry chemicals, foam or water	8.3	Biological Oxygen Demand (BOD): 25% (theoretical) 5 days
6.4	Fire Extinguishing Agents Not to be Used: Do not use water in case of drum or tank fires	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: Irritating vapors are generated when heated		
6.6	Behavior in Fire: Not pertinent		
6.7	Ignition Temperature: 715°F		
6.8	Electrical Hazard: Not pertinent		
6.9	Burning Rate: 2.2 mm/min		
7. CHEMICAL REACTIVITY		9. SELECTED MANUFACTURERS	
7.1	Reactivity with Water: Gives off heat, but reaction is not hazardous	1.	Dow Chemical Co. Midland, Michigan 48660
7.2	Reactivity with Common Materials: No reaction	2.	Jefferson Chemical Co., Inc. 3336 Richmond Ave. Houston, Texas 77052
7.3	Stability During Transport: Stable	3.	Union Carbide Corp. Chemicals and Plastics Div. 270 Park Ave. New York, N.Y. 10017
7.4	Neutralizing Agents for Acids and Caustics: Flush with water		
7.5	Polymerization: Not pertinent		
7.6	Inhibitor of Polymerization: Not pertinent		
		10. SHIPPING INFORMATION	
		10.1	Grades or Purity: 99+ %
		10.2	Storage Temperature: Ambient
		10.3	Inert Atmosphere: Not required
		10.4	Venting: Pressure/vacuum
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A P Q		13. PHYSICAL AND CHEMICAL PROPERTIES	
		13.1	Physical State at 15°C and 1 atm: Liquid
		13.2	Molecular Weight: 60.10
		13.3	Boiling Point at 1 atm: 24.1 = 117°C = 340 K
		13.4	Freezing Point: 5.1 = 41°C = 244.2 K
		13.5	Critical Temperature: 69.1 = 320°C = 593 K
		13.6	Critical Pressure: 941 psia = 64 atm = 6.4 MN/m ²
		13.7	Specific Gravity: 0.909 at 20°C (liquids)
		13.8	Liquid Surface Tension: Not pertinent
		13.9	Liquid-Water Interfacial Tension: Not pertinent
		13.10	Vapor (Gas) Specific Gravity: Not pertinent
		13.11	Ratio of Specific Heats of Vapor (Gas): 1.087
		13.12	Latent Heat of Vaporization: 258 Btu/lb = 169 cal/g = 70 X 10 ³ J/kg
		13.13	Heat of Combustion: -12,290 Btu/lb = -6840 cal/g = -26.0 X 10 ³ J/kg
		13.14	Heat of Decomposition: Not pertinent
		13.15	Heat of Solution: (solid) -9 Btu/lb = -5 cal/g = -0.2 X 10 ³ J/kg
		13.16	Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS			
12.1	Code of Federal Regulations: Not listed		
12.2	NAS Hazard Rating for Bulk Water Transportation:		
	Category Rating		
	Fire 3		
	Health 3		
	Vapor Irritant 3		
	Liquid or Solid Irritant 3		
	Persons 3		
	Water Pollution 2		
	Human Toxicity 2		
	Aquatic Toxicity 4		
	Aesthetic Effect 2		
	Reactivity 0		
	Other Chemicals 3		
	Water 0		
	Self Reaction 0		
12.3	NFPA Hazard Classifications:		
	Category Classification		
	Health Hazard (Blue) 3		
	Flammability (Red) 2		
	Reactivity (Yellow) 0		
		<i>(Continued on page 4 and 5)</i>	
NOTES			

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EDT

ETHYLENEDIAMINE TETRACETIC ACID

Common Synonyms Versene acid Tetraacetic acid Ethylenediaminetetraacetic acid EDTA		Solid powder Floats on water	White	Odorous
Is this and remove discharged material Notify local health and pollution control agencies				
Fire	Not Flammable			
Exposure	CALL FOR MEDICAL ADVICE SOLID Irritating to skin and eyes Remove contaminated clothing and shoes Flush affected areas with plenty of water If IN EYES: hold eyelids open and Flush with plenty of water			
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline May be dangerous if it enters water intakes Notify local health and wildlife agencies Notify operators of nearby water intakes			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning - water contaminant Should be removed			2 LABELS No hazard label required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: EDTA, Endrate, Ethylenediaminetetraacetic acid, Ethylenediaminetetraacetic acid, Tetraacetic acid, Versene acid 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $(HO_2CCH_2)_4N(CH_2CH_2)_2N(CH_2COOH)_2$ 3.4 IMCO United Nations Numerical Designation: Not listed			4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Data not available 5.2 Symptoms Following Exposure: Data not available 5.3 Treatment for Exposure: Data not available 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade I LD ₅₀ 1.0 g/kg (as sodium or calcium salt) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of the skin. 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point No flammable 6.2 Flammable Limits in Air Not pertinent 6.3 Fire Extinguishing Agents Not pertinent 6.4 Fire Extinguishing Agents Not to be Used Not pertinent 6.5 Special Hazards of Combustion Products Not pertinent 6.6 Behavior in Fire Not pertinent 6.7 Ignition Temperature Not pertinent 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate Not pertinent	7 WATER POLLUTION 7.1 Aquatic Toxicity: 129 ppm/95 hr/catfish/tapwater 7.2 Waterfowl Toxicity: Data not available 7.3 Biological Oxygen Demand (BOD) 17.5 days 7.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Ciba Geigy Corp Geigy Industrial Chemicals Division McInosh, Ala. 35554 2 Dow Chemical Co Midland, Mich. 48640 3 W. R. Grace & Co Dowex & Almy Chemical Division Cambridge, Mass. 0140																												
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3 II	10 SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>0</td></tr><tr><td>Health</td><td></td></tr><tr><td> Vapor Irritant</td><td>0</td></tr><tr><td> Liquid or Solid Irritant</td><td>1</td></tr><tr><td> Poisons</td><td>0</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td> Human Toxicity</td><td>0</td></tr><tr><td> Aquatic Toxicity</td><td>2</td></tr><tr><td> Aesthetic Effect</td><td>1</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td> Other Chemicals</td><td>0</td></tr><tr><td> Water</td><td>0</td></tr><tr><td> Self Reaction</td><td>0</td></tr></tbody></table> 12.3 NFPA Hazard Classification: Not listed	Category	Rating	Fire	0	Health		Vapor Irritant	0	Liquid or Solid Irritant	1	Poisons	0	Water Pollution		Human Toxicity	0	Aquatic Toxicity	2	Aesthetic Effect	1	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Powder 13.2 Molecular Weight: 164 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Data not available 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.86 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
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Other Chemicals	0																												
Water	0																												
Self Reaction	0																												
NOTES																													

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EDB

ETHYLENE DIBROMIDE

Common Synonyms 1,2-Dibromoethane Ethylene dibromide	Liquid Colorless Sweet odor Sinks in water. Poisonous vapor is produced. Freezing point is 509 F.
Stop discharge if possible. Keep people away. Avoid contact with liquid and vapors. Wash and remove discharged material. Notify local health and pollution control agencies.	
Fire	Not flammable. POISONOUS GASES ARE PRODUCED WHEN HEATED Wear goggles, self-contained breathing apparatus, and rubber overclothing, including gloves. Do not mix with water.
 Exposure	CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat. May cause dizziness. If breathing chest stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Have victim drink water or milk.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife agencies. Notify pollution control authorities.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Should be removed. Chemical and physical treatment.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Bromoethane, 1,2-Dibromoethane, ethyl bromide, dibromomethane, Bromoethane 30 W-10, 4-15 W-30. Ethylene dibromide, Glycol dibromide. 3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon. 3.3 Chemical Formula: BrCH ₂ CH ₂ Br. 3.4 IMCO United Nations Numerical Designation: 6.1 1605.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Mildly sweet like chloroform.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Canister type mask or self-contained air mask, neoprene gloves, chemical safety goggles. 5.2 Symptoms Following Exposure: Local inflammation, blisters and ulcers on skin, irritation in lungs and organic injury to liver and kidneys may be absorbed through skin. 5.3 Treatment for Exposure: Remove from exposure. Remove contaminated clothing. Wash skin with soap and water. Flush eyes with plenty of water. Consult physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 3 mg/m. 5.5 Short-Term Inhalation Limits: 50 ppm for 5 min. 5.6 Toxicity by Ingestion: Grade 4 LD ₅₀ 50 to 500 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Decomposition gases are toxic and irritating. 6.6 Behavior in Fire: Decomposes into toxic irritating gases. Reacts with hot metals such as aluminum and magnesium. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not flammable.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 18 mg/l 48 hr bioassay fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640. 2. Great Lakes Chemical Corp. West Lafayette, Ind. 47906. 3. PPG Industries, Inc. Houston Chemical Division Gateway Center Pittsburgh, Pa. 15222.																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3). A X	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure/vacuum.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: ORM-A. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="972 1407 1207 1666"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>0</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>1</td></tr> <tr><td>Liquid or Solid Irritant</td><td>1</td></tr> <tr><td>Poisons</td><td>3</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>3</td></tr> <tr><td>Aquatic Toxicity</td><td>3</td></tr> <tr><td>Aesthetic Effect</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>1</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="972 1688 1207 1774"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>3</td></tr> <tr><td>Flammability (Red)</td><td>0</td></tr> <tr><td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	0	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	3	Water Pollution		Human Toxicity	3	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 187.86. 13.3 Boiling Point at 1 atm: 268°F = 131°C = 404 K. 13.4 Freezing Point: 39.6°F = 9.8°C = 283.0 K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.180 at 20°C (liquid). 13.8 Liquid Surface Tension: 38.75 dynes/cm = 0.03875 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 36.54 dynes/cm = 0.03654 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.109. 13.12 Latent Heat of Vaporization: 82.1 Btu/lb = 45.6 cal/g = 1.91 × 10 ⁵ J/kg. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
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NOTES Continued on pages 5 and 6.																																					

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EDC

ETHYLENE DICHLORIDE

Common Synonyms 1,2-Dichloroethane Ethylene chloride EDC	Liquid Colorless Sweet odor Sinks in water. Flammable, irritating vapor is produced.
Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus and rubber overalls (including gloves). Extinguish with dry chemical, 1.25% or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If in EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning of high flame ability. Disperse and flush.	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Broxide EDC 1,2-Dichloroethane Ethylene chloride Dutch liquid Glycol dichloride 3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon 3.3 Chemical Formula: $\text{C}_2\text{H}_4\text{Cl}_2$ 3.4 IMCO United Nations Numerical Designation: 12.114	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Ethereal, chloroform like, ether like
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Clean body covering clothing and safety glasses with side shields. Respiratory protection: up to 50 ppm, none; 50 ppm to 250 ppm, 1-2 hr or less; full face mask and canister, greater than 250 ppm, self-contained breathing apparatus. 5.2 Symptoms Following Exposure: Inhalation of vapors causes nausea, dizziness, depression. Contact of liquid with eyes may produce corneal injury. Prolonged contact with skin may cause a burn. 5.3 Treatment for Exposure: INHALATION: If victim is overcome, remove him to fresh air, keep him warm and get medical attention immediately. If breathing stops, give artificial respiration. INGESTION: induce vomiting, call a physician, treat the symptoms. EYES: flush immediately with copious amounts of flowing water for at least 15 min. SKIN: remove clothing and wash skin thoroughly with soap and water. Wash contaminated clothing before reuse. 5.4 Toxicity by Inhalation (Threshold Limit Value): 50 ppm 5.5 Short-Term Inhalation Limits: 200 ppm for 5 min; during any 3 hour period 5.6 Toxicity by Ingestion: Grade 2.1 (Dose 5 to 5 g/kg (rat)) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapor cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure. May cause secondary burns on long exposure. 5.10 Odor Threshold: 100 ppm	

6.1 HAZARDS 6.1 Flash Point: 100°F (38°C) 6.2 Flammable Limits in Air: 6.2% - 15.6% 6.3 Extinguishing Agents: Foam, carbon dioxide, dry chemical 6.4 Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Toxic and irritating gases (hydrogen chloride, phosgene) are generated. 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 775°F 6.8 Electrical Hazard: Class I (gr. up I) 6.9 Burning Rate: 1.6 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: 150 ppm, 96 hr perch. 11 mg salt water. * Time period not specified. 8.2 Water Fowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 0.002 lb/lb 5 days 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Cautistics: Not pertinent. 7.5 Polymerization: No, pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Continental Oil Co. Conoco Chemical Division Park 80 Plaza East Saddle Brook, N.J. 07662 2. Dow Chemical Co. Midland, Mich. 48640 3. Shell Chemical Co. Industrial Chemical Division Houston, Texas 77001																																				
11 HAZARD ASSESSMENT CODE See HAZARD ASSESSMENT HANDBOOK, CG 446-3 XX	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure/vacuum.																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="845 1474 1101 1736"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>2</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td>Poisons</td><td>3</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>3</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Acute Effects</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="845 1758 1101 1845"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	2	Liquid or Solid Irritant	2	Poisons	3	Water Pollution		Human Toxicity	3	Aquatic Toxicity	2	Acute Effects	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 98.96. 13.3 Boiling Point at 1 atm: 182.3°F = 84°C = 357°K. 13.4 Freezing Point: -122°F = -85°C = 178°K. 13.5 Critical Temperature: 550°F = 288°C = 561°K. 13.6 Critical Pressure: 735 psia = 50 atm = 5.07 MN/m. 13.7 Specific Gravity: 1.253 at 20°C (liquids). 13.8 Liquid Surface Tension: 32.2 dynes/cm = 0.0322 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: (estimated) 90 dynes/cm = 0.09 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: 3.4. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.118. 13.12 Latent Heat of Vaporization: 135 Btu/lb = 76.4 cal/g = 3.76 x 10 ⁵ J/kg. 13.13 Heat of Combustion: (estimated) 3400 Btu/lb = 1900 cal/g = 80 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
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NOTES (Continued on page 1 and 2)																																					

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EGL

ETHYLENE GLYCOL

Common Synonyms Glycol Monomethylene glycol 1,2-Ethanediol		Thick liquid	Colorless	Odorless
		Sinks and mixes with water		
Stop discharge, if possible Call fire department Isolate and remove discharged material Notify local health and pollution control agencies				
Fire	Combustible Extinguish with dry chemical, alcohol foam, or carbon dioxide Water may be ineffective on fire Cool exposed containers with water			
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes If swallowed, will cause loss of consciousness Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 5.1 Synonyms: 1,2-Dihydroxyethane 1,2-ethanediol Ethylene dihydrate Glycol Monomethylene glycol 5.2 Coast Guard Compatibility Classification: Glycol 5.3 Chemical Formula: HOCH ₂ CH ₂ OH 5.4 IMCO United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Slight odor		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, shower and eye bath 5.2 Symptoms Following Exposure: Inhalation of vapor is not hazardous. Ingestion causes stupor or coma, sometimes leading to fatal kidney injury 5.3 Treatment for Exposure: INGESTION: induce vomiting and call a physician. SKIN AND EYES: flush with water 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Gravid LD ₅₀ Studies: 4 g/kg in guinea pigs; mice 5.7 Late Toxicity: Late toxic injury may result if ingested 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard; practically harmless to the skin 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point: 240°F (117°C) 232°F (111°C) 6.2 Flammable Limits in Air: LFL = 1.1% UFL not listed 6.3 Fire Extinguishing Agents: Water for alcohol foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 775°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 1.0 mm/min		8 WATER POLLUTION 8.1 Aquatic Toxicity: >100 ppm/48 hr. shrimp/1 C/salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 12.5% (theoretical) 78% (theoretical) 20 days 8.4 Food Chain Concentration Potential: None																													
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. PPG Industries, Inc. Chemical Division Guaynilla, Puerto Rico 00656 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																													
		10 SHIPPING INFORMATION 10.1 Grades or Purity: Industrial grade, low conductivity grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)																													
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P Q		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 62.07 13.3 Boiling Point at 1 atm: 197.3°C (= 470°F) 13.4 Freezing Point: 9.6°C (= 49.3°F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.115 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.095 13.12 Latent Heat of Vaporization: 544 Btu/lb = 191 cal/g = 8.00×10^5 J/kg 13.13 Heat of Combustion: -7259 Btu/lb = -4037 cal/g = -168.9×10^3 J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: (solid) = 20 Btu/lb = -12 cal/g = -0.5×10^3 J/kg 13.16 Heat of Polymerization: Not pertinent																													
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Toxic</td><td>1</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>0</td></tr><tr><td>Liquid or Solid Irritant</td><td>0</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>2</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>1</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemical</td><td>5</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table>		Category	Rating	Toxic	1	Health		Vapor Irritant	0	Liquid or Solid Irritant	0	Poisons	1	Water Pollution		Human Toxicity	2	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity		Other Chemical	5	Water	0	Self Reaction	0		
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<i>Continued on pages 5 and 6</i>																															
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Continued on pages 5 and 6

EGY

ETHYLENE GLYCOL DIACETATE

Common Synonyms Ethylene acetate Glycol diacetate Ethylene diacetate		Liquid Colorless Weak fruity odor
Sinks and mixes with water		
See Hazardous Waste Regulations for handling and disposal instructions. For information on disposal, contact your local health department.		
Fire		Combustible Extinguish with water or foam. Do not use carbon tetrachloride.
Exposure		LIQUID Irritating to skin and eyes. Reactions: Irritation of eyes, skin, and respiratory tract. Ingestion: May cause severe injury to the digestive tract. Inhalation: May cause irritation of the respiratory tract. If SWALLOWED, take 1-2 glasses of water and drink water.
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Spills should be cleaned up immediately.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning - water contaminant. Disperse and flush.		2. LABELS No label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethylene acetate; Ethylene diacetate; Glycol diacetate. 3.2 Coast Guard Compatibility Classification: Ester (13). 3.3 Chemical Formula: CH ₃ COO(CH ₂) ₂ OCOCH ₃ . 3.4 IMCO/United Nations Numerical Designation: Not listed.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Weak, fruity.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield; rubber gloves. 5.2 Symptoms Following Exposure: Inhalation is not hazardous. Liquid causes mild irritation of eyes. Ingestion causes stupor or coma. 5.3 Treatment for Exposure: INHALATION: remove to fresh air. EYES and SKIN: flush well with water. INGESTION: induce vomiting; call a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 1 oral LD ₅₀ = 6,860 mg/kg (rat). 5.7 Late Toxicity: Ingestion may cause severe injury to kidneys. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS

6.1 **Flash Point:** 205°F (79°C) (191°F (89°C)).

6.2 **Flammable Limits in Air:** 1.6% - 8.4%.

6.3 **Fire Extinguishing Agents:** Water, alcohol, foam, dry chemical, or carbon dioxide.

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.

6.5 **Special Hazards of Combustion Products:** Not pertinent.

6.6 **Behavior in Fire:** Not pertinent.

6.7 **Ignition Temperature:** 900°F.

6.8 **Electrical Hazard:** Data not available.

6.9 **Burning Rate:** 2.9 mm/min.

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction.

7.2 **Reactivity with Common Materials:** No reaction.

7.3 **Stability During Transport:** Stable.

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.

7.5 **Polymerization:** Not pertinent.

7.6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available.

8.2 **Waterfowl Toxicity:** Data not available.

8.3 **Biological Oxygen Demand (BOD):** Data not available.

8.4 **Food Chain Concentration Potential:** None.

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
Chemicals and Plastics Division
270 Park Avenue
New York, N.Y. 10017

2. Eastman Chemical Products, Inc.
Kingsport, Tenn. 37662

3. Pfaltz and Bauer, Inc.
126-44 Northern Boulevard
Flushing, N.Y. 11355

10. SHIPPING INFORMATION

10.1 **Grades or Purities:** 98+%

10.2 **Storage Temperature:** Ambient.

10.3 **Inert Atmosphere:** No requirement.

10.4 **Venting:** Open (flame arresters).

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446.3)
V P Q

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Not listed.

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	-
Reactivity	
Other Chemicals	1
Water	0
Sell Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	1
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid.

13.2 **Molecular Weight:** 146.1.

13.3 **Boiling Point at 1 atm:** 175.6°F = 190.9°C = 464.1 K.

13.4 **Freezing Point:** -42.2°F = -41.8°C = 231.7 K.

13.5 **Critical Temperature:** Not pertinent.

13.6 **Critical Pressure:** Not pertinent.

13.7 **Specific Gravity:** 1.104 at 20°C (liquid).

13.8 **Liquid Surface Tension (est.):** 20 dynes/cm = 0.020 N/m (20°C).

13.9 **Liquid-Water Interfacial Tension:** Not pertinent.

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.

13.12 **Latent Heat of Vaporization:** 133 Btu/lb = 74 cal/g = 3.1 × 10⁵ J/kg.

13.13 **Heat of Combustion (est.):** -11,000 Btu/lb = -6,000 cal/g = -250 × 10³ J/kg.

13.14 **Heat of Decomposition:** Not pertinent.

13.15 **Heat of Solution:** Not pertinent.

13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 5 and 6)

NOTES

EEE

ETHYLENE GLYCOL DIETHYL ETHER

Common Synonyms Diethyl Celluloside 1,2-Diethoxyethane		Liquid	Colorless	Mild pleasant odor
Floats and mixes slowly with water. Irritating vapor is produced.				
Storage: Far as possible, keep peroxide away. Caution: Department Isolate and remove contaminated material. Avoid contact with skin, clothing, and surfaces.				
Fire		Combustible Flammable with dry chemicals. Self-ignition with peroxide. Water may be ineffective.		
Exposure		GTL medical use VAPOR Irritating to eyes, nose and throat. May cause mild irritation. LIQUID Irritating to skin and eyes. Harmful if swallowed. Removes contaminated clothing and shoes. It is effective: Flushes with copious amounts of water. If INGESTED, flush with copious amounts of water. If SWALLOWED, do not induce vomiting. Have victim drink water. If inhaled, move victim to fresh air.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. Polluting to shoreline. May be dangerous if it enters water intakes. Not a health hazard if it washes off boats. Not a serious threat to water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant. Disperse and flush.		2. LABELS No label required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Diethyl Celluloside 1,2-Diethoxyethane 3.2 Coast Guard Compatibility Classification: Alcohols (6) 3.3 Chemical Formula: $C_4H_{10}O_2$ 3.4 IMCO/United Nations Numerical Designation: 1.1.1.1.1		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Faint, ethereal		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact with liquid irritates eyes but has little or no effect on skin. Ingestion causes irritation of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: remove from exposure. EYES: flush with water for at least 15 min. SKIN: wash with copious amounts of water. INGESTION: drink water and get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, oral LD ₅₀ = 4,390 mg/kg rats. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				
6 FIRE HAZARDS 6.1 Flash Point: 90°F (3°C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 406°F. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 4.1 mm/sec.				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.				
8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterflow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 0.10 lb/lb 10 days. 8.4 Food Chain Concentration Potential: None.				
9 SELECTED MANUFACTURERS 1. Eastern Chemical Division 230 Marcus Boulevard Hempstead, N.Y. 11550 2. Pfaltz and Bauer, Inc. 126-04 Northern Boulevard Flushing, N.Y. 11356				
10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arresters.				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) V P Q 11				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.				
13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 118.2. 13.3 Boiling Point at 1 atm: 252°F = 122°C = 395 K. 13.4 Freezing Point: -110°F = -79°C = 194 K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.8454 at 20°C (liquid). 13.8 Liquid Surface Tension: test = 26 dynes/cm = 0.026 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 4.1. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0504. 13.12 Latent Heat of Vaporization: 192 Btu/lb = 10 ³ cal/g = 4.4 x 10 ³ J/kg. 13.13 Heat of Combustion: test = 15,000 Btu/lb = 5,100 cal/g = 5.1 x 10 ³ J/g. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.				
NOTES				

(Continued on pages 5 and 6)

EGD

ETHYLENE GLYCOL DIMETHYL ETHER

Common Synonyms Meeohol 1,2-Dimethoxyethane Dimethyl Cellosolve Ansol Ether 12		Liquid	Colorless	Fragrant odor
Fluats and mixes with water. Irritating vapor is produced.				
Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Combustible Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water.			
Exposure	CALL FOR MEDICAL AID VAPOR If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Not irritating to skin. If swallowed, will cause nausea, vomiting or loss of consciousness. IF SWALLOWED and victim is CONSCIOUS, have victim drink water. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			
1 RESPONSE TO DISCHARGE See Response Methods Handbook, C-446-6 Flammable, highly flammable. DANGER and FUEL		2. LABELS No hazard label required by U.S. Code or Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ansol Ether 12 1,2-Dimethoxyethane Dimethyl Cellosolve Meeohol 3.2 Coast Guard Compatibility Classification: Category 3 3.3 Chemical Formula: C ₄ H ₁₀ O ₂ 3.4 IMCO United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Methyl ether		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Ventilate, wear protective clothing and gloves. 5.2 Symptoms Following Exposure: Irritation of eyes, nose, throat, and skin. 5.3 Treatment for Exposure: INHALATION: Remove to fresh air. If not breathing, give artificial respiration. IF SWALLOWED: Do not induce vomiting. IF SKIN CONTACT: Wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade III - Irritant. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: None. 5.9 Liquid or Solid Irritant Characteristics: None. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: 104°F (40°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Containers may explode in fires 6.7 Ignition Temperature: 573°F (300°C) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4.2 g/min		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS The Ansol Company Chemical Division One Station Street Manchester, New Hampshire	
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, C-446-5 VAPORS		10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum	
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 90.12 13.3 Boiling Point at 1 atm: 30.8°C (87.4°F) 13.4 Freezing Point: -12.3°C (9.1°F) 13.5 Critical Temperature: 210.1°C (406.2°F) 13.6 Critical Pressure: 34.2 atm (3476.5 kPa) 13.7 Specific Gravity: 0.835 at 20°C (68°F) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.1 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1 13.12 Latent Heat of Vaporization: 34.2 kJ/mol (8.17 kcal/mol) 13.13 Heat of Combustion: -2200 kJ/mol (-528 kcal/mol) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 10.4 kJ/mol (2.5 kcal/mol) 13.16 Heat of Polymerization: Not pertinent	
NOTES			

REVISED 1978

ETHYLENE GLYCOL MONOBUTYL ETHER

Common Synonyms 2-Butoxyethanol Butyl Cellosolve Dowsol EB Poly-Solv EB		Only liquid	Colorless	Mild rancid odor
		Floats and mixes with water		
Stop discharge if possible Call fire department Avoid contact with liquid Isolate and remove discharged material Notify local health and pollution control agencies				
Fire	Combustible. Extinguish with dry chemical, alcohol foam or carbon dioxide. Cool exposed containers with water.			
Exposure	CALL FOR MEDICAL AID			
	LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes			
1 RESPONSE TO DISCHARGE See Response Methods Manual, U.S. 446.4 Disperse and flush		2 LABELS No hazard labels required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms 2-Butoxyethanol Cellosolve Butyl Butyl Cel Poly-Solv EB Dowsol EB 3.2 Coast Guard Compatibility Classification 16.1-20.1 3.3 Chemical Formula $C_6H_{14}O_2$ 3.4 IMCO United Nations Numerical Designation: N		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild characteristic, slightly rancid, mild chemical		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Air pack or organic canister respirator or rubber gloves, goggles, clothing to prevent body contact with liquid				
5.2 Symptoms Following Exposure: Vapors irritate eyes and nose. Ingestion of skin contact causes localized irritation and redness				
5.3 Treatment for Exposure: INHALATION: remove to fresh air and call a physician. SKIN OR EYES: immediately flush with plenty of water and medical care for eyes				
5.4 Toxicity by Inhalation (Threshold Limit Value): No ppm				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 10 g/kg rat				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentration. The effect is temporary				
5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. Dispersed in clothing and a hand to clean maximum irritation and reddening of the skin				
5.10 LC ₅₀ Threshold: Data not available				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point: 105°F (40.5°C)		8.1 Aquatic Toxicity: 1000 ppm/24 hr/brine shrimp/T1 m	
6.2 Flammable Limits in Air: 1.1 - 10.0%		8.2 Waterfowl Toxicity: Data not available	
6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires; alcohol type foam for large fires		8.3 Biological Oxygen Demand (BOD): 26% of theoretical in 5 days, fresh water	
6.4 Fire Extinguishing Agents Not to be Used: Data not available		8.4 Food Chain Concentration Potential: None	
6.5 Special Hazards of Combustion Products: Not pertinent			
6.6 Behavior in Fire: No pipe burning			
6.7 Ignition Temperature: 472°F			
6.8 Electrical Hazard: Not pertinent			
6.9 Burning Rate: 6.7 mm/min			
7 CHEMICAL REACTIVITY		9 SELECTED MANUFACTURERS	
7.1 Reactivity with Water: No reaction		1. Jefferson Chemical Co. 4400 Richmond Ave. Houston, Texas 77052	
7.2 Reactivity with Common Materials: No reaction		2. Olin Corp. Chemicals Division Brandenburg, Ky. 40008	
7.3 Stability During Transport: Stable		3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017	
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent			
7.5 Polymerization: Not pertinent			
7.6 Inhibitor of Polymerization: Not pertinent			
		10 SHIPPING INFORMATION	
		10.1 Grades or Purities: Commercial	
		10.2 Storage Temperature: Ambient	
		10.3 Inert Atmosphere: No requirement	
		10.4 Venting: Open to atmosphere	
11 HAZARD ASSESSMENT CODE		13 PHYSICAL AND CHEMICAL PROPERTIES	
See Hazard Assessment Manual, U.S. 446.4 A P Q		13.1 Physical State at 15°C and 1 atm: Liquid	
		13.2 Molecular Weight: 134.15	
		13.3 Boiling Point at 1 atm: 147.2°C (300.9°F)	
		13.4 Freezing Point: -12.3°C (9.9°F)	
		13.5 Critical Temperature: 294.1°C (551.4°F)	
		13.6 Critical Pressure: 35.0 bar (507.6 psia)	
		13.7 Specific Gravity: 0.91 at 20°C (liquid)	
		13.8 Liquid Surface Tension: Not pertinent	
		13.9 Liquid-Water Interfacial Tension: Not pertinent	
		13.10 Vapor (Gas) Specific Gravity: Not pertinent	
		13.11 Ratio of Specific Heats of Vapor (Grs): 0.47	
		13.12 Latent Heat of Vaporization: 37.6 kJ/mol (8.96 kcal/mol)	
		13.13 Heat of Combustion: 13,890 Btu/lb = 7720 cal/g = 323 × 10 ³ J/kg	
		13.14 Heat of Decomposition: Not pertinent	
		13.15 Heat of Solution: 10.4 Btu/lb = 600 cal/g = 2500 J/kg	
		13.16 Heat of Polymerization: Not pertinent	
12 HAZARD CLASSIFICATIONS			
12.1 Code of Federal Regulations: Combustible Liquid			
12.2 NAS Hazard Rating for Bulk Water Transportation:			
Category	Rating		
Fire	1		
Health	1		
Vapor Irritant	1		
Liquid or Solid Irritant	1		
Poisons	2		
Water Pollution	2		
Human Toxicity	2		
Aquatic Toxicity	2		
Aesthetic Effects	3		
Reactivity	2		
Other Chemicals	2		
Water	0		
Self Reaction	0		
12.3 NFPA Hazard Classifications:			
Category	Classification		
Health Hazard (Blue)	2		
Flammability (Red)	3		
Reactivity (Yellow)	0		
		NOTES	

EMA

ETHYLENE GLYCOL MONOBUTYL ETHER ACETATE

Common Synonyms 2-Butoxyethanol acetate 2-Butoxyethyl acetate Glycol monobutyl ether acetate Butyl "Cellosolve" acetate	Liquid Colorless Weak fruity odor Floats and mixes slowly with water
No discharge to water from containers Lightly flammable Flammable and toxic vapors discharged into air No discharge to land or water	
Fire	Combustible Flammable with heat of combustion 10,000 Btu/lb Water not recommended
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed Repeated exposure may cause skin irritation Flammable and toxic vapors discharged into air No discharge to land or water
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes No discharge to land or water
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Enclose in water containers Dispense and flush	2 LABELS No label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Butoxyethanol acetate 2-Butoxyethyl acetate Butyl Cellosolve acetate Glycol monobutyl ether acetate 3.2 Coast Guard Compatibility Classification: Exempt 3.3 Chemical Formula: $\text{C}_{10}\text{H}_{20}\text{O}_4$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weak fruits
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation of concentrated vapors may cause headache, nausea, dizziness. Liquid causes irritation to eyes and moderate irritation to skin. Ingestion produces same symptoms as inhalation. 5.3 Treatment for Exposure: INHALATION: Remove person to fresh air. EYES: Flush thoroughly with water for at least 15 min. SKIN: Flush thoroughly with water. INGESTION: Induce vomiting. Get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 oral LD ₅₀ = 3.2 g/kg (approximate) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS

- 6.1 **Flash Point:** 180°F (66°C) 160°F (71°C)
 6.2 **Flammable Limits in Air:** 0.9% - 8.5%
 6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
 6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
 6.5 **Special Hazards of Combustion Products:** Not pertinent
 6.6 **Behavior in Fire:** Not pertinent
 6.7 **Ignition Temperature:** 645°F
 6.8 **Electrical Hazard:** Data not available
 6.9 **Burning Rate:** 4.1 mm/min

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:** No reaction
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterfowl Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
 Chemicals and Plastics Division
 270 Park Avenue
 New York, N.Y. 10017
 2. Eastman Chemical Products, Inc.
 Kingsport, Tenn. 37602

10 SHIPPING INFORMATION

- 10.1 **Grades or Purity:** 98.5%
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** Not required
 10.4 **Vecting:** Open flame and heat

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446-3
 A P O I I

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Combustible Liquid
 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
 12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid
 13.2 **Molecular Weight:** 160.21
 13.3 **Boiling Point at 1 atm:**
 $170.0^\circ\text{C} = 322.2^\circ\text{C} = 365.4^\circ\text{K}$
 13.4 **Freezing Point:**
 $-52.0^\circ\text{C} = -61.6^\circ\text{C} = 206.7^\circ\text{K}$
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 0.942 at 20°C (liquids)
 13.8 **Liquid Surface Tension:** (dyn/cm)
 26.5 dyn/cm = 0.0265 N/m at 20°C
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 13.12 **Latent Heat of Vaporization:** 35 Btu/lb
 $= 85 \text{ cal/g} = 2.7 \times 10^5 \text{ J/kg}$
 13.13 **Heat of Combustion:** (cal/g) = 14,000 Btu/lb
 $= 7,700 \text{ cal/g} = 3.2 \times 10^7 \text{ J/kg}$
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** Not pertinent
 13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

EME

ETHYLENE GLYCOL MONOMETHYL ETHER

Common Synonyms Poly Glycol Ether Dimethyl Ether Methyl Cellosolve Glycol Dimethyl Ether Dimethyl Glycol	Liquid Colorless Odorless Flammable and mixes with water
No discharge if possible Call fire department Avoid contact with liquid To clear and remove, discharge into soil Notify local health and pollution control agencies	
Fire	Combustible Extinguish with dry chemical, alkali foam or carbon dioxide Small exposed containers with water
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES , hold eyelids open and flush with plenty of water IF SWALLOWED , and victim is CONSCIOUS, have victim drink water or milk
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes
1 RESPONSE TO DISCHARGE See Response Methods Handbook, 2nd Ed., 1974 Discharge into	2. LABELS See Hazard Assessment Code See Material Safety Data Sheet
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: DIMETHYL ETHER Poly Glycol Ether Dimethyl Ether Methyl Cellosolve Glycol Dimethyl Ether Dimethyl Glycol 3.2 Corrosion Compatibility Classification: Corrosive 3.3 Chemical Formula: C ₂ H ₆ O ₂ 3.4 IMCO United Nations Numerical Designation: 11	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Methyl Cellosolve
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety goggles, gloves, and protective clothing 5.2 Symptoms Following Exposure: Irritation to skin and eyes, headache, dizziness, nausea, vomiting, and diarrhea 5.3 Treatment for Exposure: SKIN OR EYES: Wash with large amounts of water 5.4 Toxicity by Inhalation (Threshold Limit Value): 2 ppm 5.5 Short-Term Inhalation Limits: None known 5.6 Toxicity by Ingestion: Grade 3 (D) - Harmful 5.7 Late Toxicity: Causes blood disorders and damage to central nervous system in humans 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes irritation to the eyes, nose, and throat 5.9 Liquid or Solid Irritant Characteristics: Methyl Cellosolve is irritating to the skin 5.10 Odor Threshold: 2 ppm	

6 FIRE HAZARDS 6.1 Flash Point: 21.0°C (69.8°F) 6.2 Flammable Limits in Air: 2.5 - 19.5% 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide or alcohol foam 6.4 Fire Extinguishing Agents Not to be Used: None known 6.5 Special Hazards of Combustion Products: None known 6.6 Behavior in Fire: No polymerization 6.7 Ignition Temperature: 300°C 6.8 Electrical Hazard: No peroxide 6.9 Burning Rate: 1.5 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data available 8.2 Waterford Toxicity: Data available 8.3 Biological Oxygen Demand (BOD): 15.0 mg/l (5 days) 8.4 Food Chain Concentration Potential: None																						
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Jefferson Chemical Co., Inc. 1000 Richmond Ave. Houston, Texas 77002 Olin Corp. Chemical Division Wardensburg, Kansas 66786 Chemical Industries Chemical and Plastic Division 100 Park Ave. New York, N.Y. 10017																						
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, 2nd Ed., 1974 A P Q	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.9% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not necessary 10.4 Venting: Under normal conditions																						
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 MAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Flammable</td> <td>1</td> </tr> <tr> <td>Corrosive</td> <td>1</td> </tr> <tr> <td>Reactive</td> <td>1</td> </tr> <tr> <td>Health Hazard</td> <td>1</td> </tr> <tr> <td>Environmental</td> <td>1</td> </tr> <tr> <td>Special</td> <td>1</td> </tr> <tr> <td>Reaction</td> <td>1</td> </tr> <tr> <td>Other</td> <td>1</td> </tr> <tr> <td>Water</td> <td>1</td> </tr> <tr> <td>Not Reaction</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed	Category	Rating	Flammable	1	Corrosive	1	Reactive	1	Health Hazard	1	Environmental	1	Special	1	Reaction	1	Other	1	Water	1	Not Reaction	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 76 13.3 Boiling Point at 1 atm: 24.4°C (75.9°F) 13.4 Freezing Point: -12.3°C (9.0°F) 13.5 Critical Temperature: 235.1°C (455.2°F) 13.6 Critical Pressure: 33.5 bar (485.5 psi) 13.7 Specific Gravity: 1.115 at 20°C 13.8 Liquid Surface Tension: 24.5 dyne/cm at 20°C 13.9 Liquid-Water Interfacial Tension: 1.5 dyne/cm 13.10 Vapor (Gas) Specific Gravity: 1.51 13.11 Ratio of Specific Heats of Vapor (Gas): 1.14 13.12 Latent Heat of Vaporization: 35.1 kJ/mol (8.4 kcal/mol) 13.13 Heat of Combustion: 9440 Btu/lb (2190 cal/g) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
Category	Rating																						
Flammable	1																						
Corrosive	1																						
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Not Reaction	1																						
NOTES																							

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6 FIRE HAZARDS 6.1 Flash Point: 100 °F (38 °C) 6.2 Flammable Limits in Air: 4% 6.3 Fire Extinguishing Agents: Dry chemical, water, foam, alcohol 6.4 Fire Extinguishing Agents Not to be Used: None 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Vaporizes and burns, and the material is highly flammable. The material is highly flammable. The material is highly flammable. 6.7 Ignition Temperature: 400 °F (204 °C) 6.8 Electrical Hazard: None 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 "Waterfowl" Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																		
9 SELECTED MANUFACTURERS East Chemical Michigan, Michigan 48106																																			
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Mildly reactive 7.2 Reactivity with Common Materials: None 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: 1.5% solution 7.5 Polymerization: None 7.6 Inhibitor of Polymerization: None	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99% 10.2 Storage Temperature: 15-25 °C 10.3 Inert Atmosphere: 1-1 10.4 Venting: None																																		
11 HAZARD ASSESSMENT CODE APQPNZ	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15 °C and 1 atm: Liquid 13.2 Molecular Weight: 44 13.3 Boiling Point at 1 atm: 100 °C 13.4 Freezing Point: -162 °C 13.5 Critical Temperature: 31.1 °C 13.6 Critical Pressure: 7.38 MPa 13.7 Specific Gravity: 0.91 13.8 Liquid Surface Tension: 22.3 mN/m 13.9 Liquid-Water Interfacial Tension: 15.1 mN/m 13.10 Vapor (Gas) Specific Gravity: 1.53 13.11 Heat of Specific Heats of Vapor (G/L): 40.7 kJ/mol 13.12 Latent Heat of Vaporization: 40.7 kJ/mol 13.13 Heat of Combustion: 47.9 kJ/mol 13.14 Heat of Decomposition: 47.9 kJ/mol 13.15 Heat of Solution: 47.9 kJ/mol 13.16 Heat of Polymerization: 47.9 kJ/mol																																		
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td> Acute Toxicity</td> <td>1</td> </tr> <tr> <td> Liquid - Solid Toxicity</td> <td>1</td> </tr> <tr> <td> Poison</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td> Human Toxicity</td> <td>1</td> </tr> <tr> <td> Acute Toxicity</td> <td>1</td> </tr> <tr> <td> Chronic Toxicity</td> <td>1</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td> Organic Compounds</td> <td>1</td> </tr> <tr> <td> Water</td> <td>1</td> </tr> <tr> <td> Self-Reaction</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard Rating</td> <td>1</td> </tr> <tr> <td>Flammability Rating</td> <td>2</td> </tr> <tr> <td>Reactivity Rating</td> <td>2</td> </tr> </tbody> </table>	Category	Rating	Health	1	Acute Toxicity	1	Liquid - Solid Toxicity	1	Poison	2	Water Pollution		Human Toxicity	1	Acute Toxicity	1	Chronic Toxicity	1	Reactivity		Organic Compounds	1	Water	1	Self-Reaction	1	Category	Classification	Health Hazard Rating	1	Flammability Rating	2	Reactivity Rating	2	5 HEALTH HAZARDS (Cont'd) 5.9 Liquid or Solid Irritant Characteristics: Irritant to skin and eyes, and to the respiratory system. 5.10 Odor Threshold: Data not available
Category	Rating																																		
Health	1																																		
Acute Toxicity	1																																		
Liquid - Solid Toxicity	1																																		
Poison	2																																		
Water Pollution																																			
Human Toxicity	1																																		
Acute Toxicity	1																																		
Chronic Toxicity	1																																		
Reactivity																																			
Organic Compounds	1																																		
Water	1																																		
Self-Reaction	1																																		
Category	Classification																																		
Health Hazard Rating	1																																		
Flammability Rating	2																																		
Reactivity Rating	2																																		

EOX

ETHYLENE OXIDE

Common Synonyms Oxirane 1,2-Epoxyethane	Liquefied gas Colorless Sweet odor Floats and mixes with water. Flammable, irritating vapor is produced. Boiling point is 51° F.
Avoid contact with liquid. Keep people away. Wear goggles, self-contained breathing apparatus and rubber over clothing. Avoid clothing. Shift. If dangerous, use self-contained breathing apparatus. Stop discharge. If safe, stop upward and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Containers may explode when heated. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles, self-contained breathing apparatus and rubber over clothing. Stop flow of gas if possible. Combat fires from behind barrier with carbon dioxide or nonhalogenated flood discharge area with water. Gaseous exposed containers and liquid containers may explode if struck with water. Mixes with alcohol, many chemicals, oils and hydrocarbons.
Exposure	CAT 1 FORMALDEHYDE VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting and difficult breathing. May be fatal. If inhaled, may cause pulmonary edema. If inhaled, may cause severe irritation. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove containers and clothing. If liquid is on skin, wash with plenty of water. If in eyes, flush with plenty of water. If swallowed, do not induce vomiting. If swallowed, drink plenty of water. Notify poison control center.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if enters water intakes. Notify local health and pollution control agencies.
1 RESPONSE TO DISCHARGE (See Federal Emergency Response Code 446.4) Issue evacuation for high flammability. Evacuate area.	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,2-Epoxyethane, Oxirane 3.2 Coast Guard Competibility Classification: Alkyl epoxide 3.3 Chemical Formula: C ₂ H ₄ O 3.4 IMCO United Nations Numerical Designation: 2010	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweet, characteristic ether-like
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: At supply risk, goggles or face shield, rubber shoes and gloves. 5.2 Symptoms Following Exposure: Exposure to low vapor concentrations often results in delayed effects such as vomiting. Higher concentrations produce irritation of eyes, nose, and throat; high concentrations may cause mucous membranes to blister. Contact with skin causes blistering, eye burns. 5.3 Treatment for Exposure: INHALATION: Remove contaminated area immediately; if severe, and vomiting starts, call physician. SKIN OR EYES: Flush immediately with plenty of water for at least 15 minutes and seek medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 50 ppm 5.5 Short-Term Inhalation Limits: 500 ppm for 15 min 5.6 Toxicity by Ingestion: Grade 3 oral rat LD ₅₀ = 33 g/kg 5.7 Late Toxicity: Causes cancer in mice. Effects on humans unknown. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate to high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: A very severe skin irritant; may cause pain and second degree burns after a few minutes contact. 5.10 Odor Threshold: 50 ppm	

6 FIRE HAZARDS 6.1 Flash Point: < 0.1 (°C) 6.2 Flammable Limits in Air: 3.0 - 100% 6.3 Fire Extinguishing Agents: Stop flow of gas. Use water, carbon dioxide, dry chemical or alcohol foam. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Irritation - vapors generated when heated. 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flashback. Containers may explode when heated. 6.7 Ignition Temperature: 884°F 6.8 Electrical Hazard: Class I, Group B 6.9 Burning Rate: 3.8 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Slow reaction, not hazardous. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: May polymerize violently if contaminated with alkaline or acidic materials and metal oxides or chlorides. 7.6 Inhibitor of Polymerization: None used.	9. SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. Jefferson Chemical Co., Inc. 4336 Richmond Ave. Houston, Texas 77052 3. Union Carbide Corp. Chemicals and Plastics Div. 270 Park Ave. New York, N.Y. 10017																																				
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook CG 446.31 ABC-K-L-M-N	10 SHIPPING INFORMATION 10.1 Grades or Purities: Commercial 100%. Must contain no acetylene. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Inerted. 10.4 Venting: Safety relief.																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="966 1440 1202 1709"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>4</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>4</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td>Persons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Harmful Toxics</td><td>4</td></tr> <tr> <td>Aquatic Toxics</td><td>2</td></tr> <tr> <td>Acute Effect</td><td>4</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Organic Chemicals</td><td>4</td></tr> <tr> <td>Water</td><td>4</td></tr> <tr> <td>Self Reaction</td><td>4</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="966 1731 1202 1817"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>4</td></tr> <tr> <td>Reactivity (Yellow)</td><td>3</td></tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Persons	2	Water Pollution		Harmful Toxics	4	Aquatic Toxics	2	Acute Effect	4	Reactivity		Organic Chemicals	4	Water	4	Self Reaction	4	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	4	Reactivity (Yellow)	3	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Gas. 13.2 Molecular Weight: 44.05 13.3 Boiling Point at 1 atm.: 51.1°F = 10.6°C = 283.8°K 13.4 Freezing Point: -170°F = -112.6°C = 160.6°K 13.5 Critical Temperature: 385.1°F = 196.2°C = 469°K 13.6 Critical Pressure: 1040 psi = 71.0 atm = 7.2 MN/m ² 13.7 Specific Gravity: 0.892 @ 20°C (liquid) 13.8 Liquid Surface Tension: 24.3 dyne/cm = 0.0243 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 1.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.212 13.12 Latent Heat of Vaporization: 242.3 Btu/lb = 138.5 cal/g = 579.8 J/g 13.13 Heat of Combustion: -11,480 Btu/lb = -6380 cal/g = -267.8 kJ/g 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: -64 Btu/lb = -34 cal/g = -14.2 kJ/g 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
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NOTES Continued on inner label.																																					

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ETHYL ETHER

Common Synonyms Anesthetic ether Sulfuric ether Ether Diethyl ether Diethyl oxide	Watery liquid Colorless Sweet odor Floats on water. Flammable, irritating vapor is produced. Boiling point is 94°F.
Avoid contact with liquid and vapor. Keep people away. Wear goggles and self-contained breathing apparatus. Shut off ignition sources and call fire department. Stop discharge, if possible. Stay upwind and use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical foam or carbon dioxide. Water may be ineffective. Do not cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, or loss of consciousness. If in eyes, flush with water. If inhaled, have victim stop and give artificial respiration. If breathing is difficult, give oxygen. If breathing is difficult, give oxygen. LIQUID Irritating to skin. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 445-4) Issue warning of high flammability. Restrict access. Evacuate area.	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms Anesthetic ether Ether Diethyl ether Ethoxyethane Diethyl oxide Sulfuric ether 3.2 Coast Guard Compatibility Classification Ether 3.3 Chemical Formula C ₄ H ₁₀ O 3.4 IMCO United Nations Numerical Designation 1.1 DLS	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Color: Sweet pungent
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved organic vapor canister mask, chemical goggles, synthetic rubber or plastic gloves. 5.2 Symptoms Following Exposure: Vapor inhalation may cause headache, nausea, vomiting, and loss of consciousness. Contact with eyes will be irritant. Skin contact from clothing wet with the chemical may cause burns. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; if breathing has stopped, apply artificial respiration; if breathing is still not giving, call a physician. EYES: flush immediately with water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 400 ppm 5.5 Short Term Inhalation Limits: 1000 ppm for 30 min 5.6 Toxicity by Ingestion: Grade 2.1 DLS to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes a slight stinging of the eye or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly. 5.10 Odor Threshold: 0.5 ppm	

6 FIRE HAZARDS 6.1 Flash Point: -40 F (-40 C) 6.2 Flammable Limits in Air: 1.8% - 36% 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide or foam. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Decompose violently when heated. 6.7 Ignition Temperature: 356 F 6.8 Electrical Hazard: Class I, group C 6.9 Burning Rate: 6.7 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 0.5 days. 8.4 Food Chain Concentration Potential: None.																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Exxon Chemical Co. Houston, Texas 77001 2. Phillips Industries Inc. 1429 Walnut Street Philadelphia, Pa. 19102 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																																				
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Reagent absolute, purified, anesthetic USP, concentrated. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Inerted. 10.4 Venting: Pressure, vacuum.																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 445-7) A P-Q-T-L-V-W	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 74.12 13.3 Boiling Point at 1 atm: 94.4 F = 34.7 C = 307.8 K 13.4 Freezing Point: -173.4 F = -116.4 C = 156.9 K 13.5 Critical Temperature: 380.4 F = 193.5 C = 466.7 K 13.6 Critical Pressure: 527 psia = 35.9 atm = 5.64 MN/m ² 13.7 Specific Gravity: 0.714 @ 20 C (measured) 13.8 Liquid Surface Tension: 17.0 dynes/cm = 0.0170 N/m @ 20 C 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 2.7 13.11 Ratio of Specific Heats of Vapor (Gas): 1.08 13.12 Latent Heat of Vaporization: 135 Btu/lb = 349 cal/g = 3.49 x 10 ³ J/kg 13.13 Heat of Combustion: -14,890 Btu/lb = -802 cal/g = -3354 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation <table data-bbox="930 1480 1169 1841"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>4</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid for Solid Irritant</td><td>0</td></tr> <tr> <td>Poisonous</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>0</td></tr> <tr> <td>Aquatic Toxicity</td><td>1</td></tr> <tr> <td>Anesthetic Effect</td><td>1</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications <table data-bbox="930 1775 1169 1841"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health (Hazard Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>4</td></tr> <tr> <td>Reactivity (Yellow)</td><td>1</td></tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	1	Liquid for Solid Irritant	0	Poisonous	2	Water Pollution		Human Toxicity	0	Aquatic Toxicity	1	Anesthetic Effect	1	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health (Hazard Blue)	2	Flammability (Red)	4	Reactivity (Yellow)	1	NOTES
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ETHYL FORMATE

Common Synonyms Formic acid ethyl ester Ethyl formate Ethyl methanoate Formic ether	Liquid Colorless Pleasant odor Floats and mixes with water. Flammable, irritating vapor is produced.
Shut off ignition sources. Call fire department. Stop if discharge if possible. Keep people away. Stay upwind. Use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	Call for medical aid. VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED: and victim is CONSCIOUS, have victim drink water or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446.4) Issue warning: high flammability, water contaminant. Restrict access. Evacuate area. Disperse and flush.	2. LABEL 
3 CHEMICAL DESIGNATIONS 31 Synonyms: Ethyl formate, ethyl methanoate, Formic acid ethyl ester, Formic ether. 32 Coast Guard Compatibility Classification: Esters (13). 33 Chemical Formula: $\text{HC}_2\text{H}_5\text{O}_2$. 34 IMCO/United Nations Numerical Designation: 3.1 (190).	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid. 42 Color: Colorless. 43 Odor: Characteristic, pleasant, aromatic.
5 HEALTH HAZARDS 51 Personal Protective Equipment: Organic container, eye mask, goggles, face shield, rubber gloves. 52 Symptoms Following Exposure: Inhalation of vapor causes slight irritation of the eyes and rapidly increasing irritation of the nose. High concentrations cause deep narcosis within a few minutes followed by death within a few hours. Contact with liquid causes moderate irritation of eyes and mild irritation of skin. Ingestion causes irritation of mouth and stomach, may cause deep narcosis and death if not treated. 53 Treatment for Exposure: INHALATION: remove from exposure, begin artificial respiration if breathing has stopped, call physician. EYES: wash with water for 15 min., call physician if needed. SKIN: wash with water for 15 min., call physician if irritation persists. INGESTION: do NOT induce vomiting; get medical attention at once. 54 Toxicity by Inhalation (Threshold Limit Value): 100 ppm. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Grade 2, oral LD_{50} = 1.850 mg/kg (rat). 57 Late Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 59 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant. May cause pain and second degree burns after a few minutes contact. 510 Odor Threshold: Data not available.	

6. FIRE HAZARDS 61 Flash Point: 10°F (0°C) - 4°F (-20°C) 62 Flammable Limits in Air: 2.8% - 10.9% 63 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide. 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 65 Special Hazards of Combustion Products: Not pertinent. 66 Behavior in Fire: Vapor is heavier than air and may travel long distance to a source of ignition and flash back. 67 Ignition Temperature: 85°F. 68 Electrical Hazard: Data not available. 69 Burning Rate: 36 mm/min.	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available. 82 Waterfowl Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): 10 days 0.5 lb/lb, 10 days. 84 Food Chain Concentration Potential: None.																																				
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: No reaction. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Not pertinent. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Ertzschke Dodge & Okott, Inc. 76 Ninth Avenue New York, N.Y. 10001 2. Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14650 3. Aldrich Chemical Co. 940 West St., Paul Avenue Milwaukee, Wis. 53233.																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446.3) A P Q R S	10 SHIPPING INFORMATION 101 Grades or Purity: 95.4% 102 Storage Temperature: Ambient. 103 Inert Atmosphere: No requirement. 104 Venting: Pressure/vacuum.																																				
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable liquid. 122 NAC Hazard Rating for Bulk Water Transportation: <table data-bbox="940 1425 1192 1694"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>1</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>2</td></tr> <tr><td>Liquid or Solid Irritant</td><td>3</td></tr> <tr><td>Poisons</td><td>3</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>2</td></tr> <tr><td>Aquatic Toxicity</td><td>3</td></tr> <tr><td>Aesthetic Effect</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>1</td></tr> <tr><td>Water</td><td>1</td></tr> <tr><td>Self Reaction</td><td>0</td></tr> </tbody> </table> 123 NFPA Hazard Classifications: <table data-bbox="940 1705 1192 1791"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>3</td></tr> <tr><td>Flammability (Red)</td><td>2</td></tr> <tr><td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	2	Liquid or Solid Irritant	3	Poisons	3	Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	1	Self Reaction	0	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid. 132 Molecular Weight: 74.1. 133 Boiling Point at 1 atm: 129.6°F = 54.2°C = 327.4°K. 134 Freezing Point: -110°F = -79°C = 194°K. 135 Critical Temperature: 455°F = 235°C = 508°K. 136 Critical Pressure: 686 psia = 46.6 atm = 4.73 MN/m ² . 137 Specific Gravity: 0.922 at 20°C (liquid). 138 Liquid Surface Tension: 24 dynes/cm = 0.024 N/m at 20°C. 139 Liquid-Water Interfacial Tension: 24 dynes/cm = 0.024 N/m at 20°C. 1310 Vapor (Gas) Specific Gravity: 2.6. 1311 Ratio of Specific Heats of Vapor (Gas): 1.014. 1312 Latent Heat of Vaporization: 176 Btu/lb = 95 cal/g = 4.1 x 10 ⁵ J/kg. 1313 Heat of Combustion: -9,500 Btu/lb = -5,500 cal/g = -220 x 10 ³ J/kg. 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: -50 Btu/lb = -25 cal/g = -1.2 x 10 ⁵ J/kg. 1316 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	1																																				
Health																																					
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NOTES continued on pages 5 and 6																																					

ETHYLHEXALDEHYDE

Common Synonyms 2-Ethylhexanal Butylhexylacetaldehyde alpha-Ethylcaproaldehyde Octyl aldehyde 2-Ethylhexaldehyde	Physical State Liquid White Mild odor Floats on water
First Aid Measures Inhalation: Remove victim to fresh air. Keep breathing. If breathing is difficult, give artificial respiration. If swallowed, give water. If on skin, wash with soap and water. If in eyes, flush with water. If inhaled, give oxygen. If on skin, wash with soap and water. If in eyes, flush with water. If swallowed, give water. If on skin, wash with soap and water. If in eyes, flush with water.	
Fire	Combustible Flammable liquid and vapor. Water may be used to extinguish the fire. Use of foam, carbon dioxide, or dry chemical extinguishers is recommended.
Exposure	Health Hazards VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Prolonged contact with clothing or skin may cause irritation. If in eyes, flush with plenty of water. If swallowed, give water. Do not induce vomiting. If swallowed and victim is unconscious, do not give anything by mouth.
Water Pollution	Effect of low concentrations in aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. Not recommended for use in water.
1 RESPONSE TO DISCHARGE (See Response Manual, CG 446-4) Minimize containment. Should be removed. Chemical and physical treatment.	2 LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Butylhexylacetaldehyde, 2-Ethylcaproaldehyde, 2-Ethylhexaldehyde, alpha-Ethylhexanal, Octyl aldehyde. 3.2 Coast Guard Competibility Classification: Aldehyde. 3.3 Chemical Formula: C ₈ H ₁₆ O. 3.4 IMCO/United Nations Numerical Designation: 1.1 (19).	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Mild characteristic.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubbers gloves, safety goggles or face shield. 5.2 Symptoms Following Exposure: Inhalation may be irritating to mucous membrane. Overexposure may cause dizziness and collapse. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, give oxygen if breathing is difficult, call a doctor. EYES: irrigate immediately for 15 min., then get medical attention. SKIN: flush with water, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, oral LD ₅₀ = 3.7 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure may cause second degree burns on long exposure. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 122°F (44°C), 112°F (44°C). 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: 387°F. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Data not available.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: May ignite spontaneously when spilled on clothing, paper or other absorbent materials. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Eastman Chemical Products, Inc., Kingsport, Tenn. 37662. 2. Union Carbide Corp., Chemicals and Plastics, 270 Park Avenue, New York, N.Y. 10017. 3. Pfaltz and Bauer, Inc., 375 Fairfield Ave., Stamford, Conn. 06907.																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U	10 SHIPPING INFORMATION 10.1 Grade or Purity: Commercial 95.0+%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arrester).																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="896 1443 1146 1705"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>2</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>1</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td> Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>2</td></tr> <tr> <td> Aquatic Toxicity</td><td>2</td></tr> <tr> <td> Nesther: Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>2</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="896 1727 1146 1814"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>1</td></tr> </tbody> </table>	Category	Rating	Fire	2	Health		Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	1	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Nesther: Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 126.25. 13.3 Boiling Point at 1 atm: 122°F = 44°C = 317°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.820 at 20°C (liquid). 13.8 Liquid Surface Tension: Data not available. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 164 Btu/lb = 91.2 cal/g = 382 x 10 ³ J/kg. 13.13 Heat of Combustion: 15,860 Btu/lb = 8,810 cal/g = 369 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	2																																				
Health																																					
Vapor Irritant	1																																				
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NOTES Continued on pages 4 and 5.																																					

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2-ETHYL HEXANOL

Common Synonyms 2 Ethyl Hexanol 2 Ethylhexyl alcohol		Only liquid	Colorless	Faint odor
		Floats on water		
Symptoms: Eye irritation Cellulitis, dermatitis Aspiration pneumonia Irritation of respiratory tract Nausea, vomiting				
Fire		Combustible Flammable liquid (Category 2) Flammable solid (Category 2)		
Exposure		CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed Harmful to aquatic life Harmful to the environment Harmful to the ozone layer Harmful to the water quality Harmful to the soil Harmful to the atmosphere		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Harmful to the environment Harmful to the water quality		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.41 Mechanical containment Chemical and physical treatment		2 LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 31 Synonyms: 2-Ethylhexanol 2-Ethylhexyl alcohol 32 Coast Guard Compatibility Classification Alcohol 33 Chemical Formula: C ₈ H ₁₈ O 34 IMCO United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Strong		
5 HEALTH HAZARDS				
51 Personal Protective Equipment: Air pack or respirator, gloves, rubber boots				
52 Symptoms Following Exposure: Anesthesia, muscular headache, dizziness, mild irritation to skin and eyes				
53 Treatment for Exposure: INHALATION: move victim to fresh air. SKIN: wash affected areas with water. EYES: flush with water for 15 min. Get medical care.				
54 Toxicity by Inhalation (Threshold Limit Value): Not pertinent				
55 Short-Term Inhalation Limits: Not pertinent				
56 Toxicity by Ingestion: Grade 2 LD ₅₀ in rats, kg/day/animal				
57 Late Toxicity: Increased excitability of central nervous system in rats and rabbits				
58 Vapor (Gas) Irritant Characteristics: Vapor causes slight irritation of the eyes, respiratory system, present in high concentrations. The effect is temporary.				
59 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smothering and reddening of the skin.				
510 Odor Threshold: Disagreeable, stable				

6. FIRE HAZARDS

6.1 Flash Point: 155 F (68 C)
 6.2 Flammable Limits in Air: Data not available
 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
 6.5 Special Hazards of Combustion Products: Not pertinent
 6.6 Behavior in Fire: Not pertinent
 6.7 Ignition Temperature: Not listed
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: 4.0 mm/min

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
 7.2 Reactivity with Common Materials: No reaction
 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
 7.5 Polymerization: Not pertinent
 7.6 Inhibitor of Polymerization: Not pertinent

8. WATER POLLUTION

8.1 Aquatic Toxicity: 19 ppm/24 hr/brine shrimp/TLM
 8.2 Waterlow Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD): 68% of theoretical in 5 days
 8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

1. Eastman Chemical Products, Inc.
Kingsport, Tenn. 37602
 2. Oxychem Enterprises
Pasadena, Calif. 91124
 3. Shell Chemical Co.
Industrial Chemicals Division
Houston, Tex. 77001
 4. Union Carbide Corp.
Chemical and Plastics Division
270 Park Avenue
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 Grades or Purity: 99.9%
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: Not required
 10.4 Venting: Open (flame arrester)

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446.3
 V T I

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Combustible Liquid
 12.2 NAS Hazard Rating for Bulk Water Transportation

Category	Rating
Fire	1
Health	1
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	1
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	2
Other Chemicals	2
Water	0
Self Reaction	0

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 140.23
 13.3 Boiling Point at 1 atm: 164.5 F = 74.2 C = 427.4 K
 13.4 Freezing Point: -135.1 F = -92.9 C = 280.3 K
 13.5 Critical Temperature: 391.1 F = 200.1 C = 473.3 K
 13.6 Critical Pressure: 512 psia = 34.8 atm = 3.55 MN/m²
 13.7 Specific Gravity: 0.814 at 20 C (liquids)
 13.8 Liquid Surface Tension: 22.7 dynes/cm = 0.0227 N/m at 20 C
 13.9 Liquid-Water Interfacial Tension: 22 dynes/cm = 0.022 N/m at 22.7 C
 13.10 Vapor (Gas) Specific Gravity: Not pertinent
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
 13.12 Latent Heat of Vaporization: 157 Btu/lb = 42 kcal/kg = 149.96 kJ/kg
 13.13 Heat of Combustion: 17,440 Btu/lb = 9,710 kcal/kg = 40,650 kJ/kg
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

See Hazard Assessment Handbook

NOTES

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2-ETHYLHEXYL ACRYLATE, INHIBITED

Common Synonyms Acrylic acid 2-ethylhexylester 2-Ethylhexyl 2-propenoate	Liquid Colorless Sharp odor Floats on water
Store in a dry, cool place. Keep away from heat and fire. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Combustible Containers may explode in fire. Combat fires from safe distance. Use protected location. Extinguish with dry chemicals or carbon dioxide. Water may be ineffective so fire. Avoid exposed containers with water.
Exposure	Call for medical aid. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Have victim drink water or milk and have victim induce vomiting. IF SKIN FLOWED: Do not induce vomiting. Have victim drink water or milk and have victim induce vomiting. IF SKIN FLOWED: Do not induce vomiting. Have victim drink water or milk and have victim induce vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to skin line. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operators of nearby water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning - water contaminant. Restrict access. Mechanical containment. Should be removed. Chemical and physical treatment.	2. LABELS No label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Acrylic acid 2-ethylhexylester, 2-Ethylhexyl 2-propenoate. 3.2 Coast Guard Compatibility Classification: Acrylate. 3.3 Chemical Formula: $\text{CH}_2=\text{CHCOO}(\text{H}_2\text{CCH}_2)_6\text{CH}_3$. 3.4 IMCO/United Nations Numerical Designation: Not listed.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Sharp, mild ester type, inoffensive.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, rubber gloves, vapor proof chemical safety goggles, impervious apron and boots. 5.2 Symptoms Following Exposure: Inhalation of concentrated vapor causes drowsiness and convulsions. Liquid causes irritation of eyes and may irritate skin on prolonged exposure. Ingestion produces same symptoms as inhalation. 5.3 Treatment for Exposure: INHALATION: Give artificial respiration and oxygen if necessary. Call a physician. EYES: Immediately flush with plenty of water for at least 15 min. Get medical attention. SKIN: Immediately flush with plenty of water for at least 15 min. INGESTION: Induce vomiting and consult a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, oral rat LD_{50} = 1,540 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are not irritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 198 F (92 C). 6.2 Flammable Limits in Air: 0.8 - 6.4. 6.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause fothing. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Heat can result in a severe polymerization with rapid release of energy. Sealed containers may rupture explosively if hot. 6.7 Ignition Temperature: 496 F. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 4.6 mm/min.	8 WATER POLLUTION 8.1 Aquatic Toxicity: 72 ppm 24 hr. Fine shrimp, H ₉₆ . 8.2 Waterflow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 92% of theoretical in 5 days, fresh water, acclimated seed. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Will polymerize in the absence of inhibitor and when heated. 7.6 Inhibitor of Polymerization: Monomethyl ether of hydroquinone, 1 - 120 ppm. Hydroquinone, 96 - 120 ppm.	9 SELECTED MANUFACTURERS 1. Celanese Chemical Company 248 Park Avenue New York, N.Y. 10017 2. Rohm and Haas Co., Inc. Independence Mall West Philadelphia, Pa. 19106 3. Union Carbide Corporation Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A L L Z	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99+. 10.2 Storage Temperature: <100 F (38 C). 10.3 Inert Atmosphere: Not requirement. 10.4 Ventings: Open flame arrester.																																				
*2. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="907 1447 1167 1723"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>1</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>0</td></tr> <tr><td>Liquid or Solid Irritant</td><td>1</td></tr> <tr><td>Poisons</td><td>1</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>1</td></tr> <tr><td>Aquatic Toxicity</td><td>2</td></tr> <tr><td>Aesthetic Effect</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>2</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="907 1734 1167 1830"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>2</td></tr> <tr><td>Flammability (Red)</td><td>2</td></tr> <tr><td>Reactivity (Yellow)</td><td>1</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	0	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 184.2. 13.3 Boiling Point at 1 atm: (polymerized) 417 F = 214 C = 487 K. 13.4 Freezing Point: -130 F = -89 C = 183 K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.885 at 20°C (liquid). 13.8 Liquid Surface Tension: (est.) 26 dynes/cm = 0.026 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: (est.) 30 dynes/cm = 0.030 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 110 Btu/lb = 61 cal/g = 2.6×10^4 J/kg. 13.13 Heat of Combustion: -15,500 Btu/lb = -8,600 cal/g = -3.6×10^7 J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: 142 Btu/lb = 79 cal/g = 3.3×10^4 J/kg.
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	0																																				
Liquid or Solid Irritant	1																																				
Poisons	1																																				
Water Pollution																																					
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Self Reaction	1																																				
Category	Classification																																				
Health Hazard (Blue)	2																																				
Flammability (Red)	2																																				
Reactivity (Yellow)	1																																				
NOTES																																					

(Continued on page 5 and 6)

EHT

ETHYL HEXYL TALLATE

Common Synonyms		Liquid	Light yellow	Mild odor
		Floats on water		
Stop discharge if possible Call fire department Isolate and remove discharged material Notify local health and pollution control agencies				
Fire		Combustible Extinguish with dry chemical, foam, or carbon dioxide		
Exposure		Not harmful		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify local health and welfare officials Notify operators of nearby water intakes		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444.4. Mechanical treatment Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulation		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethylhexyl 3.2 Coast Guard Compatibility Classification: Ex-1 3.3 Chemical Formula: (Mixture) 3.4 IMCO United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Pale yellow 4.3 Odor: Mild, characteristic		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Data not available 5.2 Symptoms Following Exposure: Data not available 5.3 Treatment for Exposure: Data not available 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point: 195°F (90°C)		8.1 Aquatic Toxicity: Data not available	
6.2 Flammable Limits in Air: Data not available		8.2 Waterfowl Toxicity: Data not available	
6.3 Fire Extinguishing Agents: Data not available		8.3 Biological Oxygen Demand (BOD): Data not available	
6.4 Fire Extinguishing Agents Not to be Used: Data not available		8.4 Food Chain Concentration Potential: None	
6.5 Special Hazards of Combustion Products: Not pertinent			
6.6 Behavior in Fire: Not pertinent			
6.7 Ignition Temperature: Data not available			
6.8 Electrical Hazard: Not pertinent			
6.9 Burning Rate: Data not available			
		9 SELECTED MANUFACTURERS	
		Arizona Chemical Co. 111 West 1st St. New York, N.Y. 10020	
		2. Union Carbide Corp. Plastics Division 270 Park Ave. New York, N.Y. 10017	
7 CHEMICAL REACTIVITY			
7.1 Reactivity with Water: Not reactive			
7.2 Reactivity with Common Materials: Not reactive			
7.3 Stability During Transport: Stable			
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent			
7.5 Polymerization: Not pertinent			
7.6 Inhibitor of Polymerization: Not pertinent			
		10 SHIPPING INFORMATION	
		10.1 Grades or Purity: Data not available	
		10.2 Storage Temperature: Ambient	
		10.3 Inert Atmosphere: No equipment	
		10.4 Venting: Open flame arresters	
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444.3 ALC 11			
12 HAZARD CLASSIFICATIONS		13 PHYSICAL AND CHEMICAL PROPERTIES	
12.1 Code of Federal Regulations: Not listed		13.1 Physical State at 15°C and 1 atm: Liquid	
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed		13.2 Molecular Weight: Not pertinent	
12.3 NFPA Hazard Classifications: Not listed		13.3 Boiling Point at 1 atm: Not listed	
		13.4 Freezing Point: Not listed	
		13.5 Critical Temperature: Not listed	
		13.6 Critical Pressure: Not listed	
		13.7 Specific Gravity: (est.) 0.95 at 20°C (liquid)	
		13.8 Liquid Surface Tension: 30.4 dynes/cm = 0.0304 N/m at 24°C	
		13.9 Liquid-Water Interfacial Tension: 28 dynes/cm = 0.028 N/m at 21.3°C	
		13.10 Vapor (Gas) Specific Gravity: Not pertinent	
		13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent	
		13.12 Latent Heat of Vaporization: Not pertinent	
		13.13 Heat of Combustion: Not listed = (Heat of Formation) - 28.8 kcal/mol	
		13.14 Heat of Decomposition: Not pertinent	
		13.15 Heat of Solution: Not pertinent	
		13.16 Heat of Polymerization: Not pertinent	
		See inside cover page for notes	
NOTES			

REVISED 1978

ELT

ETHYL LACTATE

Common Synonyms ethyl 2-hydroxyacetate ethyl 2-hydroxypropionate ethyl 2-hydroxypropanoate		Liquid	Colorless	Mild odor								
Mixes with water												
Vapors irritate the eyes, nose, throat, and respiratory tract. Ingestion causes irritation of the mouth and throat. Ingestion of large quantities may cause nausea and vomiting.												
Fire	Combustible Flammable liquid (F+), Flammable solid (F+) Flash point: 114°F (40°C) Boiling point: 121°F (49°C) Freezing point: -111°F (-80°C)											
Exposure	LIQUID Harmful if swallowed Irritant to eyes, nose, throat, and respiratory tract. Ingestion of large quantities may cause nausea and vomiting.											
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not recommended for use in water bodies.											
1 RESPONSE TO DISCHARGE See Response: Spills Handbook, CG 446-4 Issue warning: water, start main Dispense and flush		2 LABELS No label required by Code of Federal Regulations										
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethyl alpha-hydroxypropionate, Ethyl 2-hydroxypropionate, Ethyl DL-lactate, Ethyl D,L-lactate, Ethyl 2-hydroxypropanoate 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₅ H ₁₀ O ₃ 3.4 IMCO/United Nations Numerical Designation: 1111		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild characteristic										
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation of concentrated vapor may cause drowsiness. Contact with liquid causes mild irritation of eyes and on prolonged contact with skin ingestion may cause nausea. 5.3 Treatment for Exposure: INHALATION: remove person to fresh air. EYES and SKIN: flush with water. INGESTION: induce vomiting, get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Irritant to the GI tract, may cause nausea. 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available												
6 FIRE HAZARDS 5.1 Flash Point: 114°F (40°C) 5.2 Flammable Limits in Air: 3.5 - 11.4 5.3 Fire Extinguishing Agents: Water, dry chemical, alcohol foam, carbon dioxide 5.4 Fire Extinguishing Agents Not to be Used: Not pertinent 5.5 Special Hazards of Combustion Products: Not pertinent 5.6 Behavior in Fire: Not pertinent 5.7 Ignition Temperature: 527°F 5.8 Electrical Hazard: Data not available 5.9 Burning Rate: Data not available												
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent												
8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None												
9 SELECTED MANUFACTURERS 1. Kay-Tee Chemicals, Inc. 941 Lexington Avenue New York, N.Y. 10017 2. Aceto Chemical Co. 12502 Northern Boulevard Flushing, N.Y. 11358 3. Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14650												
10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Vapor flame arresters												
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A P Q												
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>3</td></tr><tr><td>Reactivity (Yellow)</td><td>1</td></tr></table>					Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	1
Category	Classification											
Health Hazard (Blue)	2											
Flammability (Red)	3											
Reactivity (Yellow)	1											
13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 116.1 13.3 Boiling Point at 1 atm: 121°F = 49°C = 322°K 13.4 Freezing Point: -111°F = -80°C 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.90 at 20°C (liquid) 13.8 Liquid Surface Tension: 29.2 dynes/cm at 20°C; 26.5 at 25°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 1060 cal/g = 4437 Btu/lb 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent												
NOTES												

EMC

ETHYL MERCAPTAN

Common Synonyms Ethanethiol Mercaptothane Ethyl sulfide Thioethyl alcohol	Liquid Colorless to yellow Strong skunk-like odor Floats and mixes slowly with water. Poisonous flammable vapor is produced. Boiling point is 96°F.
AVOID CONTACT WITH LIQUID AND VAPOR. KEEF PEOPLE AWAY. Wear goggles and self-contained breathing apparatus. Shut off gas supply and remove from area. Stop discharging immediately. Stay upwind. Use water spray to knock down vapor. Isolate and free any discharged material. Notify local health and safety authorities.	
Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, carbon dioxide, or water. Water may be effective free of oil. Do not use extended outdoor water lines.
 Exposure	CAUTION: MEDICAL VAPOR POISONOUS IF INHALED. May cause irritation. If breathed, have person move to fresh air. If breathing is difficult, call a doctor. LIQUID POISONOUS IF SWALLOWED. If SWALLOWED and conscious, give 1-2 glasses of water. Do not induce vomiting. If SWALLOWED and unconscious, do not give anything by mouth. Call a doctor. EXPOSURE If SWALLOWED and unconscious, do not give anything by mouth. Call a doctor.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not a health hazard. Not a pollutant. Not a pollutant of surface waters.
1 RESPONSE TO DISCHARGE See Response Methods in Section 2.5.4.4.4. Issue warning. High flammability. Aerial discharges may be flammable. Post warnings. Evacuate area. Dispose and flush.	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethanethiol, Ethyl mercaptan, Mercaptothane, Thioethyl alcohol. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: C ₂ H ₅ SH 3.4 IMCO/United Nations Numerical Designation: 1275	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to yellow 4.3 Odor: Strong skunk-like odor
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing and shoes. 5.2 Symptoms Following Exposure: Irritation of eyes, nose, throat, and skin. High concentrations cause unconsciousness and death. 5.3 Treatment for Exposure: INHALATION: Move to fresh air. If breathing is difficult, call a doctor. EYES: Flush with water. SKIN: Wash with soap and water. INGESTION: Do not induce vomiting. Call a doctor. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm 5.5 Short-Term Inhalation Limits: 10 ppm (15 min) 5.6 Toxicity by Ingestion: Grade 3 (LD ₅₀ 1.5 g/kg) 5.7 Late Toxicity: May cause irritation of eyes, nose, throat, and skin. 5.8 Vapor (Gas) Irritant Characteristics: Irritant to eyes. 5.9 Liquid or Solid Irritant Characteristics: Irritant to skin. 5.10 Odor Threshold: 118 ppm	

6 FIRE HAZARDS 6.1 Flash Point: 40-100°C 6.2 Flammable Limits in Air: 3.5-15% 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Breathing fumes of sulfur dioxide are generated. 6.6 Behavior in Fire: Vapor is heavier than air and may travel long distances. A source of ignition and flash back containers may explode in fire. Breathing fumes are released when heated. 6.7 Ignition Temperature: 570°C 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive. 7.2 Reactivity with Common Materials: Not reactive. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Permut Chemicals Chemicals Division 100 Parkway Philadelphia, PA 19102 2. Phillips Petroleum Company Chemical Department Special Products Division Bartlesville, OK 74004 Eastman Kodak Company Eastman Organic Chemicals Rochester, NY 14640								
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, U.S. 446.3 APOELVA	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.9% 10.2 Storage Temperature: Room temp. 10.3 Inert Atmosphere: Not required. 10.4 Venting: Pressure vessels.								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations, 1910.106: Not classified. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard</td> <td>3</td> </tr> <tr> <td>Flammability</td> <td>4</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> </tbody> </table>	Category	Classification	Health Hazard	3	Flammability	4	Reactivity	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 62 13.3 Boiling Point at 1 atm: 30.6°C (87.1°F) 13.4 Freezing Point: -114.1°C (-173.4°F) 13.5 Critical Temperature: 214.1°C (417.4°F) 13.6 Critical Pressure: 20.9 atm (21.1 MN/m ²) 13.7 Specific Gravity (20°C/20°C): 0.81 13.8 Liquid Surface Tension: 21.5 dynes/cm (0.0215 N/m) at 20°C 13.9 Liquid-Vapor Interfacial Tension: 16.5 dynes/cm (0.0165 N/m) at 20°C 13.10 Vapor (Gas) Specific Gravity: 2.0 13.11 Ratio of Specific Heats of Vapor (Gas): 1.04 at 20°C 13.12 Latent Heat of Vaporization: 34.5 kJ/mol (8.29 kcal/mol) at 20°C 13.13 Heat of Combustion: -1485 kJ/mol (-354 kcal/mol) at 20°C 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard	3								
Flammability	4								
Reactivity	1								
NOTES Continued on page 1446.									

ETM

ETHYL METHACRYLATE

Common Synonyms Ethyl methacrylate inhibited Methacrylic acid, ethyl ester Ethyl 2-methacrylate Ethyl alpha-methylmethacrylate Ethyl 2-methyl-2-propenoate	Liquid Floats on water	Colorless Sharp, unpleasant odor
NFPA Hazardous Materials Classification: NFPA 220: 2.1 (Health), 2.2 (Irritation), 2.3 (Reactivity) NFPA 704: 2 (Health), 1 (Irritation), 1 (Reactivity) NFPA 704: 2 (Health), 1 (Irritation), 1 (Reactivity) NFPA 704: 2 (Health), 1 (Irritation), 1 (Reactivity)		
Fire	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Toxic gases may be evolved in fire. Water may be ineffective in fire. Extinguish with foam or water spray.	
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If eyes are affected, remove contact lenses if possible and flush with water. If breathing apparatus is required, use self-contained breathing apparatus. If necessary, use full-face respirator. LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush skin with plenty of water. If swallowed, do not induce vomiting. Give water to drink. If SWALLOWED, do not induce vomiting. If SKIN OR EYES have contact, flush with water or milk. If SWALLOWED, do not induce vomiting. If NECESSARY, use PAINKILLERS. If necessary, use full-face respirator.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. NFPA 704: 2 (Health), 1 (Irritation), 1 (Reactivity) NFPA 704: 2 (Health), 1 (Irritation), 1 (Reactivity)	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4. Issue water, high flammability. Remove excess. Mechanical containment. Should be removed. Chemical and physical treatment.		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethyl 2-methacrylate, Ethyl methacrylate, inhibited, Ethyl alpha-methylmethacrylate, Ethyl 2-methyl-2-propenoate, Methacrylic acid, ethyl ester. 3.2 Coast Guard Compatibility Classification: Aries 1. 3.3 Chemical Formula: CH ₃ CH=CHCOOCH ₂ CH ₃ 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Acrid, sick.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: In persons gloves, splash goggles, self-contained breathing apparatus if exposed to vapors or mists. 5.2 Symptoms Following Exposure: Inhalation may cause irritation to the upper respiratory tract. Ingestion may cause irritation to the mouth and stomach. Contact with liquid may cause irritation. 5.3 Treatment for Exposure: INHALATION: Remove person to fresh air. Apply artificial respiration if breathing is impaired. INGESTION: Induce vomiting. Call a physician. EYES: Wash with copious amounts of water for 15 minutes. Call a physician. SKIN: Flush with water. Wash thoroughly. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3, LD ₅₀ 4 g/kg body wt. 5.7 Late Toxicity: Causes birth defects in experimental animals. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS 6.1 Flash Point: 55-100-50-100°C 6.2 Flammable Limits in Air: 1.5-11.1% 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: Sealed containers may rupture, explosively if hot. Heat can cause a violent polymerization reaction with rapid release of energy. Vapors are heavier than air and can travel to source of ignition and flash back. 6.7 Ignition Temperature: 740-1 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 4 Minimum/min.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: If proper concentration of inhibitor is not present or when material is hot, a violent polymerization reaction may occur. 7.6 Inhibitor of Polymerization: Oxygen in the air inhibits polymerization.	9 SELECTED MANUFACTURERS 1 Polysciences, Inc. Paul Valley Industrial Park Warrington, Pa. 18976 Rohm and Haas Independence Mall West Philadelphia, Pa. 19106 2 E. I. du Pont de Nemours & Co., Inc. Plastics Dept. Polymer Products Division Wilmington, Del. 19898.								
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) 2112	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical. 10.2 Storage Temperature: Below 38°C (100°F). 10.3 Inert Atmosphere: Ventilated container. 10.4 Venting: Open flame arrestor.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable; liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table data-bbox="937 1463 1163 1550"> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 114. 13.3 Boiling Point at 1 atm: 24.1-25.1°C (75-77°F). 13.4 Freezing Point: -9.5°C (-15°F) to -12.2°C (-10°F). 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.941 at 20°C (68°F). 13.8 Liquid Surface Tension: Data not available. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: 1.9. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.04. 13.12 Latent Heat of Vaporization: 170 Btu/lb. (36.9 kcal/kg). 13.13 Heat of Combustion: 12,670 Btu/lb. (29,400 kJ/kg). 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: -118 Btu/lb. (-27.1 kcal/kg) to -106 Btu/lb. (-24.4 kcal/kg).
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	3								
Reactivity (Yellow)	0								
NOTES									

(continued on pages 1 and 2)

ETN

ETHYL NITRITE

Common Synonyms Nitrous ether Sweet spirit of nitre Spirit of ether nitrite	Liquid Colorless to light yellow Pleasant odor Floats on water. May boil on water. Boiling point 18°C (64°F)
Shut off flames or sources. Call fire department. Stop discharge if possible. Keep people away. Evacuate and remove discharging material. Notify local health and fire departments.	
Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus if you have respiratory distress or are in an enclosed space. Extinguish with water. Do not use water on a leaking container.
Exposure	VAPOR If inhaled will cause headache, dizziness, or loss of consciousness. Move victim to fresh air. If breathing apparatus is not available, use mouth-to-mouth respiration. LIQUID If swallowed will cause headache or loss of consciousness. If swallowed, do not induce vomiting. Give water to drink. If swallowed, do not induce vomiting. Give water to drink.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and fire departments.
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4. Issue warning: High flammability. Restrict access. Evacuate area. Disperse and flush.	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Nitrous ether. Spirit of ether nitrite. Sweet spirit of nitre. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: C ₂ H ₅ NO 3.4 IMCO/United Nations Numerical Designation: 1102	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Pungent, ethereal, characteristic
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles, face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation irritant. Skin causes headache, increased pulse rate, decreased blood pressure, and unconsciousness. Contact with liquid irritates eyes and skin. 5.3 Treatment for Exposure: INHALATION: Remove victim from exposure. If breathing has stopped, provide artificial respiration. Call physician. EYES: Flush with water. If contact with liquid, get medical attention. SKIN: Flush with water. Wash with soap and water. INGESTION: Do NOT induce vomiting. Give water to drink. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS

- 6.1 Flash Point: 18°C (64°F)
- 6.2 Flammable Limits in Air: 3.5-12.5%
- 6.3 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide.
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent.
- 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen are generated.
- 6.6 Behavior in Fire: Vapors are heavier than air and may travel a considerable distance from source of ignition and flash back. Can decompose violently above 194°C. Containers may explode at 150°C.
- 6.7 Ignition Temperature: 194°C
- 6.8 Electrical Hazard: Data not available.
- 6.9 Burning Rate: Not pertinent.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
- 8.2 Waterfowl Toxicity: Data not available.
- 8.3 Biological Oxygen Demand (BOD): Data not available.
- 8.4 Food Chain Concentration Potential: None.

9 SELECTED MANUFACTURERS

Mallory-Kelly Chemical Works
 224 West Side Avenue
 P.O. Box 104
 Jersey City, N.J. 07310
 Pfaff and Bawie, Inc.
 126-04 Northern Boulevard
 Flushing, N.Y. 11355

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
- 7.2 Reactivity with Common Materials: No reaction.
- 7.3 Stability During Transport: Stable if stored in a cool place and not exposed to strong light.
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
- 7.5 Polymerization: Not pertinent.
- 7.6 Inhibitor of Polymerization: Not pertinent.

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: When shipped as 1102, this is pure ethyl nitrite.
- 10.2 Storage Temperature: Cool, ambient.
- 10.3 Inert Atmosphere: Not required.
- 10.4 Venting: Safety relief.

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3.
 ABCDEF

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable liquid.
- 12.2 HAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	2
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Poisons	1
Water Pollution	
Human Toxicity	
Aquatic Toxicity	
Acute Toxicity	
Reactivity	
Other Chemicals	
Water	1
Self-Reaction	4
- 12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard/Risks	1
Flammability (Red)	2
Reactivity (Yellow)	2

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid.
- 13.2 Molecular Weight: 75.
- 13.3 Boiling Point at 1 atm: 18.1°C (64.6°F).
- 13.4 Freezing Point: -11.3°C (10.9°F).
- 13.5 Critical Temperature: Not pertinent.
- 13.6 Critical Pressure: Not pertinent.
- 13.7 Specific Gravity: 0.895 at 15°C.
- 13.8 Liquid Surface Tension: 22.1 dyne/cm at 15°C.
- 13.9 Liquid-Water Interfacial Tension: 15 dyne/cm at 15°C.
- 13.10 Vapor (Gas) Specific Gravity: 1.5.
- 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available.
- 13.12 Latent Heat of Vaporization: 370 kcal/kg (1550 Btu/lb).
- 13.13 Heat of Combustion: 12,100 kcal/kg (50,600 Btu/lb).
- 13.14 Heat of Decomposition: Not pertinent.
- 13.15 Heat of Solution: Not pertinent.
- 13.16 Heat of Polymerization: Not pertinent.

NOTES

EPS

ETHYLPHENYLDICHLOROSILANE

Common Synonyms	Liquid Colorless Sharp irritating odor Reacts with water. Explosive gases produced on contact with water.
AVOID CONTACT WITH SKIN. IF CONTACT OCCURS, WASH IMMEDIATELY WITH WATER. AVOID CONTACT WITH EYES. IF CONTACT OCCURS, FLUSH IMMEDIATELY WITH WATER.	
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE EXTINGUISH WITH WATER
Exposure	ACUTE TOXICITY DATA GAS PRODUCED IN REACTION WITH WATER POISONOUS IF INHALED Irritating to eyes, nose and throat LIQUID Will burn skin and eyes Harmful if swallowed ENVIRONMENTAL Slightly soluble in water. Not biodegradable. Not volatile.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Manual: CG 444.4 Avoid running, minimize water contamination. Restrict access. Disperse and flush to waste.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: N-ethylphenyldichlorosilane 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $C_6H_5CH_2SiCl_2$ 3.4 IMCO/United Nations Numerical Designation: 1.170	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sharp like hydrochloric acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Acid vapor type respiratory protection, rubber gloves, chemical worker's goggles, other equipment as necessary to protect skin and eyes. 5.2 Symptoms Following Exposure: Inhalation irritates nose and throat. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air, give artificial respiration if needed, call physician. EYES: Flush with water for 15 min., obtain medical attention immediately. SKIN: Flush with water, obtain medical attention if burning has occurred. The EMISSION of extremely toxic gases, plus large amounts of water, depending on setting, get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 1.1. Dose 1000-12 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very toxic to the eyes. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: $>150^{\circ}\text{F}$ (60) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water spray 6.5 Special Hazards of Combustion Products: Toxic hydrogen chloride and phosgene fumes may be formed. 6.6 Behavior in Fire: Difficult to extinguish; reignition may occur. Contact with water applied to radiant fires will generate a cloud of hydrogen chloride gas. 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts with water to generate hydrogen chloride, then hydrochloric acid. 7.2 Reactivity with Common Materials: Will react with surface moisture to evolve hydrogen chloride which is corrosive to common metals. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, ring with sodium bicarbonate or some solution. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Dow Corning Corporation P.O. Box 902 Midland, Mich. 48686																												
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual: CG 444.3 A 0	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure vacuum																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: 1.170 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>2</td></tr> <tr> <td>Health</td><td>2</td></tr> <tr> <td>Vapor Irritant</td><td>2</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td>Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td>2</td></tr> <tr> <td>Human Toxicity</td><td>2</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Acute Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td>2</td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>4</td></tr> <tr> <td>Self-Reaction</td><td>2</td></tr> </tbody> </table> 12.3 NFPA Hazard Classification: Not used	Category	Rating	Fire	2	Health	2	Vapor Irritant	2	Liquid or Solid Irritant	4	Poisons	2	Water Pollution	2	Human Toxicity	2	Aquatic Toxicity	2	Acute Effect	2	Reactivity	2	Other Chemicals	2	Water	4	Self-Reaction	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 206.1 13.3 Boiling Point at 1 atm: $>400^{\circ}\text{F}$ or $>205^{\circ}\text{C}$ or $>422^{\circ}\text{K}$ 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.9 at 15°C (liquid) 13.8 Liquid Surface Tension: 102 + 25 dynes/cm + 0.027 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 101 Btu/lb or 23.4 cal/g or 2.4 x 10 ⁵ J/kg 13.13 Heat of Combustion: 10000 Btu/lb or 4540 cal/g or 2.0 x 10 ⁷ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	2																												
Health	2																												
Vapor Irritant	2																												
Liquid or Solid Irritant	4																												
Poisons	2																												
Water Pollution	2																												
Human Toxicity	2																												
Aquatic Toxicity	2																												
Acute Effect	2																												
Reactivity	2																												
Other Chemicals	2																												
Water	4																												
Self-Reaction	2																												
NOTES																													

EPD

ETHYL PHOSPHONOTHIOIC DICHLORIDE, ANHYDROUS

Common Symptoms		Liquid	Colorless	Choking odors
Effect: Choking odors if dichloride		Reacts with water. Poisonous gas is produced on contact with water.		
No data available on possible health effects. (Excludes phosphorus dichloride) No data available on possible health effects.				
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE. Wear proper and sufficient respiratory apparatus. Extinguish with dry chemical or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE.			
	CALL FOR MEDICAL AID. GAS PRODUCED IN REACTION WITH WATER POISONOUS IF INHALED. Irritating to eyes, nose and throat. May be harmful if breathed. If breathed has a rapid onset of respiratory distress and breathing is difficult after exposure. INGESTION Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, do not induce vomiting. Seek medical aid at once.			
Exposure				
Water Pollution	Effect of low concentrations on aquatic life unknown. May be dangerous if it enters water intakes. No data available on biodegradability. No data available on persistence in the environment.			
1. RESPONSE TO DISCHARGE See Response Handling Manual, CG 446-6. Avoid contact with water. Contaminant. Reacts with water. Dispense and flush with water.		2. LABEL 		
3. CHEMICAL DESIGNATION* 3.1 Synonym: Ethyl phosphonothioic dichloride. (Excludes phosphorus dichloride) 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: C ₂ H ₄ Cl ₂ P ₂ S ₂ 3.4 IMCO/United Nations Numerical Designation: 1.102		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Astringent, chlorine		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air mask, rubber or neoprene gloves, goggles, goggles. 5.2 Symptoms Following Exposure: Irritation to eyes, nose, throat, and skin. If inhaled, symptoms may be delayed 24 hours. If inhaled, symptoms may be delayed 24 hours. If inhaled, symptoms may be delayed 24 hours. If inhaled, symptoms may be delayed 24 hours. 5.3 Treatment for Exposure: INHALATION: Remove victim from exposure. Oxygen can be used if pulmonary symptoms develop. If necessary, give complete rest. Because effects may be delayed 24 hours, continue observation for 24 hours. If symptoms develop, give medical attention. INGESTION: Give large amounts of water and induce vomiting. Do not induce vomiting if patient is unconscious. SKIN: Wash thoroughly with soap and water. EYES: Flush with water for 15 minutes. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2.1 (Data not available). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 6.1 Flash Point: Data not available. 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water, foam. 6.5 Special Hazards of Combustion Products: Oxides of sulfur, phosphorus, hydrogen chloride and phosgene. 6.6 Behavior in Fire: On contact with water or exposed to adjacent fires will produce irritating fumes of hydrogen chloride. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts with water to produce hydrogen chloride (hydrochloric acid). 7.2 Reactivity with Common Materials: Will react with surface materials to produce hydrogen chloride, which may corrode common metals. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flood with water. If fire with sodium bicarbonate or other suitable agent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Ethyl Corporation Industrial Chemical Division Ethyl Tower 4000 Baton Rouge, La. 70802 Phillips and Baker, Inc. 2000 Northern Boulevard Flushing, N.Y. 11354
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 446-5. A 0	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Required with 2.1 classification. 10.4 Venting: Pressure relief.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not applicable. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not coded. 12.3 NFPA Hazard Classifications: Not coded.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 166. 13.3 Boiling Point at 1 atm: 102.1°C (215.8°F). 13.4 Freezing Point: -10.0°C (14°F). 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.27 at 15°C (liquid). 13.8 Liquid Surface Tension: 24.5 dyne/cm at 15°C (liquid). 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: 11,500 Btu/lb (4,280 cal/g). 13.14 Heat of Dissolution: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Fusion: Not pertinent.
NOTES	

EPP

ETHYL PHOSPHORODICHLORIDATE

Common Synonyms Phosphorodichloric acid ethyl ester Ethyl dichlorophosphate		Liquid Reacts with water. Irritating gas is produced on contact with water.	Colorless	Choking odor
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear self-contained breathing apparatus and protective clothing, including gloves. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Fire data not available		
Exposure		Call for medical aid. VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. Move victim to fresh air. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: corrosive water, contaminant. Restrict access. Disperse and flush with care.		2 LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethyl dichlorophosphate Phosphorodichloric acid ethyl ester 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₂ H ₄ OCl ₂ P ₂ O 3.4 IMCO/United Nations Numerical Designation: N/1760		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Acidic, choking		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles and face shield, self-contained or air-line respirator, rubber gloves, boots, and clothing. 5.2 Symptoms Following Exposure: Inhalation of vapor irritates nose and throat. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: remove victim from exposure; if his breathing has stopped, start artificial respiration; call a doctor. EYES: flush with water for at least 15 min; get medical attention for burns. SKIN: flush with water; get medical attention for burns. INGESTION: do NOT induce vomiting; give large amounts of water, followed by milk or milk of magnesia. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam 6.5 Special Hazards of Combustion Products: Irritating fumes of hydrogen chloride and phosphoric acid may be formed 6.6 Behavior in Fire: Contact with water applied to adjacent fires produces irritating fumes of hydrogen chloride 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Factor: Not available
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts with water to evolve hydrogen chloride (hydrochloric acid) 7.2 Reactivity with Common Materials: Will react with surface moisture to evolve hydrogen chloride, which is corrosive to common metals 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flood with water; rinse with sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Aldrich Chemical Co. 940 West Saint Paul Ave. Milwaukee, Wis. 53233 2. Pfaltz and Bauer, Inc. 126-04 Northern Boulevard Flushing, N. Y. 11368
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A G	10 SHIPPING INFORMATION 10.1 Grades or Purity: 97% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive 12.2 NAS Hazard Rating for Bulk Materials Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 162.9 13.3 Boiling Point at 1 atm: 333°F = 167°C = 340°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.35 at 15°C (liquid) 13.8 Liquid Surface Tension (est.): 32 dyne/cm = 0.032 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion (est.): -4,700 Btu/lb = -2,600 cal/g = -110 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

NOTES

EPA

2-ETHYL-3-PROPYLACROLEIN

Common Synonyms 2-Ethyl-2-butenal 2-Ethyl-3-propylacrylaldehyde	Liquid Yellow Floats on water
Accidental Release Wear goggles, suit, gloves, and other appropriate protective clothing including shoes. Notify local fire department. Notify local health department. Notify local environmental agency.	
Fire	Combustible Will burn. If in contact with apparatus and rubber covered things, melted glass. Extinguish with dry chemical or carbon dioxide. Do not spread contamination with water.
Exposure	CAUTION MEDICAL AID LIQUID Will burn skin and eyes. Harmful if swallowed. Run water into affected clothing and flush. Flush affected areas of skin with water. IF IN EYES, hold eyes open and flush with plenty of water. IF SWALLOWED, get person to CONSIDER having to drink water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health department. Notify local environmental agency.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.2) Mechanical containment Should be removed Chemical and physical treatment	2 LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Ethyl-2-butenal 2-Ethyl-3-propylacrylaldehyde 3.2 Coast Guard Compatibility Classification: Aldehyde 3.3 Chemical Formula: $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCO}_2\text{H}$ 3.4 IMCO/United Nations Numerical Designation: 1.1 (19)	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow 4.3 Odor: Sharp, powerful, irritating
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing, eye protection, approved respirator for high vapor concentrations. 5.2 Symptoms Following Exposure: Vapor is irritating. Contact produces skin and eye irritation. 5.3 Treatment for Exposure: Remove from exposure. Wash affected areas of body with water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 to 5 g/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Causes smothering of the skin and first degree burns on short exposure, may cause secondary burns on long exposure. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 155°F (63°C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 200°C 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 82% theoret. 10 days. 8.4 Food Chain Concentration Potential: None.																												
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.2) ATU	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure/vacuum.																												
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation <table data-bbox="922 1401 1178 1681"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>2</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>3</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td> Poisons</td><td>3</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>3</td></tr> <tr> <td> Aquatic Toxicity</td><td>3</td></tr> <tr> <td> Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>2</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed.	Category	Rating	Fire	2	Health		Vapor Irritant	3	Liquid or Solid Irritant	2	Poisons	3	Water Pollution		Human Toxicity	3	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 126.2. 13.3 Boiling Point at 1 atm: 283°F = 175°C = 448°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.887 at 15°C (liquids). 13.8 Liquid Surface Tension: 28.2 dyne/cm = 0.0282 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 140 dyne/cm = 0.04 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: -15,610 Btu/lb = -8670 cal/g = -363×10^3 J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	2																												
Health																													
Vapor Irritant	3																												
Liquid or Solid Irritant	2																												
Poisons	3																												
Water Pollution																													
Human Toxicity	3																												
Aquatic Toxicity	3																												
Aesthetic Effect	2																												
Reactivity																													
Other Chemicals	2																												
Water	0																												
Self Reaction	1																												
NOTES																													

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REVISED 1976

Common Synonym		Waters: liquid		Colorless		Mild odor	
Tetraethyl silicate Silibond Tetraethyl orthosilicate Ethyl orthosilicate Ethyl silicate 40 Ethyl silicate condensed		May float or sink in water. Reacts slowly with water.					
Stop discharge if possible. Keep people away. Call fire department. Isolate and remove discharged material to protect public health and pollution environment.							
Fire		Combustible Extinguish with water. Dry chemicals. Do not use carbon dioxide.					
Exposure		Call for medical aid. LIQUID Irritating to eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If EYES: Flush eyes for 15 minutes. Flush with plenty of water. If SWALLOWED: Do not induce vomiting. Have victim drink water if conscious. If unconscious, do not drink. If SWALLOWED and victim is unconscious, DO NOT INDUCE VOMITING. If SWALLOWED and victim is conscious, DO NOT INDUCE VOMITING. If SWALLOWED and victim is conscious, DO NOT INDUCE VOMITING.					
Water Pollution		Effect of low concentrations on aquatic life is unknown. Polluting to shoreline. May be dangerous if it enters water intakes. No direct health hazard to humans. No significant effect on aquatic life.					
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4)				2. LABELS			
Disperse and flush.				No label required by Code of Federal Regulations.			
3 CHEMICAL DESIGNATIONS				4 OBSERVABLE CHARACTERISTICS			
3.1 Synonyms: Ethyl orthosilicate, Ethyl silicate 40, Ethyl silicate, condensed, Silibond, Tetraethyl orthosilicate, Tetraethyl silicate. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $(C_2H_5)_4SiO_2$. 3.4 IMCO/United Nations Numerical Designation: 1.3, 2.2.				4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Mild and non-oxidizing.			
5 HEALTH HAZARDS							
5.1 Personal Protective Equipment: Rubber or polyethylene gloves, safety glasses or other form of eye protection, self-contained breathing apparatus or one that absorbs organic vapors. 5.2 Symptoms Following Exposure: Inhalation of vapor causes eye and nose irritation, unsteadiness, tremors, salivation, respiratory difficulty, and unconsciousness. Contact with liquid irritates eye and may cause dryness, cracking, and inflammation of skin. Ingestion may produce nausea, vomiting, and cramps. 5.3 Treatment for Exposure: INHALATION: move patient from contaminated atmosphere if his breathing has ceased, start mouth-to-mouth artificial respiration; oxygen if available should be administered only by an experienced person when authorized by a physician; keep patient warm and comfortable; call physician immediately. EYES: flush immediately with large quantities of running water for at least 15 min.; obtain medical attention if irritation persists. SKIN: immediately flush affected areas with large volumes of water; obtain medical attention if irritation persists. INGESTION: give large amounts of water or warm salty water and induce vomiting; milk, eggs or olive oil may then be given; obtain medical attention if abdominal discomfort persists. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm. 5.5 Short-Term Inhalation Limit: 300 ppm for 30 min. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Liver, kidney, and lung damage may result from overexposures by inhalation or ingestion. 5.8 Vapor (Gas) Irritant Characteristics: Data not available.							

6 FIRE HAZARDS 6.1 Flash Point: 125°F (50° - 99°F) C 6.2 Flammable Limits in Air: 1.3% - 23% 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Data not available 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 4.4 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts slowly forming non-toxic silica and ethyl alcohol 7.2 Reactivity with Common Materials: Causes swelling and hardening of some plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Sta-Her Chemical Company Specialty Chemical Division Westport, Conn. 06880 2. Union Carbide Corporation Chemicals and Plastics Div. 279 Park Avenue New York, N.Y. 10017 3. Du-Sarmit Nobel of America, Inc. 105 Stonehurst Road Northvale, N.J. 07647								
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Manual, CG 446-3) ACTUARY	10. SHIPPING INFORMATION 10.1 Grades or Purity: 90-95% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: On a (flame) test								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations Combustible Liquid 12.2 NFPA Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 708.3 13.3 Boiling Point at 1 atm: 336°F = 169°C = 442°K 13.4 Freezing Point: -121.2°F = -85.5°C = 187°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.933 at 20°C, liquid 13.8 Liquid Surface Tension: 22.8 dynes/cm = 0.0228 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 6.8 Btu/lb = 534 cal/g = 2.2 x 10³ J/kg 13.13 Heat of Combustion: (cal/g) = 12,000 Btu/lb = -6,700 cal/g = -280 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	2								
Reactivity (Yellow)	0								

(Continued on pages 5 and 6)

5 HEALTH HAZARDS (Cont'd.)

5.9 Liquid or Solid Irritant Characteristics: Data not available

5.10 Odor Threshold: 85 ppm

ETHYLTRICHLOROSILANE

Common Synonyms Trichloroethyl silane Ethylsilane trichloride Ethylsilane trichlorosilane Trichloroethyl siloxane	Liquid Reacts violently with water. Irritating gas is produced on contact with water.	Colorless Sharp irritating odor
AVOID CONTACT WITH EYES, SKIN AND AIR. KEEP PEOPLE AWAY Wear goggles. Use contained breathing apparatus and self-rescuer if doing breathing apparatus. Shut off ignition sources. Call fire department. Self-rescuer if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE Containers may explode in fire. Rapid fire along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide or foam. Water may be ineffective in fire. Use of exposed containers with water.	
Exposure	First aid for medical aid. VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If in EYES, hold eye closed and flush with plenty of water. IF SWALLOWED, do not induce vomiting. Have victim drink water if able. DO NOT INDUCE VOMITING.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution officials. Notify operators of nearby water intakes.	
1. RE. ONSE TO DISCHARGE (See Response Methods Manual, CG 444-4) Issue warning: high flammability Confine Restrict access Dispense: under pressure 3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethylsilane, trichloride Ethylsilane trichloride Trichloroethylsilane Trichloroethylsilane 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C₂H₅SiCl₃ 3.4 IMCO/United Nations Numerical Designation: 1.2+1196	2. LABEL  4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sharp hydrochloric acid like pungent acid	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Full protective clothing and vapor type respirators protection rubber gloves chemical worker's goggles other equipment as necessary to protect skin and eyes 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact with liquid causes severe burns of eyes and skin. Ingestion causes burns of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: remove victim from exposure administer artificial respiration if breathing has stopped call physician EYES: flush with water for 15 minutes obtain medical attention immediately SKIN: flush with water obtain medical attention immediately if irritation persists INGESTION: give large amounts of water get medical attention 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, oral LD₅₀ = 1,370 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact. Causes severe injury to the eyes. 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS 6.1 Flash Point: 57 °C 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Toxic hydrogen chloride and phosgene gases, a form 6.6 Behavior in Fire: Vapors lighter than air and may travel a considerable distance to a source of ignition and flash back. Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires will produce irritating hydrogen chloride fumes 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 2.0 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously, evolving hydrogen chloride and hydrochloric acid 7.2 Reactivity with Common Materials: Reacts with surface moisture to form hydrogen chloride, which is corrosive to common metals 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flood with water, rinse with sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Union Carbide Corporation Chemicals and Plastics Div. 270 Park Avenue New York, N.Y. 10017 2. Dow Corning Corporation P.O. Box 592 Midland, Mich. 48640 3. Petrarich Systems P.O. Box 143 Levittown, Pa. 19059																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Code, 12-2000, CG 446.3) A O	10 SHIPPING INFORMATION 10.1 Grade or Purity: 99.5% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not recommended 10.4 Venting: Pressure vacuum																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>4</td> </tr> <tr> <td>Health</td> <td>4</td> </tr> <tr> <td>Vapor Irritant</td> <td>4</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>4</td> </tr> <tr> <td>Poisons</td> <td>4</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td></td> </tr> <tr> <td>Aquatic Toxicity</td> <td></td> </tr> <tr> <td>Anesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>4</td> </tr> <tr> <td>Water</td> <td>4</td> </tr> <tr> <td>Self-Reaction</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	4	Health	4	Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	4	Water Pollution		Human Toxicity		Aquatic Toxicity		Anesthetic Effect	2	Reactivity		Other Chemicals	4	Water	4	Self-Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 163.5 13.3 Boiling Point at 1 atm: 210°F = 99 °C = 372°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.24 at 25 °C (liquid) 13.8 Liquid Surface Tension: (red.) 25 dynes/cm = 0.025 N/m at 20 °C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 6.4 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 104 Btu/lb = 54 cal/g = 2.4 x 10³ J/kg 13.13 Heat of Combustion: (red.) -4,400 Btu/lb = -2,000 cal/g = -100 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	4																																				
Health	4																																				
Vapor Irritant	4																																				
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Flammability (Red)	2																																				
Reactivity (Yellow)	0																																				

(Continued on pages 5 and 6)

NOTES

FAC

FERRIC AMMONIUM CITRATE

Common Synonyms Ammonium ferric citrate Ferric ammonium citrate, brown Ferric ammonium citrate, green		Solid	Red, green or brown	Odorless
		Sinks and moves slowly with water		
Avoid contact with solid and dust. Keep people away. Stop discharge if possible. In lab and room are: Inhaled: irritates eyes, nose and throat. No data on health and pollution effects of this chemical.				
Fire	Not flammable			
Exposure	CUTE FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If in eyes: If eyes are open and there is a place to wash If breathing has stopped, give artificial respiration If breathing is difficult, give oxygen SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting Run if contaminated clothing catches fire If on affected areas with plenty of water IF IN EYES: hold eyelids open and flush with plenty of water IF SWALLOWED and it is not a CONSUMABLE: also clean mouth with water or milk IF SWALLOWED and it is not a CONSUMABLE: DO NOT INDUCE VOMITING If vomiting occurs, keep person lying down			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes. No data on health and pollution effects of this chemical. No data on health and pollution effects of this chemical.			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2 LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium ferric citrate Ferric ammonium citrate, brown Ferric ammonium citrate, green 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: Mixture of $\text{Fe}(\text{C}_6\text{H}_5\text{O}_7)_3$ and water of hydration 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Red, green or brown 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved respirator for nuisance dust, chemical goggles or face shield 5.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eyes and causes mild irritation of skin on prolonged contact 5.3 Treatment for Exposure: INGESTION: give large amount of water. EYES or SKIN: flush with water 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m ³ (as dust) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS

- 6.1 Flash Point: Not flammable
 6.2 Flammable Limits in Air: Not flammable
 6.3 Fire Extinguishing Agents: Not pertinent
 6.4 Fire Extinguishing Agents Not to be Used:
 6.5 Special Hazards of Combustion Products:
 Toxic oxides of nitrogen or ammonia gas may be formed in fires.
 6.6 Behavior in Fire:
 6.7 Ignition Temperature: Not pertinent
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
 8.2 Waterlow Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD):
 Data not available
 8.4 Food Chain Concentration Potential:
 None

9. SELECTED MANUFACTURERS

- Pfizer Chemicals Div.
234 E. 42nd St.
New York, N.Y. 10017
- Mallinckrodt Chemical Works
223 Westside Ave.
P.O. Box 384
Jersey City, N.J. 07303
- Gairland Schlesinger Chemical Mfg. Co.
584 Mincola Ave.
Carle Place, N.Y. 11514

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
 7.2 Reactivity with Common Materials:
 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
 7.5 Polymerization: Not pertinent
 7.6 Inhibitor of Polymerization: Not pertinent

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Commercial
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 SS

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15° and 1 atm: Solid
 13.2 Molecular Weight: Not pertinent (mixture)
 13.3 Boiling Point at 1 atm: Not pertinent (decomposes)
 13.4 Freezing Point: Not pertinent
 13.5 Critical Temperature: Not pertinent
 13.6 Critical Pressure: Not pertinent
 13.7 Specific Gravity: 1.8 at 20°C (solid)
 13.8 Liquid Surface Tension: Not pertinent
 13.9 Liquid-Water Interfacial Tension: Not pertinent
 13.10 Vapor (Gas) Specific Gravity: Not pertinent
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
 13.12 Latent Heat of Vaporization: Not pertinent
 13.13 Heat of Combustion: Not pertinent
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
 12.2 NAS Hazard Rating for Bulk Water Transport: Not listed
 12.3 NFPA Hazard Classifications: Not listed

NOTES

FERRIC AMMONIUM OXALATE

Common Synonyms Ammonium ferric oxalate trihydrate Ammonium trioxalatoferrate trihydrate	Solid powder Yellowish-green Light burnt sugar odor	Sinks and mixes with water
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED	
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing It causes irritation upon contact with skin or water If inhaled may cause irritation of the respiratory tract It may irritate the eyes, nose and throat SOLID Will burn skin and eyes If swallowed will cause nausea and vomiting It may cause irritation of the skin and eyes Food and beverages with peroxide of water IF IN EYES: Flush eyes with plenty of water IF SWALLOWED: Do not induce vomiting. Give water to drink IF SWALLOWED: Do not induce vomiting. Give water to drink IF SWALLOWED: Do not induce vomiting. Give water to drink IF SWALLOWED: Do not induce vomiting. Give water to drink	
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not recommended for use in water bodies Not recommended for use in water bodies	
1 RESPONSE TO DISCHARGE See Response Methods Handbook (O-644-4) Is a warning water contaminant Disperse and flush	2 LABELS No hazard label required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium ferric oxalate trihydrate Ammonium trioxalatoferrate trihydrate 3.2 Coast Guard Compatibility Classification Not listed 3.3 Chemical Formula: $\text{Fe}(\text{NH}_4)(\text{C}_2\text{O}_4)_3 \cdot 3\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellowish green 4.3 Odor: Light burnt sugar odor	
5. HEALTH HAZARDS		
5.1 Personal Protective Equipment: Approved dust respirator, rubber or plastic eye shield, gloves, chemical goggles or face shield 5.2 Symptoms Following Exposure: Inhalation of dust may cause irritation of nose and throat. Ingestion causes burning pain in throat and stomach. Muscular weakness, headache, white crass also causes vomiting, weak pulse, card. muscular collapse and death. Contact with dust irritates eyes and skin may cause severe skin burns 5.3 Treatment for Exposure: Treat victim promptly. INHALATION: move to fresh air, get medical attention. If symptoms persist. INSTILLATION: give immediately a dilute solution of any soluble substance, such as calcium lactate, lime water, chalk or milk, induce vomiting, get medical attention. A skin or eye contact of the dust is and delayed contact of exophthalmos. FLUSH: flush with water and get medical attention. SKIN: flush with water 5.4 Toxicity by Inhalation (Threshold Limit Value): Long term exposure 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS	8 WATER POLLUTION
6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen, carbon monoxide and carbon monoxide dinitrate 6.6 Behavior in Fire 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY	9 SELECTED MANUFACTURERS
7.1 Reactivity with Water: Not pertinent 7.2 Reactivity with Common Materials 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	Phelps Chemicals Div. 245 E. 42nd St. New York, N.Y. 10017 2. Plafiz and Bacter, Inc. 455 Fairfield Ave. St. Louis 6, Mo. 63102
11 HAZARD ASSESSMENT CODE	10 SHIPPING INFORMATION
See Hazard Assessment Handbook, CG 444-2 SS	10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS	13 PHYSICAL AND CHEMICAL PROPERTIES
12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13.1 Physical State at 15°C and 1 atm.: Solid 13.2 Molecular Weight: 426 13.3 Boiling Point at 1 atm.: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.78 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

FCL

FERRIC CHLORIDE

Common Synonyms Iron III chloride Iron perchloride Iron trichloride Ferric chloride anhydrous Ferric chloride, hexahydrate		Solid Greenish black Odorless Sinks and mixes with water
Avoid contact with skin and eyes. If contact occurs, wash immediately with large amounts of water. If swallowed, do not induce vomiting. Seek medical attention immediately.		
Fire	Not flammable	
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Will burn skin and eyes. If swallowed will cause nausea and vomiting. IF SWALLOWED: Do not induce vomiting. If swallowed, do not induce vomiting. If swallowed, do not induce vomiting.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3 Synonyms: Ferric chloride anhydrous Ferric chloride hexahydrate, Iron (III) chloride, Iron perchloride, Iron trichloride 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: FeCl ₃ or FeCl ₃ ·6H ₂ O 34 IMCO/United Nations Numerical Designation: N 1774		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: Anhydrous: greenish black Hydrate: brown 43 Odor: None
5. HEALTH HAZARDS 51 Personal Protective Equipment: Dust respirator if required; rubber apron and heavy chemical worker's goggles or face shield 52 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Ingestion causes irritation of mouth and stomach. Dust in late eyes. Prolonged contact with skin causes irritation and burns. 53 Treatment for Exposure: INGESTION: Give large amounts of water; induce vomiting if large amounts have been swallowed. EYES: Immediately flush with streams of water for at least 15 minutes; get medical attention promptly. SKIN: Flush with water. 54 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m ³ (airborne) 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade 2.1 Dose: 5 g/kg (rat) 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Not pertinent 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: Data not available		

6. FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used 65 Special Hazards of Combustion Products: Irritating hydrogen chloride fumes may form in fire 66 Behavior in Fire: 67 Ignition Temperature: Not pertinent 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not pertinent	8. WATER POLLUTION 81 Aquatic Toxicity: 1.2 ppm 144 hr stickleback harmful fresh water 1 ppm 240 hr stickleback safe fresh water 15 ppm 96 hr daphnia 11 m fresh water 82 Waterflow Toxicity: Data not available 83 Biological Oxygen Demand (BOD): None 84 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: Water solutions are acidic and corrosive to most metals 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Flush with water; rinse with dilute sodium bicarbonate or soda ash solutions 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Pennwalt Corp Three Parkway Philadelphia, Pa. 19102 2 Dow Chemical Co Midland, Mich. 48640 3 J. T. Baker Chemical Co Phillipsburg, N. J. 08865
	10. SHIPPING INFORMATION 101 Grades or Purity: Anhydrous Hydraulic Reagent 46% solution in water 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NN	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 162.20 (anhydrous) 133 Boiling Point at 1 atm: Not pertinent (decomposes) 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 2.84 at 0°C (anhydrous solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: (anhydrous) -460 Btu/lb (solid) -84.4 x 10³ J/kg 1316 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: ORM-B 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed	
NOTES	

FCP

FERRIC GLYCEROPHOSPHATE

Common Synonyms		Solid	Greenish brown to greenish yellow
		Sinks and mixes with water	
Avoid contact with solid and dust. Keep people away. Stop discharge if possible. Isolate and remove discharged material. Notify local water authority and local health department.			
Fire	Not flammable		
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, flush eyes open and flush with plenty of water. If on face, flush with plenty of water and if still on face, breathe fresh air. If breathing is difficult, use oxygen. SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected area with plenty of water. If IN EYES, flush eyes open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water and have victim spit it out. If SWALLOWED and victim is UNCONSCIOUS OR HAVING SEIZURES, do nothing except keep victim warm.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify authorities if low level threat. Notify authorities if health water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Dispense and flush		2. LABELS No hazard label required by Code of Federal Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{Fe}(\text{C}_2\text{H}_3\text{O}_2)_3 \cdot 5\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Greenish brown, greenish yellow 4.3 Odor: None	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, dust mask, rubber gloves 5.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Contact with dust irritates eyes and non-protected contact skin. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting if large amount has been swallowed. EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Limit not listed 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Odorless			

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
	9 SELECTED MANUFACTURERS 1. Platt and Bauer, Inc. 175 Fairfield Ave. Stanford, Conn 06062 2. Shepherd Chemical Co. 2400 B. East Columbus, Ohio 43212
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-2 XX	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 470 (approx.) 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.5 (approx.) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
Continued on page 1 and 4 NOTES	

FNT	FERRIC NITRATE
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FNT	FERRIC NITRATE
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Common Synonyms Ferric nitrate nonahydrate Nitric acid, iron(III) salt		Solubility Green, colorless to pale violet Odorless
Sinks and mixes with water		
As solid, it will sublimate just as easily as it dissolves. Sublimation is reversible. Isotonic and tends to discharge 1 material. Not a health hazard. Pollution: Not aggressive.		
Fire	Not flammable Will increase the intensity of a fire. The solids, if ignited, will burn.	
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If it comes to nose, rubs up nose, flush with plenty of water If breathing becomes difficult, get to fresh air immediately If breathing is difficult, get to fresh air SOLID Irritating to skin and eyes Harmful if swallowed If on skin, wash immediately with plenty of water If on face, get to eye doctor with plenty of water If IN EYES, flush eyes open and flush with plenty of water If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, Do nothing except keep victim awake	
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not a water quality problem Not a pollution problem in water bodies	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ferric nitrate nonahydrate Nitric acid, iron(III) salt 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: Fe(NO₃)₉H₂O 3.4 IMCO/Units, & Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Green, colorless to pale violet 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust irritates eye and can irritate skin on prolonged contact. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting if large amounts have been swallowed. EYES: flush with water, get medical attention if irritation persists. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m (as dust) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD₅₀ 5.5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen and nitric acid vapor may form in fires 6.6 Behavior in Fire: In contact with combustible materials will increase the intensity of a fire. Apply water to avoid containers or spilled material 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Solutions are corrosive to most metals Contact of solid with wood or paper may cause fire 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Industrial Chemicals Div. P.O. Box 70 Morristown, N.J. 07960 2. J. I. Baker Chemical Co. Phillipsburg, N.J. 08865 3. Gallard Schlenker Chemicals, Inc. 584 Minolta Ave. Clark Place, N.Y. 11514
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 416.3) NA 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	10 SHIPPING INFORMATION 10.1 Grade or Purity: Technical, 99.9% Analytical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open 13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 304.07 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 117°C = 243°F = 320°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.7 at 20°C (solids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 45.8 kJ/mole = 22 cal/g = 0.02 x 10³ J/g 13.16 Heat of Polymerization: Not pertinent
Continued on page 1 and 2	
NOTES	

FSF

FERRIC SULFATE

Common Synonyms Iron(III) sulfate Iron sesquioxide Iron sesquioxide		Solid Gray to white Odorless Sinks and mixes slowly with water
Fire Not flammable		
Exposure DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.		
Water Pollution Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4 Dispense and flush		2 LABELS See Hazard Labels Handbook, CG 446.3 Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Iron sesquioxide, Iron(III) sulfate, Ferric sulfate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: Fe ₂ (SO ₄) ₃ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Gray to white 4.3 Odor: None
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles, face shield, protective gloves. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Dust in eyes causes irritation. Skin contact causes irritation. 5.3 Treatment for Exposure: INHALATION: Move to fresh air. If breathing is difficult, give oxygen. If water induces vomiting, flush mouth with water. If swallowed, drink water. If skin contact, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not listed. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 0.75 ppm, 12-24 hr. shiners carp, suckers, killed. Fresh water. 250 ppm, 48 hr. mosquitofish 11% fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Corrosive to copper, copper alloys, mild steel, and galvanized steel 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. F. I. Baker Chemical Co. Phillipsburg, N. J. 08865 2. Ches Service Co. Industrial Chemicals Div. 1445 Peachtree Road, N. E. Atlanta, Ga. 30326 3. Mannesmann Chemical Works 221 Westside Ave. P. O. Box 184 Jersey City, N. J. 07310
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3 NS	10 SHIPPING INFORMATION 10.1 Grades or Purity: Anhydrous Hydrate *FE sometimes shipped as water solutions which are acids 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 399.88 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 3.1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 64.3 Btu/lb. = 246 cal/g = 1.24 x 10³ J/kg 13.16 Heat of Polymerization: Not pertinent
<i>(Continued on pages 4 and 5)</i>	
NOTES	

FAS

FERROUS AMMONIUM SULFATE

Common Synonyms: Mohr's salt Iron ammonium sulfate Ferrous ammonium sulfate hexahydrate	Solid	Pale blue-green	Odorless
	Sinks and mixes slowly with water		
As a general rule, the following information is provided for the purpose of providing a basis for the user to determine the appropriate protective measures to be taken. The user should consult the appropriate regulatory agencies for more detailed information.			
Fire	No. flammable		
Exposure	ALL FORMS: ALL AGES DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If inhaled in large amounts may cause irritation of the respiratory tract. If swallowed may cause irritation of the mouth and stomach. If swallowed in large amounts may cause irritation of the digestive tract. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. If swallowed in large amounts may cause irritation of the digestive tract. If swallowed in large amounts may cause irritation of the digestive tract. If swallowed in large amounts may cause irritation of the digestive tract.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		

4. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating and toxic; ammonia and oxides of nitrogen may form in fires 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. General Chemical Div. 4. Astoria New York, N.Y. 10004 2. J. T. Baker Chemical Co. Phillipsburg, N.J. 08865 3. W. R. Grace Chemical Works 233 Westside Ave. P.O. Box 104 Jersey City, N.J. 07310
10. SHIPPING INFORMATION 10.1 Grades or Purities: Technical 99-102% Reagent 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	

1. RESPONSE TO DISCHARGE (See Response Methods Manual, CG 445-4.) Disperse and flush.	2. LABELS No hazard label required by code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium ferrous sulfate; Ammonium iron sulfate; Ferrous ammonium sulfate hexahydrate; Iron ammonium sulfate; Mohr's salt 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $Fe^{+2}(NH_4)_2(SO_4)_6 \cdot 6H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Pale blue-green 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles and eye shield, protective gloves. 5.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat; ingestion causes irritation of mouth and stomach; dust irritates eyes and causes irritation if swallowed; irritation. 5.3 Treatment for Exposure: INGESTION: give large amount of water and induce vomiting; if large amounts have been swallowed, 1 EYE: NO SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m³ as dust. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 ED₀₁ 5 g/kg rat. 5.7 Late Toxicity: May cause eye degeneration in rabbits. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

11. HAZARD ASSESSMENT CODE (See Hazard Assessment Manual, CG 446-3.) XX	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 1 and 1 atm: Solid 13.2 Molecular Weight: 392.14 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.86 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classification: Not listed	

NOTES

FEC

FERROUS CHLORIDE

Common Synonyms: Iron dichloride Iron protochloride Ferrous chloride tetrahydrate	Solid Pale green Odorless Sinks and mixes freely with water
No discharge prevention Avoid contact with skin and eyes Avoid contact with clothing No special handling instructions	
Fire	Not flammable
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. If in contact with skin or clothing, remove contaminated clothing and wash exposed areas with plenty of water. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Flush the mouth with water and spit out. If in eyes, wash with plenty of water for at least 15 minutes. If swallowed, do not induce vomiting. Give a glass of water to drink. If swallowed, do not induce vomiting. Give a glass of water to drink.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. No restrictions on disposal.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41 Disperse and flush	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ferrous chloride tetrahydrate, Iron dichloride, Iron protochloride 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: FeCl ₂ ·4H ₂ O 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Pale green 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Ingestion causes irritation of mouth and stomach. Dust in eyes, nose and throat causes irritation. In prolonged contact. 5.3 Treatment for Exposure: INHALATION: Move to fresh air. INGESTION: If large amounts are swallowed, do not vomit. Rinse mouth and get medical help. EYES: Flush with plenty of water for at least 15 minutes. Get medical help promptly if effects develop. SKIN: Wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): mg/m ³ as dust 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2.1 Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride fumes may form in fire. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: <18 ppm/48 hr daphnia toxic, fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Solutions may corrode metals. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. Mallinckrodt Chemical Works 223 Westside Ave. P.O. Box 164 Jersey City, N.J. 07301 3. K. A. Chemicals Inc. 2750 Des Plaines Ave. Des Plaines, Ill. 60018
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 NS	10. SHIPPING INFORMATION 10.1 Grades or Purities: Technical 35% solution in water. 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Vecting: Open 13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 151.9 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.54 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -18.8 kJ/mole (-10.4 cal/gm x 0.42 x 10 ³ J/kg) 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 HFPA Hazard Classification: Not listed	
NOTES	

FFB

FERROUS FLUOROBORATE

Common Synonyms Ferrous borofluoride	Liquid Yellow-green Sinks and mixes with water
AVOID CONTACT WITH LIQUID AND VAPOR. KEEPTIGHTLY AWAY FROM HEAT, FLAME, AND OPEN FLAMES. Do not breathe dust or fumes. Do not get on skin or clothes. Do not get in eyes, nose, or mouth. Do not swallow.	
Fire	Not flammable Irritating gases may be produced when heated
 Exposure	ALL TOP MEMBERS VAPOR POISONOUS IF INHALED Irritating to skin and eyes If swallowed will cause nausea and vomiting If in eyes, flush with water for at least 15 minutes If swallowed, do not induce vomiting. Seek medical attention immediately.
Water Pollution	Effect of low concentration on aquatic life is unknown May be dangerous if it enters water intakes Do not discharge into water bodies
1 RESPONSE TO DISCHARGE See Response Methods Manual (Form CG 445-4) Toxic materials - water contamination Dispersal and flush	2. LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ferrous borofluoride 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{FeBF}_4 \cdot \text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow-green 4.3 Odor: Data not available
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Irritation caused by contact with skin and eyes and irritation of contact with eyes or skin causes irritation 5.3 Treatment for Exposure: INGESTION: Give large amount of water. Induce vomiting per medical attention. EYES: Flush with water for at least 15 min. SKIN: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not listed 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS American Heavy Metal Chemicals and Products Division Somerset, N.J. 08856 Harshaw Chemical Corp. 2400 West Street Milwaukee, Wisc. 53212 Platts and Bazel, Inc. 175 Fairfield Ave. Stamford, Conn. 06902
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual (Form CG 445-3) N.P.	10 SHIPPING INFORMATION 10.1 Grades or Purity: Not applicable in water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: None
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 220.0 g/mole (approx) 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.65 (at 20°C liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

FOX

FERROUS OXALATE

Condition: See page 10 Oxalic acid ferrous salt Iron pyruvate Ferrous oxalate dihydrate	Solid Yellow Odorless Sinks in water
No significant health hazards are known. No significant environmental hazards are known.	
Fire	Not flammable
Exposure	DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Method Manual, CS 444.4 Not to be permitted Chemical and physical hazards	2. LABELS No hazard label required by U.S. Dept. of Federal Regulation
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ferrous oxalate dihydrate, Ferrous bispyruvate, Oxalic acid pyruvate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{FeC}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Pale yellow 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, gloves, eye protection, apron 5.2 Symptoms Following Exposure: Inhalation: Coughing, sore throat, difficulty breathing and chest pain. Ingestion: Nausea, vomiting, diarrhea and abdominal pain. If swallowed will cause nausea, vomiting or loss of consciousness. 5.3 Treatment for Exposure: Inhalation: Remove to fresh air. If breathing is difficult, give oxygen. Ingestion: Give milk or water to drink. Do not induce vomiting unless instructed to do so by a physician. If swallowed will cause nausea, vomiting or loss of consciousness. 5.4 Toxicity by Inhalation (Threshold Limit Value): (Data not available) 5.5 Short-Term Inhalation Limits: (Data not available) 5.6 Toxicity by Ingestion: (Data not available) 5.7 Late Toxicity: (Data not available) 5.8 Vapor (Gas) Irritant Characteristics: (Data not available) 5.9 Liquid or Solid Irritant Characteristics: (Data not available) 5.10 Odor Threshold: (Data not available)	

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: (Data not available) 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: (Data not available) 8.2 Waterfowl Toxicity: (Data not available) 8.3 Biological Oxygen Demand (BOD): (Data not available) 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not pertinent 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Union Carbide Corp. 444 Peachtree Road, N.E. Atlanta, Ga. 30308 2. Pfizer and Kaelin, Inc. 174 Fairfield Ave. Stamford, Conn. 06907
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CS 444.2 II	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: None
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 174 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

(continued on page 1 and 2)

FRS

FERROUS SULFATE

Common Synonyms Iron vitriol Green vitriol Copperas Iron (ous) sulfate	Solid Green Odorless Sinks and mixes with water
Do not remove this label material It is flammable and pollutes the environment	
Fire	Not flammable
Exposure	CALL FOR MEDICAL AID SOLID If swallowed will cause nausea, vomiting or loss of consciousness If SWALLOWED, do not induce vomiting. Have victim drink water or milk if available. Do not give food or drink until if SWALLOWED, do not induce vomiting. Have victim drink water or milk if available. Do not give food or drink until if SWALLOWED, do not induce vomiting. Have victim drink water or milk if available. Do not give food or drink until
Water Pollution	HARMFUL TO AQUATIC LIFE AT VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Do not pour down drain or into water
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446.4) Disperse and flush	2 LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 31 Synonyms: Copperas Green vitriol Iron(ous) sulfate Iron vitriol 32 Coast Guard Compatibility Classification Not applicable 33 Chemical Formula: FeSO ₄ · 7H ₂ O 34 IMCO United Nations Numerical Classification: Not listed	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: Green 43 Odor: Odorless
5 HEALTH HAZARDS 51 Personal Protective Equipment: Mask if dust is present 52 Symptoms Following Exposure: INGESTION: abdominal pain, itching, diarrhea, dehydration, shock, pallor, cyanosis, rapid or weak pulse, shallow respiration, low blood pressure 53 Treatment for Exposure: INGESTION: give milk immediately and then induce vomiting by stroking the pharynx with a blunt object such as a spoon handle. Gastric lavage with 1 pint of 1% aqueous solution of mono- or disodium phosphate if promptly available; otherwise, with water. Give medicine. 54 Toxicity by Inhalation (Permissible Limit Value): Not pertinent 55 Short-Term Inhalation Limit: None listed 56 Toxicity by Ingestion: Grade 2 LD ₅₀ 9.5 to 56 g/kg (r.p.) 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Not pertinent 59 Liquid or Solid Irritant Characteristics: None 60 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Not flammable 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not flammable	8 WATER POLLUTION 81 Aquatic Toxicity: 100 ppm 42 hr. LC50 fish (fresh water) No ppm 48 hr. shrimp 100% salt water 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Colum Corp. 530 North East Loop San Antonio, Tex. 78209 2. N.I. Industries, Inc. Titanium Pigment Division St. Louis, Mo. 63111 3. Phizer, Inc. C.K. Williams & Co. Division 640 N. 14th St. Easton, Pa. 18042
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook CG 446.3 NS	10 SHIPPING INFORMATION 101 Grades or Purity: USP Commercial 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirements 104 Venting: Open
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 278.06 133 Boiling Point at 1 atm: Not pertinent 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.90 at 15°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
NOTES	

(Continued on page 546)

FFX

FLUORINE

Common Synonyms		Liquefied gas	Clear to yellow	Very irritating odor
Liquid sinks and boils in water. Poisonous visible vapor cloud is produced.				
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear chemical protective suit. Stop discharge if possible. Evacuate area in case of large discharge. Notify local health and pollution control agencies.				
Fire		Not flammable WILL CAUSE FIRE AND REACT VIOLENTLY WITH COMBUSTIBLES. POISONOUS GAS IS PRODUCED IN FIRE. Wear chemical protective suit with self-contained breathing apparatus. Combat fires from behind barrier with ammonia hose holder or monitor nozzle. Cool exposed containers with water.		
Exposure		CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Will cause frostbite. Flush affected areas with plenty of water. If in EYES, hold eyes open and flush with plenty of water. DO NOT RUB AFFECTED AREAS.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.7.) Issue warning. Isolate. Restrict access. Evacuate area.		2. LABELS OXIDIZER POISON		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: F ₂ 3.4 IMCO/United Nations Numerical Designation: 2.0 1045		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Compressed gas. 4.2 Color: Pale yellow. 4.3 Odor: Strong pungent intense.		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Tight fitting chemical goggles specified during not only ignited by fluorine gas.				
5.2 Symptoms Following Exposure: Severe burning of eyes, skin and respiratory system. The burns may develop slowly after exposure.				
5.3 Treatment for Exposure: Flush all affected parts with water for at least 15 min. Do NOT use ointments. Administer artificial respiration and oxygen if required.				
5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm.				
5.5 Short-Term Inhalation Limits: 0.5 ppm for 5 min.				
5.6 Toxicity by Ingestion: Not pertinent.				
5.7 Late Toxicity: Severe burns may develop slowly after exposure.				
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.				
5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.				
5.10 Odor Threshold: 0.025 ppm.				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: Not flammable	8.1	Aquatic Toxicity: 2.5 ppm * trout, 11 mg/l in water * Time period not specified
6.2	Flammable Limits in Air: Not flammable	8.2	Waterfowl Toxicity: Data not available
6.3	Fire Extinguishing Agents: Not pertinent	8.3	Biological Oxygen Demand (BOD): None
6.4	Fire Extinguishing Agents Not to be Used: Do not direct water onto flowing leaks	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: Toxic gases generated in fires involving fluorine		
6.6	Behavior in Fire: Dangerously reactive gas Ignites most combustibles	9. SELECTED MANUFACTURERS	
6.7	Ignition Temperature: Not flammable	1.	Air Products and Chemicals, Inc. Allentown, Pa. 18105
6.8	Electrical Hazard: Not pertinent	2.	Allied Chemical Corp. Specialties Chemicals Division Baton Rouge, La. 70821
6.9	Burning Rate: Not flammable	3.	Union Carbide Corp. Nuclear Division 270 Park Ave. New York, N.Y. 10017
7 CHEMICAL REACTIVITY			
7.1	Reactivity with Water: Reacts with water to form hydrogen fluoride, oxygen and oxygen difluoride	10 SHIPPING INFORMATION	
7.2	Reactivity with Common Materials: Reacts violently with all combustible materials except the metal cylinders in which it is shipped	10.1	Grades or Purity: 98%
7.3	Stability During Transport: Stable	10.2	Storage Temperature: Ambient
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent	10.3	Inert Atmosphere: No requirement
7.5	Polymerization: Not pertinent	10.4	Venting: Safety relief
7.6	Inhibitor of Polymerization: Not pertinent		
11 HAZARD ASSESSMENT CODE* (See Hazard Assessment Handbook, CG 446.3) N/C		13 PHYSICAL AND CHEMICAL PROPERTIES	
12. HAZARD CLASSIFICATIONS		13.1	Physical State at 15°C and 1 atm: Gas
12.1	Code of Federal Regulations: Non-Flammable Gas	13.2	Molecular Weight: 38.00
12.2	NAS Hazard Rating for Bulk Water Transportation: Not listed	13.3	Boiling Point at 1 atm: 366.1°F = 188.1°C = 355.3 K
12.3	NFPA Hazard Classifications	13.4	Freezing Point: -362.1°F = -219.0°C = 54.2 K
	Category Classification	13.5	Critical Temperature: -109.8°F = -122.1°C = 151.1 K
	Health Hazard (Blue) 1	13.6	Critical Pressure: 58.7 psia = 58.7 atm = 5.87 MPa
	Flammability (Red) 0	13.7	Specific Gravity: 1.50 = 1.50 g/cm ³ liquid
	Reactivity (Yellow) 3	13.8	Liquid Surface Tension: Not pertinent
		13.9	Liquid-Water Interfacial Tension: Not pertinent
		13.10	Vapor (Gas) Specific Gravity: Not pertinent
		13.11	Ratio of Specific Heats of Vapor (Gas): 1.36
		13.12	Latent Heat of Vaporization: 114.6 Btu/lb = 33.3 kJ/kg
		13.13	Heat of Combustion: Not pertinent
		13.14	Heat of Decomposition: Not pertinent
		13.15	Heat of Solution: Not pertinent
		13.16	Heat of Polymerization: Not pertinent
		* N = hazard in major hazard	
NOTES			

REVISED 1978

FSL

FLUOSILICIC ACID

Common Synonyms Hydrofluosilicic acid Hexafluorosilicic acid Silicofluoric acid Fluosilicic acid Sand acid	Liquid Sinks and mixes with water	Colorless Sharp unpleasant odor
Avoid contact with liquid and vapor. Keep personnel away. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Not Flammable Irritating gases may be produced when heated	
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If eyes are affected, open and flush with plenty of water. If breathing has stopped, use artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF SWALLOWED , do not induce vomiting. Do not drink water or milk. IF SWALLOWED and you are unconscious, have someone drink water for you. Do not induce vomiting or have someone do so.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local authority for further action. Notify operators of water treatment works.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4.) Issue warning to toxic. Restrict access. Disperse and flush.		2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Fluosilicic acid, Hexafluorosilicic acid, Hydrofluosilicic acid, Hydrogen hexafluorosilicic acid, Sand acid, Silicofluoric acid. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: H_2SiF_6 3.4 IMCO/United Nations Numerical Designation: 8.1775		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Transparent, straw-colored, colorless. 4.3 Odor: Acid, sharp.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, safety glasses, protective clothing. 5.2 Symptoms Following Exposure: Inhalation of vapor produces severe corrosive effect on mucous membrane. Ingestion causes severe burns of mouth and stomach. Contact with liquid or vapor causes severe burns of eyes and skin. 5.3 Treatment for Exposure: INHALATION: remove person to fresh air, get medical attention. INGESTION: give large amounts of water, do NOT induce vomiting. EYES: immediately wash with water for 15 min. call physician. SKIN: wash affected parts with water, treat as for hydrogen fluoride burns with calcium gluconate solution. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 LD₅₀ Threshold: Data not available.		

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable.
 6.2 **Flammable Limits in Air:** Not flammable.
 6.3 **Fire Extinguishing Agents:** Not pertinent.
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
 6.5 **Special Hazards of Combustion Products:** Irritating fumes of hydrogen fluoride may form in fire.
 6.6 **Behavior in Fire:** Not pertinent.
 6.7 **Ignition Temperature:** Not pertinent.
 6.8 **Electrical Hazard:** Not pertinent.
 6.9 **Burning Rate:** Not pertinent.

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available.
 8.2 **Waterfowl Toxicity:** Data not available.
 8.3 **Biological Oxygen Demand (BOD):** None.
 8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

1. W. R. Grace & Co.
 Agricultural Chemicals Group
 Baltimore, Md. 21204
 2. The Harshaw Chemical Co.
 1945 E. 97th St.
 Cleveland, OH 44106
 3. Plaford and Bauer, Inc.
 3 East 6th Ave.
 Stratford, Conn. 06602

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction.
 7.2 **Reactivity with Common Materials:** Will corrode most metals, producing flammable hydrogen gas, which may collect in enclosed spaces.
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water, rinse with dilute solution of sodium carbonate or soda ash.
 7.5 **Polymerization:** Not pertinent.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

10 SHIPPING INFORMATION

- 10.1 **Grades or Purity:** 22-40 solutions in water.
 10.2 **Storage Temperature:** Ambient.
 10.3 **Inert Atmosphere:** No requirement.
 10.4 **Venting:** Open.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446.3.)
 A P

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid.
 13.2 **Molecular Weight:** 144.09 (solute only).
 13.3 **Boiling Point at 1 atm (water):** 212.3°C = 400.1°F = 473.1 K.
 13.4 **Freezing Point (typical):** -74 to -41°C = -103 to -20°F = 223 to 253 K.
 13.5 **Critical Temperature:** Not pertinent.
 13.6 **Critical Pressure:** Not pertinent.
 13.7 **Specific Gravity (vapor):** 1.3 at 25°C (liquid).
 13.8 **Liquid Surface Tension:** Not pertinent.
 13.9 **Liquid Water Interfacial Tension:** Not pertinent.
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
 13.12 **Latent Heat of Vaporization:** Not pertinent.
 13.13 **Heat of Combustion:** Not pertinent.
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** Not pertinent.
 13.16 **Heat of Polymerization:** Not pertinent.

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Corrosive liquid.
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	0
Vapor (Fumes)	0
Liquid or Solid Irritant	5
Poisons	5
Water Pollution	0
Human Toxicity	5
Aquatic Toxicity	0
Air Pollution	0
Reactivity	0
Other Chemicals	1
Water	0
Self-Reaction	0
12.3 NFPA Hazard Classifications	
Category	Classification
Health Hazard (Blue)	5
Flammability (Red)	0
Reactivity (Yellow)	0

NOTES

(Continued on pages 2 and 3)

FSA

FLUOSULFONIC ACID

Common Synonyms Fluorosulfuric acid Fluorosulfonic acid	Liquid Colorless to light yellow Choking odor Reacts violently with water. Irritating mist and gas are produced on contact with water.
HAZARD STATEMENT H314 Causes severe skin burns and eye damage. H332 Irritating to respiratory system. H334 May cause asthma or worsen existing asthma. H373 May cause long-term health effects.	Precautionary Statement P201+P202 Attention! Read the label and take all necessary precautions. P273 Avoid release to the environment. P301+P312 In case of contact with skin, wash immediately with plenty of water. P301+P331 In case of contact with skin, remove contaminated clothing and wash immediately with plenty of water. P302+P352 In case of contact with skin, wash immediately with plenty of water. P302+P353 In case of contact with skin, wash immediately with plenty of water and consult a physician. P303+P361+P353 In case of contact with skin, remove contaminated clothing and wash immediately with plenty of water and consult a physician. P304+P340 In case of inhalation, move to fresh air and rest.
Fire	Not Flammable No flame propagation observed.
Exposure	VAPOR OR MIST Irritating to eyes, nose and throat. Harmful if inhaled. LIQUID Will burn skin and eyes. Harmful if swallowed. INGESTION Causes severe burns to mouth and throat. May cause long-term health effects.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intake.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Toxic marine, corrosive air contaminant, water contaminant. Restr. classes: 1, 2, 3, 4, 5, 6, 7, 8, 9. Evacuate area. Dispense and flush with care.	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Fluorosulfuric acid, Fluorosulfonic acid. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: FSO ₃ H. 3.4 IMCO/United Nations Numerical Designation: 8.1.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Slightly cloudy, colorless to slightly yellow. 4.3 Odor: Choking, irritating.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, shoes, and clothing; goggles and face shield; acid fumes; under mask or air line mask. 5.2 Symptoms Following Exposure: Inhalation of fumes causes severe irritation of nose and throat. Contact of liquid with eyes or skin causes very severe burns. Ingestion causes very severe burns to mouth and stomach. 5.3 Treatment for Exposure: (See medical attention quickly following all exposure.) To those exposed: INHALATION: Move victim to fresh air. If the victim is unconscious, give artificial respiration. EYES: Flush with water until medical help arrives. SKIN: Flush with water until medical help arrives. Swallow: Do not induce vomiting. If patient is conscious, give plenty of water to drink. If patient is unconscious, give large amount of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause lung injury. They can be irritating even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin, eye, and third degree burns on skin contact and severe irritation to the eyes. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Do not use water or foam on adjacent fires. 6.5 Special Hazards of Combustion: Products: Toxic and irritating fumes of hydrogen fluoride and sulfuric acid may form in fires. 6.6 Behavior in Fire: Contact with water of fire on adjacent fires produces toxic irritating fumes of hydrogen fluoride. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																												
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently with water to generate hydrogen fluoride and sulfuric acid. 7.2 Reactivity with Common Materials: Reacts with metals generating flammable hydrogen. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flood with water, rinse with sodium bicarbonate or lime solution. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Allied Chemical Corporation Specialty Chemicals Division P.O. Box 4987R Morristown, N.J. 07960 2. PCR, Inc. P.O. Box 1496 Gainesville, Fla. 32602																												
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A O	10 SHIPPING INFORMATION 10.1 Grades or Purity: 98.5% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure vacuum with protection from moisture in air. 13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 100.07 13.3 Boiling Point at 1 atm: 42.9°C = 109.2°F = 316.1 K. 13.4 Freezing Point: -125.1°C = -193.2°F = 148.1 K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity, 15°C/15°C (liquid): 13.8 Liquid Surface Tension: Data not available. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 170 Btu/lb = 94 cal/g = 39 x 10 ³ J/kg. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.																												
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive. 12.2 HAS Hazard Rating for Bulk Water Transportation: <table data-bbox="896 1470 1135 1729"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Toxic</td><td>0</td></tr> <tr> <td>Flammable</td><td>0</td></tr> <tr> <td>Vapor Corrosive</td><td>4</td></tr> <tr> <td>Liquid or Solid Corrosive</td><td>4</td></tr> <tr> <td>Poisonous</td><td>0</td></tr> <tr> <td>Water Pollution</td><td>0</td></tr> <tr> <td>Human Toxicity</td><td>0</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Acute Toxicity</td><td>0</td></tr> <tr> <td>Reactivity</td><td>0</td></tr> <tr> <td>Other Chemicals</td><td>4</td></tr> <tr> <td>Water</td><td>4</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed.	Category	Rating	Toxic	0	Flammable	0	Vapor Corrosive	4	Liquid or Solid Corrosive	4	Poisonous	0	Water Pollution	0	Human Toxicity	0	Aquatic Toxicity	2	Acute Toxicity	0	Reactivity	0	Other Chemicals	4	Water	4	Self Reaction	0	NOTES
Category	Rating																												
Toxic	0																												
Flammable	0																												
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Aquatic Toxicity	2																												
Acute Toxicity	0																												
Reactivity	0																												
Other Chemicals	4																												
Water	4																												
Self Reaction	0																												

FMS

FORMALDEHYDE SOLUTION

Common Synonyms Formalith Eyde Formalin Formic aldehyde solution Methanal solution		Watery liquid	Colorless	Irritating odor
Sinks and mixes with water				
Avoid contact with liquid Wear goggles when handling liquid. Avoid contact with skin and eyes. Wash thoroughly with water if contact occurs. Notify physician if contact occurs. Notify fire department if spill occurs. Notify health department if spill occurs.				
Fire	Combustible Flammable liquid. Flash point: 18°C (64°F). Flammable solid. Flash point: 18°C (64°F). Combustible. Flash point: 18°C (64°F).			
CAUTION: HARMFUL TO AQUATIC LIFE				
Exposure	LIQUID Will burn skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. If inhaled, will cause irritation of the respiratory tract. If in contact with skin, will cause irritation. If in contact with eyes, will cause irritation. If swallowed, will cause nausea, vomiting or loss of consciousness. If inhaled, will cause irritation of the respiratory tract. If in contact with skin, will cause irritation. If in contact with eyes, will cause irritation. SWALLOWED: DO NOT INDUCE VOMITING. IF NECESSARY, GIVE ORAL FLUIDS. IF SWALLOWED, DO NOT INDUCE VOMITING. IF NECESSARY, GIVE ORAL FLUIDS.			
	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify health department if spill occurs.			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify health department if spill occurs.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Formalin, Eyde, Formalith, Methanal, Formic aldehyde. 3.2 Coast Guard Compatibility Classification: Aldehyde. 3.3 Chemical Formula: HCHO, H ₂ C=O, CH ₂ O. 3.4 IMCO United Nations Numerical Designation: 281105.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Pungent irritating characteristic pungent.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, chemical goggles, protective clothing, synthetic rubber or plastic gloves. 5.2 Symptoms Following Exposure: IRRITATION - eyes are irritating and will cause stinging, burning, nausea and vomiting; IRRITATION - nose, throat, and skin; IRRITATION - skin, throat, and skin; IRRITATION - skin, throat, and skin. 5.3 Treatment for Exposure: IRRITATION - move victim to fresh air; give oxygen if breathing; administer artificial respiration if necessary; induce vomiting once and repeat until vomitus clear; then give 1 quart of water and continue giving until SKIN OR EYES flush immediately with plenty of water; IRRITATION - move victim to fresh air; give oxygen if breathing; administer artificial respiration if necessary; induce vomiting once and repeat until vomitus clear; then give 1 quart of water and continue giving until SKIN OR EYES flush immediately with plenty of water. 5.4 Toxicity by Inhalation (Three-Hour Limit Value): 2 ppm. 5.5 Short-Term Inhalation Limits: 5 ppm for 30 min; 10 ppm for 15 min; 20 ppm for 5 min. 5.6 Toxicity by Ingestion: 100 mg/kg of body weight of formaldehyde solution (Grade 2) LD ₅₀ is 2 g/kg. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating to eyes, nose, throat, and skin; high concentrations cause severe irritation. 5.9 Liquid or Solid Irritant Characteristics: Causes stinging of eyes and first degree burns in short exposure; Moderate and severe burns if long exposure. 5.10 Odor Threshold: 0.1 ppm.				

6 FIRE HAZARDS 6.1 Flash Point 15% formaldehyde Methanol free 182°F (6.6°C) 15% methanol 122°F (50°C) 6.2 Flammable Limits in Air 7.0 - 13.0 6.3 Fire Extinguishing Agents Water dry chemical, carbon dioxide, or alcohol foam 6.4 Fire Extinguishing Agents Not to be Used Data not available 6.5 Special Hazards of Combustion Products Toxic vapors are generated 6.6 Behavior in Fire Not pertinent 6.7 Ignition Temperature 806 F 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity formaldehyde Ning 1: 96 hr. LC50 for H₂ fish, fresh water 22 ppm; 24 hr. LC50 for H₂ fish, sea water 100 ppm; 48 hr. LC50 for H₂ fish, salt water 8.2 Waterfowl Toxicity Data not available 8.3 Biological Oxygen Demand (BOD) 10% in 4 days; 40% in 10 days 8.4 Food Chain Concentration Potential None																												
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water No reaction 7.2 Reactivity with Common Materials No reaction 7.3 Stability During Transport Stable 7.4 Neutralizing Agents for Acids and Caustics Not pertinent 7.5 Polymerization Not pertinent 7.6 Inhibitor of Polymerization Not pertinent	9. SELECTED MANUFACTURERS 1 Borden Inc. Borden Chemical Division 50 W. Broad Street Columbus, Ohio 43215 2 Celanese Corp. Celanese Chemical Division 245 Park Ave. New York, N.Y. 10017 3 E. I. du Pont de Nemours & Co. Inc. Industrial & Biochemical Dept. Wilmington, Del. 19885																												
	10 SHIPPING INFORMATION 10.1 Grades or Purity 37.5% formaldehyde in water containing 0.1% methyl alcohol 10.2 Storage Temperature Ambient 10.3 Inert Atmosphere No requirement 10.4 Venting Pressure: vacuum																												
11 HAZARD ASSESSMENT CODE See Hazard Assessment Code Chapter 4, A.P.C.																													
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>2</td></tr><tr><td>Health</td><td>2</td></tr><tr><td>Vapor Irritant</td><td>2</td></tr><tr><td>Ecotoxic - Solid Ingestion</td><td>2</td></tr><tr><td>Poisons</td><td>2</td></tr><tr><td>Water Pollution</td><td>2</td></tr><tr><td>Human Toxicity</td><td>2</td></tr><tr><td>Aquatic Toxicity</td><td>2</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td>2</td></tr><tr><td>Other Chemicals</td><td>2</td></tr><tr><td>Water</td><td>2</td></tr><tr><td>Self Reaction</td><td>2</td></tr></table>	Category	Rating	Fire	2	Health	2	Vapor Irritant	2	Ecotoxic - Solid Ingestion	2	Poisons	2	Water Pollution	2	Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity	2	Other Chemicals	2	Water	2	Self Reaction	2	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm. Liquid 13.2 Molecular Weight 30.03 13.3 Boiling Point at 1 atm. Not pertinent 13.4 Freezing Point Not pertinent 13.5 Critical Temperature Not pertinent 13.6 Critical Pressure Not pertinent 13.7 Specific Gravity 0.815 (20°C/20°C) 13.8 Liquid Surface Tension Not pertinent 13.9 Liquid-Water Interfacial Tension Not pertinent 13.10 Vapor (Gas) Specific Gravity Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas) Not pertinent 13.12 Latent Heat of Vaporization Not pertinent 13.13 Heat of Combustion Not pertinent 13.14 Heat of Decomposition Not pertinent 13.15 Heat of Solution 10.5 kJ/mol (25°C) 10.5 kcal/mol (25°C) 13.16 Heat of Polymerization Not pertinent
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12.3 NFPA Hazard Classifications <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	0																					
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Health Hazard (Blue)	2																												
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NOTES																													

FMA

FORMIC ACID

Common Synonyms Methanoic acid Formic acid	Liquid Colorless Penetrating odor Sinks and mixes with water. Freezing point is 47°F.
AVOID CONTACT WITH EYES. Keep people away. Wear goggles. Self-contained breathing apparatus and other eye protection including gloves. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Combustible Wear goggles, self-contained breathing apparatus and rubber covered clothing including gloves. Extinguish with water. Do not use water if flame is not subdued. Call fire department with water.
Exposure	CALL FOR MEDICAL AID. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected area with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED, do not induce VOMITING. Have victim drink water if possible. If SWALLOWED and also IN EYES, DO NOT INDUCE VOMITING. Call fire department with water. DO NOT INDUCE VOMITING.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife agencies. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Issue warning. Evacuate. Restrict access. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Methanoic acid, Formic acid. 3.2 Coast Guard Compatibility Classification: Organic acid. 3.3 Chemical Formula: HCOOH. 3.4 HMCO United Nations Numerical Designation: 801 (1979).	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Penetrating.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus when entering area. Wear full rubber suit, gloves and boots. 5.2 Symptoms Following Exposure: Irritation of skin and eyes. Ingestion causes severe irritation of the mouth and throat. Inhalation causes severe irritation of the respiratory tract. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air. If breathing is difficult, give oxygen. If ingestion, do not induce vomiting. If on skin, flush with water. IF EYES: Flush with water for 15 minutes. IF INGESTION: Do not induce vomiting. If on skin, flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm. 5.5 Short-Term Inhalation Limits: Do not exceed. 5.6 Toxicity by Ingestion: Grade 2, oral rat LD ₅₀ = 1.21 g/kg. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: A very strong irritant to the eyes, nose, throat and respiratory tract. Causes severe irritation of the respiratory tract. 5.9 Liquid or Solid Irritant Characteristics: Irritates the skin and causes severe irritation of the respiratory tract. 5.10 Odor Threshold: Do not exceed.	

6. FIRE HAZARDS 6.1 Flash Point: 118°F (42°C). 6.2 Flammable Limits in Air: 18-57%. 6.3 Fire Extinguishing Agents: Water, carbon dioxide, dry chemical, foam. 6.4 Fire Extinguishing Agents Not to be Used: None. 6.5 Special Hazards of Combustion Products: Toxic gases, carbon monoxide. 6.6 Behavior in Fire: Non-persistent. 6.7 Ignition Temperature: 1114°F. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 0.5 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 175 mg/L 24 hr. Bluegill, 11 mg/L freshwater, 120 ppm 48 hr. Daphnia, 11 mg/L freshwater. 8.2 Waterlow Toxicity: Do not use table. 8.3 Biological Oxygen Demand (BOD): 2.5 days 40°C, 10 days 20°C. 8.4 Food Chain Concentration Potential: None.																								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water then neutralize with base. 7.5 Polymerization: No pertinent. 7.6 Inhibitor of Polymerization: No pertinent.	9. SELECTED MANUFACTURERS 1. E. I. du Pont de Nemours & Co., Inc., Industrial & Biochemicals Dept., Wilmington, Del. 19880. 2. Middlebrook, Inc., One One One, Orono, Maine 04469. 3. Union Carbide Corp., Chemicals and Plastics Division, 270 Park Ave., New York, N.Y. 10017.																								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-4 APQ	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical, pharmaceutical 99.99%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure/vacuum.																								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive material. 12.2 NAG Hazard Rating for Bulk Water Transportation: <table data-bbox="905 1452 1152 1714"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Toxic</td><td>1</td></tr> <tr><td>Flammable</td><td>1</td></tr> <tr><td>Corrosive</td><td>1</td></tr> <tr><td>Reactive</td><td>1</td></tr> <tr><td>Other Chemicals</td><td>1</td></tr> <tr><td>Water</td><td>1</td></tr> <tr><td>Self-Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="905 1736 1152 1823"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (H302)</td><td>3</td></tr> <tr><td>Flammable (F+)</td><td>2</td></tr> <tr><td>Corrosive (C+)</td><td>1</td></tr> </tbody> </table>	Category	Rating	Toxic	1	Flammable	1	Corrosive	1	Reactive	1	Other Chemicals	1	Water	1	Self-Reaction	1	Category	Classification	Health Hazard (H302)	3	Flammable (F+)	2	Corrosive (C+)	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 46.04. 13.3 Boiling Point at 1 atm: 210.1°C (402.2°F). 13.4 Freezing Point: 47°F (8.9°C). 13.5 Critical Temperature: No pertinent. 13.6 Critical Pressure: No pertinent. 13.7 Specific Gravity: 1.22 at 20°C (liquid). 13.8 Liquid Surface Tension: 35 dyne/cm at 20°C (liquid). 13.9 Liquid-Water Interfacial Tension: No pertinent. 13.10 Vapor (Gas) Specific Gravity: No pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): No pertinent. 13.12 Latent Heat of Vaporization: 10.8 kcal/mol (45.6 kJ/mol). 13.13 Heat of Combustion: -10.8 kcal/mol (45.6 kJ/mol). 13.14 Heat of Decomposition: No pertinent. 13.15 Heat of Solution: 10.8 kcal/mol (45.6 kJ/mol). 13.16 Heat of Polymerization: No pertinent.
Category	Rating																								
Toxic	1																								
Flammable	1																								
Corrosive	1																								
Reactive	1																								
Other Chemicals	1																								
Water	1																								
Self-Reaction	1																								
Category	Classification																								
Health Hazard (H302)	3																								
Flammable (F+)	2																								
Corrosive (C+)	1																								
NOTES																									

REVISED 1978

FUM

FUMARIC ACID

Common Synonyms Trans-Butenedioic acid Alloxenic acid Trans-1,2-ethylenedicarboxylic acid Boletic acid Lachenic acid	Solid White Odorless Sinks and mixes with water
Stop discharge if possible. Keep people away. Shut off ignition sources. Call fire department. Avoid contact with solid and/or dust. Locate and remove discharged materials. Notify local health and pollution control agencies.	
Fire	Combustible Dust cloud may explode if ignited in an enclosed area. Irritating gases may be produced when heated. Extinguish with water. Dry chemical, foam, or carbon dioxide.
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing & difficult breathing. If on eyes: 1. Flashes open and flush with plenty of water. If breathing has stopped: Give artificial respiration. If breathing is difficult: Give oxygen. SOLID Irritating to skin and eyes. Remove & irrigate immediately with water. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water works.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush.	
2. LABELS No hazard label required by Code of Federal Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Alloxenic acid Boletic acid, trans-Butenedioic acid, trans-1,2-Ethylenedicarboxylic acid, Lachenic acid 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{HO}-\text{C}(\text{H})=\text{C}(\text{H})-\text{O}-\text{H}$ 3.4 IMCO/United Nations Numerical Designation: Not listed	
4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, gloves, safety glasses, dust cap. 5.2 Symptoms Following Exposure: Inhalation of dust may cause respiratory irritation. Compound is non-toxic when ingested. Prolonged contact with eyes or skin may cause irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. EYES: flush with water, get medical attention if irritation persists. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Odorless	

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water spray, dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Irritating fumes of malic anhydride may form in fires. 6.6 Behavior in Fire: Dust prevents explosion hazard. Knock down dust with water fog. 6.7 Ignition Temperature: 1364°F (powder) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	
8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Water/soil Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 61% - days 8.4 Food Chain Concentration Potential: None	
9. SELECTED MANUFACTURERS 1. Tenneco Chemicals, Inc. Intermediates Div. Turner Place P. O. Box 2 Piscataway, N. J. 08854 2. Pfizer Inc. Chemicals Div. 235 East 42 St. New York, N. Y. 10017 3. Monsanto Company 800 North Lindbergh Blvd. St. Louis, Mo. 63169	
10. SHIPPING INFORMATION 10.1 Grade or Purity: Technical Purified food grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 MFPA Hazard Classifications: Not listed	
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 116.07 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.635 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -4970 Btu/lb = -2760 cal/g = -116 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent (continued on page 2 and 4)	
NOTES	

FFA

FURFURAL

Common Synonyms 2-Furancarboxaldehyde 2-Furaldehyde Furfuraldehyde Fural		Only liquid	Colorless to reddish-brown	Almond odor
		Sinks in water		
Avoid contact with liquid. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber overclothing including gloves. (a) fire department (b) up discharge if possible (c) late and remove downwind material (d) notify local health and pollution control agencies				
Fire	Combustible Wear goggles, self-contained breathing apparatus and rubber overclothing including gloves. Extinguish with water. Dry chemical, alcohol foam, carbon dioxide. Confined containers with water.			
Exposure	CALL FOR MEDICAL AID LIQUID Will burn skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES: flush with plenty of water IF SWALLOWED AND VICTIM IS CONSCIOUS: have victim drink water or milk; have victim induce vomiting IF SWALLOWED AND VICTIM IS UNCONSCIOUS OR HAVING CONVULSIONS: do not give anything by mouth			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Soluble in water and slightly oily Notify local health and pollution control agencies			
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 445-41 Issue warning if water contains hazard Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms 2-Furaldehyde, Furfural, 2-Furancarboxaldehyde, Furfuraldehyde, Fural 3.2 Coast Guard Compatibility Classification Aqueous 3.3 Chemical Formula O=C1C=CC(=O)CC1 3.4 IMCO United Nations Numerical Designation: 1501		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to reddish brown 4.3 Odor: Almond like		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus 5.2 Symptoms Following Exposure: Irritation of eyes, nose, and throat; coughing; chest pain; dizziness; headache; nausea; vomiting; diarrhea; skin irritation; allergic reactions 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; if breathing is difficult, give oxygen; if unconscious, give artificial respiration; if vomiting, give emetics; if ingestion, induce vomiting; if skin contact, wash with water 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 ppm 5.5 Short-Term Inhalation Limit: 1 ppm (15 min) 5.6 Toxicity by Ingestion: 0.1 g/kg (100 mg/kg) 5.7 Late Toxicity: Causes liver damage in rats 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause irritation to the eyes, nose, and throat; high concentrations are irritating to the respiratory tract 5.9 Liquid or Solid Irritant Characteristics: Causes irritation to the skin and mucous membranes; causes severe burns on contact with skin 5.10 Odor Threshold: 0.1 ppm (100 mg/kg)				

6 FIRE HAZARDS 6.1 Flash Point: 150°F (60°C) (140°F (60°C)) 6.2 Flammable Limits in Air: 7.1-19.3 6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide, dry chemical, alcohol foam 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating upon inhalation when heated 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 719°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 2.6 mm/min		8 WATER POLLUTION 8.1 Aquatic Toxicity: 24 ppm 96 hr bluegill; 11 mg/l fresh water; 32 ppm 24 hr sunfish; 11 mg/l fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0.25-0.67% in 5 days 8.4 Food Chain Concentration Potential: None																																					
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS The Quaker Oats Co. Chemicals Division Merchandise Mart Plaza Chicago, Ill. 60654																																					
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 445-41 A P Q		10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Pressure vessel																																					
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Flammability</td><td>2</td></tr><tr><td>Health</td><td>1</td></tr><tr><td>Vapor Pressure</td><td>2</td></tr><tr><td>Liquid or Solid Expansion</td><td>2</td></tr><tr><td>Poison</td><td>2</td></tr><tr><td>Water Pollution</td><td>2</td></tr><tr><td>Human Toxicity</td><td>2</td></tr><tr><td>Aquatic Toxicity</td><td>2</td></tr><tr><td>Acute Health Effects</td><td>2</td></tr><tr><td>Reactivity</td><td>1</td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Waste</td><td>0</td></tr><tr><td>Self-Reaction</td><td>0</td></tr></table> 12.3 NFPA Hazard Classifications <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Rating	Flammability	2	Health	1	Vapor Pressure	2	Liquid or Solid Expansion	2	Poison	2	Water Pollution	2	Human Toxicity	2	Aquatic Toxicity	2	Acute Health Effects	2	Reactivity	1	Other Chemicals	1	Waste	0	Self-Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 96.08 13.3 Boiling Point at 1 atm: 161.1°C (324.2°F) 13.4 Freezing Point: 16.1°C (61.0°F) 13.5 Critical Temperature: 281.1°C (538.0°F) 13.6 Critical Pressure: 36.0 atm (36.0 MPa) 13.7 Specific Gravity: 1.266 at 20°C 13.8 Liquid Surface Tension: 40.5 dyne/cm at 20°C 13.9 Liquid-Water Interfacial Tension: 35.5 dyne/cm at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 40.5 kJ/mol at 20°C 13.13 Heat of Combustion: -1240 kJ/mol 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Rating																																						
Flammability	2																																						
Health	1																																						
Vapor Pressure	2																																						
Liquid or Solid Expansion	2																																						
Poison	2																																						
Water Pollution	2																																						
Human Toxicity	2																																						
Aquatic Toxicity	2																																						
Acute Health Effects	2																																						
Reactivity	1																																						
Other Chemicals	1																																						
Waste	0																																						
Self-Reaction	0																																						
Category	Classification																																						
Health Hazard (Blue)	2																																						
Flammability (Red)	2																																						
Reactivity (Yellow)	0																																						
NOTES																																							

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FAL

FURFURYL ALCOHOL

Common Synonyms		Liquid	Colorless to light yellow	Mild irritating
2-Furancarboxal Furfuralcohol 2-Furancarbal 2-Hydroxymethylfuran		Mixes with water		
Stop discharge if possible or keep discharge under control until fire department arrives. Do not breathe vapor discharged in storage. No discharge into drains or sewers.				
Fire	Combustible Flammable liquid (F+), highly flammable (F+)			
Exposure	LIQUID Irritating to skin and eyes. Harmful if swallowed. Reactions on ingestion: Irritation of mouth and throat. If swallowed, drink water. Do not induce vomiting. If SWALLOWED, do not induce vomiting. If INGESTED, drink water. If SWALLOWED, do not induce vomiting. If INGESTED, drink water. If SWALLOWED, do not induce vomiting. If INGESTED, drink water.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not a serious hazard to life. Flammable liquid.			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Issue warning: water contaminant. Dispense and flush.		2. LABELS No label required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Furancarboxal Furfuralcohol, alpha-Furancarbal 2-Furancarbal, 2-Hydroxymethylfuran. 3.2 Coast Guard Compatibility Classification: A-10. 3.3 Chemical Formula: C ₅ H ₆ O. 3.4 MCO/United Nations Numerical Designation: Not listed.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless to amber. 4.3 Odor: Mildly irritating.		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes headache, nausea, and irritation of nose and throat. Vapor irritates eyes. Liquid causes inflammation and irritation of skin. Contact with liquid causes dryness and irritation. Ingestion causes headache, nausea, and irritation of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air. Breathing irritates the respiratory system. If severe, seek medical attention. If minor, get medical attention. SKIN: Wash promptly with soap and water. INGESTION: Do not induce vomiting. If severe, seek medical attention. If minor, get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): None. 5.5 Short-Term Inhalation Limits: 5 ppm (5 mg/m ³). 5.6 Toxicity by Ingestion: Irritation of the T.D. ₀₁ is 10 g/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes irritation of nose and throat with high concentrations. Irritation of the eyes is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard: If ingested, it should be followed by a large amount of water. Irritation of the skin. 5.10 Odor Threshold: 5 ppm.				

6 FIRE HAZARDS

6.1 Flash Point: 167°F (60°C) 149°F (66°C)
6.2 Flammable Limits in Air: 1.8% to 12.3%
6.3 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide
6.4 Fire Extinguishing Agent: Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 550°F
6.8 Electrical Hazard: Data not available
6.9 Burning Rate: 2.5 mm/min

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Damages and forms water-soluble material in exposure to air, acids, particularly when hot
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: Data not available
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1. The Quaker Oats Company
Chemicals Division
345 Merchandise Mart Plaza
Chicago, Ill. 60654
2. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N. Y. 14650
3. Aldrich Chemical Co.
940 West St. Paul Ave.
Milwaukee, Wis. 53234

10. SHIPPING INFORMATION

10.1 Grades or Purity: Technical
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: Not required
10.4 Venting: Open flame arrester

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3.)
A P O

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Not listed

12.2 NAS Hazard Rating for Bulk Water Transportation

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Acute Effect	1
Reactivity	
Other Chemicals	2
Water	9
Self Reaction	0

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	2
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: 98.1
13.3 Boiling Point at 1 atm: 100°F = 170°C = 423°K
13.4 Freezing Point: 5°F = -15°C = 258°K
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 1.13 at 20°C (liquid)
13.8 Liquid Surface Tension: 38 dynes/cm = 0.038 N/m at 20°C
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: 1.4
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: 230 Btu/lb = 130 cal/g = 5.4 x 10³ J/kg
13.13 Heat of Combustion: -11,200 Btu/lb = -6,200 cal/g = -260 x 10³ J/kg
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

(Continued on pages 7 and 8.)

NOTES

GLA

GALLIC ACID

Common Synonyms: 3,4,5-Trihydroxybenzoic acid Gallic acid monohydrate		Solid White Odorless
Sinks in water		
Stop discharge if possible. Keep people away. Shut off ignition sources. Call fire department. Avoid contact with solid and dust. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible Extinguish with water, dry chemicals, foam, or carbon dioxide.	
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4.) Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Gallic acid monohydrate 3,4,5-Trihydroxybenzoic acid 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_6H_2(OH)_3COOH$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Bu. Mines approved respirator, rubber gloves, safety goggles. 5.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INGESTION: Give large amount of water, induce vomiting. EYES: Flush with water for at least 10 min., consult a physician if irritation persists. SKIN: Wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 ED ₀₁ = 5 g/kg (rat) 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 90-100 ppm 6 hr rainbow MTD fresh water 15-20 ppm 6 hr rainbow MTD fresh water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 8% 5 days 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 The Harshaw Chemical Co 1945 E. 97 St Cleveland, Ohio 44106 2 Aldrich Chemical Co 940 W. Saint Paul Ave Milwaukee, Wis 53233 3 Eastman Organic Chemicals Rochester, N. Y. 14650								
	10 SHIPPING INFORMATION 10.1 Grades - Purity: N.E. Practical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3.) H 11 S	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 170 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.7 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -6,060 Btu/lb = -3,370 cal/g = -14.1 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Vessel Transportation: Not listed 12.3 NFPA Hazard Classifications:<table><tr><td>Category</td><td>Classification</td></tr><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0	
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	1								
Reactivity (Yellow)	0								
NOTES									

GOC

GAS OIL: CRACKED

Common Synonyms	Liquid	Colorless	Gasoline-like odor
Floats on water			
Stop discharge ifammable keeps on fire. Call fire department. Isolate and remove discharged material. Avoid health and pollution hazards.			
Fire	Combustible Flammable with heat of combustion 40,000 Btu/lb		
Exposure	CALL FOR MEDICAL AID LIQUID Harmful if swallowed. If swallowed, do not be conscious, have some fresh water drink. DO NOT INDUCE VOMITING		
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Floating to shoreline May be dangerous if it enters water intakes. No other health and safety effects. No vapor hazard to water intakes.		
1. RESPONSE TO DISCHARGE See Response Methods Handbook (7-646-4) Mechanical containment Should be removed Physical and chemical treatment		2. LABELS No hazard label required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not pertinent (mixture) 3.4 IMCO-United Nations Numerical Designation: 1.1 (202 (gas oil))		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow to brown 4.3 Odor: Like gasoline and petroleum	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective goggles, gloves 5.2 Symptoms Following Exposure: INHALATION causes irritation of upper respiratory tract stimulation, then depression, dizziness, headache, incoordination, anesthesia, coma, respiratory arrest, irregular heartbeat is a complication. ASPIRATION causes severe coughing, gagging, distress, rapid development of pulmonary edema. INGESTION causes irritation of throat and stomach stimulation, then depression. 5.3 Treatment for Exposure: Get medical attention. INHALATION: maintain respiration, administer oxygen if needed. ASPIRATION: enforce bed rest and administer oxygen. INGESTION: give victim water or milk, do NOT induce vomiting. Guard against aspiration if change. EYES: wash with copious quantities of water. SKIN: remove by wiping, then wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): No single value applicable 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 1 LD ₅₀ 0.5 to 1 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight irritation of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause irritation and reddening of skin. 5.10 Odor Threshold: 0.25 ppm			

6 FIRE HAZARDS

6.1 Flash Point: 150°F (60°C)
 6.2 Flammable Limits in Air: 0.6% - 13.5%
 6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide, or dry chemical
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
 6.5 Special Hazards of Combustion Products: Not pertinent
 6.6 Behavior in Fire: Not pertinent
 6.7 Ignition Temperature: 640°F
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: 4 mm/min

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water: Not reactive
 7.2 Reactivity with Common Materials: No reaction
 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
 7.5 Polymerization: Not pertinent
 7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

8.1 Aquatic Toxicity: 90 ppm, 24 hr, average clad. 11 ppm, clad. water
 90 ppm, 48 hr, average clad. 11 ppm, clad. water
 8.2 Waterfowl Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD): 30-50 days
 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1. Exxon Co.
 30 Rockefeller Plaza
 New York, N.Y. 10020
 2. Shell Oil Co.
 1 Shell Plaza
 Houston, Texas 77002
 3. Sun Oil Co.
 N. Darrow, Pa. 19047

10 SHIPPING INFORMATION

10.1 Grades or Purity: Composition varies widely with refinery and operation involved
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: Not pertinent
 10.4 Venting: Operate flame arresters

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (7-646-3)
 VII

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Combustible Liquid
 12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Toxic	0
Health	0
Vapor Irritant	0
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	0
Human Toxicity	1
Acute Toxicity	2
Aesthetic Effect	3
Reactivity	0
Other Chemicals	0
Water	0
Self Reaction	0

12.3 NFPA Hazard Classifications.

Category	Classification
Health Hazard (Blue)	0
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: Not pertinent
 13.3 Boiling Point at 1 atm: 475-500°F
 13.4 Freezing Point: Not pertinent
 13.5 Critical Temperature: Not pertinent
 13.6 Critical Pressure: Not pertinent
 13.7 Specific Gravity: 0.848-0.860 (liquid)
 13.8 Liquid Surface Tension: 28.0-32.0 dynes/cm at 20°C (N/m at 20°C)
 13.9 Liquid-Water Interfacial Tension: 18.0-22.0 dynes/cm at 20°C (N/m at 20°C)
 13.10 Vapor (Gas) Specific Gravity: 4
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
 13.12 Latent Heat of Vaporization: Not pertinent
 13.13 Heat of Combustion: 18,400 Btu/lb = 10,200 cal/g x 428 x 10³ J/kg
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

(continued on page 7 and 8)

NOTES

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GASOLINES: AUTOMOTIVE
(< 4.23g lead/gal)

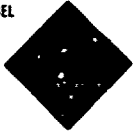
Water Pollution

NOTES

GAV

GASOLINES: AVIATION

(< 4.86g lead/gal)

Common Synonyms	Waters liquid Red blue green brown or purple Gasoline odor Floats on water. Flammable; irritating vapor is produced.
No indication of possible harm possible. No indication of possible harm possible. No indication of possible harm possible. No indication of possible harm possible.	
Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Vapor may ignite if exposed to a flame or other source. Vapor may ignite if exposed to a flame or other source.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness. LIQUID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Skin irritation may occur if liquid is absorbed. If swallowed will cause nausea or vomiting. If swallowed will cause nausea or vomiting. If swallowed will cause nausea or vomiting.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. No indication of possible harm possible.
1. RESPONSE TO DISCHARGE	2. LABEL 
3. CHEMICAL DESIGNATIONS	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Red blue green brown or purple 4.3 Odor: Gasoline
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: None 5.2 Symptoms Following Exposure: INHALATION: Irritation to eyes, nose and throat. Headache, dizziness, difficulty breathing, loss of consciousness. ASPIRATION: Irritation to eyes, nose and throat. Headache, dizziness, difficulty breathing, loss of consciousness. INGESTION: Nausea, vomiting. SKIN: Irritation. 5.3 Treatment for Exposure: INHALATION: Move to fresh air. ASPIRATION: Move to fresh air. INGESTION: Do not induce vomiting. SKIN: Wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): None 5.5 Short-Term Inhalation Limits: None 5.6 Toxicity by Ingestion: None 5.7 Late Toxicity: None	

6. FIRE HAZARDS	8. WATER POLLUTION								
6.1 Flash Point: -50°F (-45°C) 6.2 Flammable Limits in Air: 1.4% - 7.6% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: None. 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance from source of ignition and flash back. 6.7 Ignition Temperature: 424°F 6.8 Electrical Hazard: Class I group D. 6.9 Burning Rate: 4 mm/min	8.1 Aquatic Toxicity: No data available. 8.2 Waterfowl Toxicity: No data available. 8.3 Biological Oxygen Demand (BOD): No data available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY	9. SELECTED MANUFACTURERS								
7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Alkalies: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	Exxon Mobil Shell Standard Oil Sunoco								
11. HAZARD ASSESSMENT CODE	10. SHIPPING INFORMATION								
11.1 Hazard Assessment Code: 1.1 11.2 Hazard Assessment Code: 1.1	10.1 Grades or Purities: Grade 100 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not pertinent. 10.4 Venting: Not pertinent.								
12. HAZARD CLASSIFICATIONS	13. PHYSICAL AND CHEMICAL PROPERTIES								
12.1 Code of Federal Regulations: 1910.106 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Health</td><td>1</td></tr> <tr> <td>Flammability</td><td>2</td></tr> <tr> <td>Reactivity</td><td>1</td></tr> </tbody> </table>	Category	Rating	Health	1	Flammability	2	Reactivity	1	13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 114.22 13.3 Boiling Point at 1 atm: 37.7°C 13.4 Freezing Point: -43.0°C 13.5 Critical Temperature: 254.0°C 13.6 Critical Pressure: 36.0 atm 13.7 Specific Gravity: 0.71 at 15°C (liquid) 13.8 Liquid Surface Tension: 22.0 dyne/cm at 15°C 13.9 Liquid-Water Interfacial Tension: 22.0 dyne/cm at 15°C 13.10 Vapor (Gas) Specific Gravity: 3.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1 13.12 Latent Heat of Vaporization: 350 kJ/kg 13.13 Heat of Combustion: 43.5 MJ/kg 13.14 Heat of Decomposition: None 13.15 Heat of Solution: None 13.16 Heat of Polymerization: None
Category	Rating								
Health	1								
Flammability	2								
Reactivity	1								
12.3 NFPA Hazard Classifications	5. HEALTH HAZARDS (Cont'd)								
<table border="1"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health</td><td>1</td></tr> <tr> <td>Flammability</td><td>2</td></tr> <tr> <td>Reactivity</td><td>1</td></tr> </tbody> </table>	Category	Classification	Health	1	Flammability	2	Reactivity	1	5.3 Vapor (Gas) Irritant Characteristics: None 5.4 Liquid or Solid Irritant Characteristics: None 5.5 Odor Threshold: 0.02 ppm
Category	Classification								
Health	1								
Flammability	2								
Reactivity	1								

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6. FIRE HAZARDS 6.1 Flash Point: (a) 100°C (b) 100°C 6.2 Flammable Limits in Air: (a) 11.5-8.5% 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Class I group II 6.9 Burning Rate: 4 mm/sec	8. WATER POLLUTION 8.1 Aquatic Toxicity: 50 ppm: 24 hr. LC50; 500 ppm: 96 hr. LC50 50 ppm: 24 hr. LC50; 500 ppm: 96 hr. LC50 8.2 Waterbody Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 5-10 days 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Exxon Co. 600 Rockefeller Plaza New York, N.Y. 10020 2. Shell Int'l. Shell Plaza Houston, Tex. 77001 3. Sasol Inc. S. Davids, Pa. 1908																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG-66, 3 NTPAW	10. SHIPPING INFORMATION 10.1 Grades or Purity: 100% pure, no stabilizers, no additives, no preservatives used 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame, heat, or pressure hazard																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>+</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td></td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td></td> </tr> <tr> <td>Toxicity</td> <td></td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Hazards</td> <td></td> </tr> <tr> <td>Aquatic Toxicity</td> <td></td> </tr> <tr> <td>Acute Effects</td> <td></td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>0</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self-Reactive</td> <td>0</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	+	Health		Vapor Irritant		Liquid or Solid Irritant		Toxicity		Water Pollution		Human Hazards		Aquatic Toxicity		Acute Effects		Reactivity		Other Chemicals	0	Water	0	Self-Reactive	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 96.12 13.3 Boiling Point at 1 atm: 150.6°C (303.1°F) 13.4 Freezing Point: 10.0°C (50.0°F) 13.5 Critical Temperature: 251.0°C (483.8°F) 13.6 Critical Pressure: 33.5 atm (3400 kPa) 13.7 Specific Gravity: 0.6818 (at 15°C) 13.8 Liquid Surface Tension: 22.0 dyne/cm (at 15°C) 13.9 Liquid-Water Interfacial Tension: 2.0 dyne/cm (at 15°C) 13.10 Vapor (Gas) Specific Gravity: 2.4 13.11 Ratio of Specific Heats of Vapor (Gas): No data 13.12 Latent Heat of Vaporization: 35.0 kJ/mol (8.3 kcal/mol) 13.13 Heat of Combustion: 30.0 kJ/mol (7.2 kcal/mol) 13.14 Heat of Decomposition: No data 13.15 Heat of Solution: No data 13.16 Heat of Polymerization: No data
Category	Rating																																				
Fire	+																																				
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Health Hazard (Blue)	1																																				
Flammability (Red)	3																																				
Reactivity (Yellow)	0																																				
5. HEALTH HAZARD (Cont'd) 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes a mild irritation of the eyes, respiratory system if present in high concentrations. No effect on skin. 5.9 Liquid or Solid Irritant Characteristics: Mild skin hazard. If present in solution and allowed to remain, may cause irritation and reddening of the skin. 5.10 Oral Threshold: 0.5 g/kg																																					

GRF

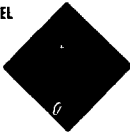
GASOLINE BLENDING STOCKS: REFORMATES

Common Synonym as		Watery liquid	Colorless	Gasoline odor
		Floats on water. Flammable, irritating vapor is produced.		
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Move upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
Exposure		CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability. Evacuate area. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 31 Synonyms: No common synonyms. 32 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures. 33 Chemical Formula: Not pertinent. 34 IMCO/United Nations Numerical Designation: 31132/1203.		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid. 42 Color: Colorless. 43 Odor: Gasoline.		
5. HEALTH HAZARDS 51 Personal Protective Equipment: Protective goggles, gloves. 52 Symptoms Following Exposure: INHALATION causes irritation of upper respiratory tract, central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest. Irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema. Later, signs of bronchopneumonia and pneumonia, acute onset of central nervous system followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach, stimulation followed by depression of central nervous system, irregular heartbeat. 53 Treatment for Exposure: Seek medical attention. INHALE maintain respiration, give oxygen if needed. ASPIRATION enforce bed rest, administer oxygen. INGESTION do NOT induce vomiting, lavage carefully if appreciable quantity was ingested, guard against aspiration into lungs. EYES wash with copious quantity of water. SKIN wipe off and wash with soap and water. 54 Toxicity by Inhalation (Threshold Limit Value): No single TLV applicable. 55 Short-Term Inhalation Limits: 500 ppm for 30 min. 56 Toxicity by Ingestion: Grade 2, LD50 0.5 to 5 g/kg. 57 Late Toxicity: None. 58 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.				

6 FIRE HAZARDS		8 WATER POLLUTION	
61 Flash Point:	81 Aquatic Toxicity:	90 ppm 24 hr juvenile American mad 11 m fresh water 91 ppm 24 hr juvenile American mad 11 m salt water	
(a) $\leq 0.1^{\circ}\text{C}$ (b) 0.73°C	82 Waterfowl Toxicity:	Data not available	
62 Flammable Limits in Air:	83 Biological Oxygen Demand (BOD):	≤ 5 days	
(a) 1.1% - 8.7%	84 Food Chain Concentration Potential:	None	
63 Fire Extinguishing Agents: Dry chemical foam, carbon dioxide			
64 Fire Extinguishing Agents Not to be Used:			
Water may be ineffective			
65 Special Hazards of Combustion Products:			
None			
66 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back			
67 Ignition Temperature:			
Data not available			
68 Electrical Hazard: Class I, group D			
69 Burning Rate: 4 mm/min			
7 CHEMICAL REACTIVITY		9. SELECTED MANUFACTURERS	
71 Reactivity with Water: No reaction	1 Exxon Co.	40 Rockefeller Plaza New York, N.Y. 10020	
72 Reactivity with Common Materials: No reaction	2 Shell Oil Co.	1 Shell Plaza Houston, Texas 77001	
73 Stability During Transport: Stable	3 Sun Oil Co.	St. Davids, Pa. 19087	
74 Neutralizing Agents for Acids and Caustics: Not pertinent			
75 Polymerization: Not pertinent			
76 Inhibitor of Polymerization: Not pertinent			
11 HAZARD ASSESSMENT CODE		10 SHIPPING INFORMATION	
(See Hazard Assessment Handbook, CG 446-3) A-T U-V-W		101 Grades or Purity: Composition varies with range of distillation, temperatures used	
		102 Storage Temperature: Ambient	
		103 Inert Atmosphere: No requirement	
		104 Venting: Open flame arrestor for pressure/vacuum	
12 HAZARD CLASSIFICATIONS		13 PHYSICAL AND CHEMICAL PROPERTIES	
121 Code of Federal Regulations: Flammable liquid	131 Physical State at 15°C and 1 atm: Liquid	132 Molecular Weight: Not pertinent	
122 NAS Hazard Rating for Bulk Water Transportation:	133 Boiling Point at 1 atm: $58 - 275^{\circ}\text{F}$ $= 14 - 135^{\circ}\text{C} = 267 - 408^{\circ}\text{K}$	134 Freezing Point: Not pertinent	
	135 Critical Temperature: Not pertinent	136 Critical Pressure: Not pertinent	
	137 Specific Gravity: 0.7934 at 20°C (liquid)	138 Liquid Surface Tension: 19 - 23 dynes/cm $= 0.019 - 0.023 \text{ N/m}$ at 20°C	
	139 Liquid-Water Interfacial Tension: 49 - 51 dynes/cm $= 0.049 - 0.051 \text{ N/m}$ at 20°C	1310 Vapor (Gas) Specific Gravity: 3.4	
	1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent	1312 Latent Heat of Vaporization: 130 - 150 Btu/lb $= 71 - 81 \text{ cal/g} = 3.0 - 3.4 \times 10^5 \text{ J/kg}$	
	1313 Heat of Combustion: -18,720 Btu/lb $= -10,400 \text{ cal/g} = -43.4 \times 10^3 \text{ J/kg}$	1314 Heat of Decomposition: Not pertinent	
	1315 Heat of Solution: Not pertinent	1316 Heat of Polymerization: Not pertinent	
123 NFPA Hazard Classifications:			

GCS

GASOLINES: CASINGHEAD

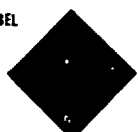
Common Synonyms		Watery liquid	Colorless	Gasoline odor
Floats on water. Flammable, irritating vapor is produced.				
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.			
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: have victim drink water or milk. DO NOT INDUCE VOMITING.			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41. Issue warning: high flammability. Evacuate area. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No algal gasoline. 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures. 3.3 Chemical Formula: Not pertinent. 3.4 IMCO/United Nations Numerical Designation: 31.125*		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Gasoline.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective goggles, gloves. 5.2 Symptoms Following Exposure: INHALATION causes irritation of upper respiratory tract, central nervous system stimulation followed by depression of varying degrees ranging from dizziness, headache, and nausea to anesthesia, coma, and respiratory arrest. Irregular heartbeat is a dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema. Late signs of bronchopneumonia and pneumonitis. Acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of the oral, esophagus, and stomach. Stimulation followed by depression of central nervous system, irregular heartbeat. 5.3 Treatment for Exposure: Seek medical attention. INHALATION: maintain respiratory, give oxygen if needed. ASPIRATION: enforced rest, administer oxygen if needed. DO NOT induce vomiting. Lavage carefully if appreciable quantity was ingested. Guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): No single TLV applicable. 5.5 Short-Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2 LD50 9.5 to 5 g/kg. 5.7 Late Toxicity: None.				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point	<0 F (0 C)	8.1 Aquatic Toxicity:	90 ppm, 24 hr. juvenile American shad 11 mg, fresh water 91 pp m, 24 hr. juvenile American shad 11 mg, salt water
6.2 Flammable Limits in Air	1.4-7.6	8.2 Waterbody Toxicity:	Data not available
6.3 Fire Extinguishing Agents	Dry chemical, foam, or carbon dioxide	8.3 Biological Oxygen Demand (BOD)	8% Solids
6.4 Fire Extinguishing Agents Not to be Used	Water may be ineffective	8.4 Food Chain Concentration Potential	None
6.5 Special Hazards of Combustion Products	None	9. SELECTED MANUFACTURERS	
6.6 Behavior in Fire	Vapor is heavier than air and may travel a considerable distance to source of ignition and flashback	1. Exxon Co.	30 Rockefeller Plaza New York, N.Y. 10020
6.7 Ignition Temperature	Data not available	2. Shell Oil Co.	1 Shell Plaza Houston, Texas 77001
6.8 Electrical Hazard	Class I, group D	3. Sun Oil Co.	St. Davids, Pa. 19081
6.9 Burning Rate	4 in./min.		
7 CHEMICAL REACTIVITY			
7.1 Reactivity with Water	No reaction	10 SHIPPING INFORMATION	
7.2 Reactivity with Common Materials	No reaction	10.1 Grades or Purity:	Composition depends on location of oil well
7.3 Stability During Transport	Stable	10.2 Storage Temperature	Ambient
7.4 Neutralizing Agents for Acids and Caustics	Not pertinent	10.3 Inert Atmosphere:	No requirement
7.5 Polymerization:	Not pertinent	10.4 Venting	Open flame arrester or pressure vacuum
7.6 Inhibitor of Polymerization	Not pertinent		
11 HAZARD ASSESSMENT CODE		13 PHYSICAL AND CHEMICAL PROPERTIES	
See HAZARD ASSESSMENT HANDBOOK, CG 446-3 A T U V W		13.1 Physical State at 15°C and 1 atm:	Liquid
		13.2 Molecular Weight:	Not pertinent
		13.3 Boiling Point at 1 atm:	255 F = 124.4 C = 257.40 K
		13.4 Freezing Point:	Not pertinent
		13.5 Critical Temperature:	Not pertinent
		13.6 Critical Pressure:	Not pertinent
		13.7 Specific Gravity:	0.671 at 15°C (liquid)
		13.8 Liquid Surface Tension:	19.23 dyn/cm = 2.019 × 10 ⁻³ N/m at 20°C
		13.9 Liquid-Water Interfacial Tension:	49.51 dyn/cm = 0.0495 N/m at 20°C
		13.10 Vapor (Gas) Specific Gravity:	3.4
		13.11 Ratio of Specific Heats of Vapor (Gas)	Not pertinent
		13.12 Latent Heat of Vaporization:	130-180 Btu/lb = 71-81 cal/g = 3.0-3.4 × 10 ⁵ J/kg
		13.13 Heat of Combustion:	-18,720 Btu/lb = -10,400 cal/g = -43.4 × 10 ³ J/g
		13.14 Heat of Decomposition:	Not pertinent
		13.15 Heat of Solution:	Not pertinent
		13.16 Heat of Polymerization:	Not pertinent
12 HAZARD CLASSIFICATIONS			
12.1 Code of Federal Regulations:	Flammable liquid		
12.2 NAS Hazard Rating for Bulk Water Transportation:			
Category	Rating		
Fire	4		
Health			
Vapor Irritant	1		
Liquid or Solid Irritant	0		
Poisons	1		
Water Pollution			
Human Toxicity	1		
Aquatic Toxicity	2		
Aesthetic Effect	1		
Reactivity			
Other Chemicals	0		
Water	0		
Self Reaction	0		
12.3 NFPA Hazard Classifications			
Category	Classification		
Health Hazard (Blue)	1		
Flammability (Red)	3		
Reactivity (Yellow)	0		
		Continued on page 7 and 8	
5 HEALTH HAZARDS (Cont'd)			
5.8 Vapor (Gas) Irritant Characteristics:	Vap. causes a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.		
5.9 Liquid or Solid Irritant Characteristics:	Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and red-irritation of the skin.		
5.10 Odor Threshold:	0.25 ppm		

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GPL

GASOLINES: POLYMER

Common Synonyms	Watery liquid	Colorless	Gasoline odor
Floats on water. Flammable, irritating vapor is produced.			
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.			
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Ext. nozzle with dry chemical foam or carbon dioxide. Water may be ineffective in fire. Cool exposed containers with water.		
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headaches, difficult breathing or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability. Evacuate area. Disperse and flush.		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures. 3.3 Chemical Formula: Not pertinent. 3.4 IMCO United Nations Numerical Designation: 3.2 1215.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: colorless. 4.3 Odor: Gasoline.	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective goggles, gloves. 5.2 Symptoms Following Exposure: INHALATION causes irritation of upper respiratory tract, central nervous system stimulation followed by depression of varying degrees, ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest. Irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gasping, dyspnea, substernal distress, and rapidly developing pulmonary edema. Later, signs of bronchopneumonia and pneumonia. Acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach, stimulation followed by depression of central nervous system, irregular heartbeat. 5.3 Treatment for Exposure: Seek medical attention. INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, administer oxygen. INGESTION: DO NOT induce vomiting. Lavage carefully if appreciable quantity was ingested, guard against aspiration into lungs. EYES: wash with copious quantity of water. SKIN: wipe off and wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): No single TLV applicable. 5.5 Short-Term Inhalation Limits: 400 ppm for 10 min. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 to 5 g/kg. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentration. The effect is temporary.			

6. FIRE HAZARDS

- 6.1 Flash Point: 0 °F (-1 °C)
 6.2 Flammable Limits in Air: 1.3% - 7.1%
 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide.
 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.
 6.5 Special Hazards of Combustion Products: None.
 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
 6.7 Ignition Temperature: Data not available.
 6.8 Electrical Hazard: Class I, group D.
 6.9 Burning Rate: 4 mm/min.

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
 7.2 Reactivity with Common Materials: No reaction.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

8. WATER POLLUTION

- 8.1 Aquatic Toxicity:
 90 ppm 24 hr, juvenile American shad
 11 mg/l fresh water
 91 ppm 24 hr, juvenile American shad
 11 mg/l salt water
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): < 5 mg/l
 8.4 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

1. Exxon Co.
 40 Rockefeller Plaza
 New York, N.Y. 10020
 2. Shell Oil Co.
 1 Shell Plaza
 Houston, Texas 77001
 3. Sun Oil Co.
 St. David, Pa. 19381

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Composition varies with range of distillation temperatures used. Contains mostly isohexane, isooctane.
 10.2 Storage Temperature: Ambient.
 10.3 Inert Atmosphere: No requirement.
 10.4 Venting: Open flame arrester or pressure/vacuum.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-5)
 A-1-L-A-W

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable liquid.
 12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	2
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	0
Water	0
Self Reaction	0

12.3 NFPA Hazard Classifications.

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	3
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid.
 13.2 Molecular Weight: Not pertinent.
 13.3 Boiling Point at 1 atm: 58 - 275 °F = 14 - 135 °C = 287 - 405°K.
 13.4 Freezing Point: Not pertinent.
 13.5 Critical Temperature: Not pertinent.
 13.6 Critical Pressure: Not pertinent.
 13.7 Specific Gravity: 0.71 - 0.75 at 15 °C (liquid).
 13.8 Liquid Surface Tension: 19 - 23 dyne/cm = 0.019 - 0.023 N/m at 20 °C.
 13.9 Liquid-Water Interfacial Tension: 40 - 51 dyne/cm = 0.040 - 0.051 N/m at 20 °C.
 13.10 Vapor (Gas) Specific Gravity: 3.4.
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.
 13.12 Latent Heat of Vaporization: 130 - 150 Btu/lb = 71 - 81 cal/g = 30 - 34 × 10³ J/kg.
 13.13 Heat of Combustion: -18,720 Btu/lb = -10,400 cal/g = -43.4 × 10³ J/kg.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: Not pertinent.

(Continued on page 15 and 16)

5. HEALTH HAZARDS (Cont'd)

- 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled, wash clothing and allowed to remain may cause staining and reddening of the skin.
 5.10 Odor Threshold: 0.25 ppm.

GSR

GASOLINES: STRAIGHT RUN

Common Synonyms	Waters liquid	Colorless	Gasoline odor
	Floats on water	Flammable, irritating vapor is produced	
	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.		
	VAPOR. Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness.		
Exposure	LIQUID. Irritating to skin and eyes. If swallowed, will cause nausea or vomiting.		
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Fouling to shoreline. May be dangerous if it enters water intakes.		

1. RESPONSE TO DISCHARGE

(See Response Methods Handbook, CG 446-41)

Issue warning: high flammability.
Evacuate area.
Disperse and flush.

2. LABEL



3. CHEMICAL DESIGNATIONS

- 3.1 Synonyms: No common synonyms.
3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures.
3.3 Chemical Formula: Not pertinent.
3.4 IMCO/United Nations Numerical Designation: 1.1, 2.1, 2.2.

4. OBSERVABLE CHARACTERISTICS

- 4.1 Physical State (as shipped): Liquid.
4.2 Color: Colorless.
4.3 Odor: Gasoline.

5. HEALTH HAZARDS

- 5.1 Personal Protective Equipment: Protective goggles, gloves.
5.2 Symptoms Following Exposure: INHALATION causes irritation of upper respiratory tract, central nervous system stimulation followed by depression of various degrees ranging from dizziness, headache, and incoordination to anesthesia, coma, and respiratory arrest. Irregular heartbeat is dangerous complication. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapidly developing pulmonary edema. Later, signs of bronchopneumonia and pneumonia. Acute onset of central nervous system excitement followed by depression. INGESTION causes irritation of mucous membranes of throat, esophagus, and stomach; stimulation followed by depression of central nervous system, irregular heartbeat.
5.3 Treatment for Exposure: Neck, face, attention: INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: encourage expectoration, do not induce vomiting. INGESTION: do NOT induce vomiting. lavage carefully. If approx. 100 ml was ingested, guard against aspiration into lungs. EYES: wash with copious quantities of water. SKIN: wipe off and wash with soap and water.
5.4 Toxicity by Inhalation (Threshold Limit Value): Single TLV applicable.
5.5 Short-Term Inhalation Limits: 500 ppm (1).
5.6 Toxicity by Ingestion: Grade 2 (1, 2).
5.7 Late Toxicity: None.

6. FIRE HAZARDS

- 6.1 Flash Point:
(a) $< 0^{\circ}\text{F}$ ($< 0^{\circ}\text{C}$)
(b) 0°F (0°C)
6.2 Flammable Limits in Air:
(a) 1.1% - 7.1%
6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide.
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.
6.5 Special Hazards of Combustion Products: None.
6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flashback.
6.7 Ignition Temperature: Data not available.
6.8 Electrical Hazard: Class I group D.
6.9 Burning Rate: 4 mm/min.

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
7.2 Reactivity with Common Materials: No reaction.
7.3 Stability During Transport: Stable.
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
7.5 Polymerization: Not pertinent.
7.6 Inhibitor of Polymerization: Not pertinent.

8. WATER POLLUTION

- 8.1 Aquatic Toxicity:
90 ppm/24 hr juvenile American shad.
11 ml/fresh water.
91 ppm/24 hr juvenile American shad.
11 ml/salt water.
8.2 Waterfowl Toxicity: Data not available.
8.3 Biological Oxygen Demand (BOD): 3% 5 days.
8.4 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

1. Exxon Co.
30 Rockefeller Plaza
New York, N.Y. 10620
2. Shell Oil Co.
1 Shell Plaza
Houston, Texas 77001
3. Sun Oil Co.
St. Davids, Pa. 19087

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Composition varies with range of distillation temperatures used.
10.2 Storage Temperature: Ambient.
10.3 Inert Atmosphere: No requirement.
10.4 Venting: Open flame arrester or pressure vacuum.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A T T V W

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid.
13.2 Molecular Weight: Not pertinent.
13.3 Boiling Point at 1 atm: 38 - 275°F
 $= 14 - 135^{\circ}\text{C}$ $= 25^{\circ}\text{F}$ $= 4^{\circ}\text{C}$
13.4 Freezing Point: Not pertinent.
13.5 Critical Temperature: Not pertinent.
13.6 Critical Pressure: Not pertinent.
13.7 Specific Gravity: 0.71 - 0.74 at 15°C (liquid).
13.8 Liquid Surface Tension: 19 - 23 dynes/cm
 $= 0.019 - 0.023 \text{ N/m}$ at 20°C .
13.9 Liquid-Water Interfacial Tension: 49 - 51 dynes/cm $= 0.049 - 0.051 \text{ N/m}$ at 20°C .
13.10 Vapor (Gas) Specific Gravity: 4.
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.
13.12 Latent Heat of Vaporization:
13.13 Heat of Combustion: $-18,720 \text{ Btu/lb}$
 $= -10,400 \text{ kJ/kg}$ $= -45.4 \times 10^3 \text{ J/kg}$
13.14 Heat of Decomposition: Not pertinent.
13.15 Heat of Solution: Not pertinent.
13.16 Heat of Polymerization: Not pertinent.

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable liquid.
12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Fire | 1 |
| Health | |
| Vapor Irritant | 1 |
| Liquid or Solid Irritant | 1 |
| Poisons | 2 |
| Water Pollution | |
| Human Toxicity | 1 |
| Aquatic Toxicity | 2 |
| Aesthetic Effect | 3 |
| Reactivity | |
| Other Chemicals | 0 |
| Water | 0 |
| Self Reaction | 0 |
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 1 |
| Reactivity (Yellow) | 0 |

5. HEALTH HAZARDS (Cont'd)

8. Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary.
9. Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin.
10. Odor Threshold: 0.25 ppm.

REVISED 1978

GTA

GLUTARALDEHYDE SOLUTION

Common Synonyms 1,5-Pentanedial		Liquid Light yellow Mixes with water
Stop discharge, if possible. Keep people away. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Not flammable	
Exposure	Call for medical aid. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Have victim drink water or milk.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445-4.) Issue warning: water contaminant. Restrict access. Disperse and flush.		2. LABELS No label required, by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,5-Pentanedial solution. 3.2 Coast Guard Compatibility Classification: Aldehyde. 3.3 Chemical Formula: $\text{OHC}-(\text{CH}_2)_3-\text{CHO}$ (in water). 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Pale yellow. 4.3 Odor: Like rotten apples.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield; rubber gloves. 5.2 Symptoms Following Exposure: Contact with liquid causes severe irritation of eyes and irritation of skin. Chemical readily penetrates skin in harmful amounts. Ingestion causes irritation of mouth and stomach. 5.3 Treatment for Exposure: EYES: immediately flush with plenty of water for at least 15 min; get medical attention. SKIN: immediately flush with plenty of water for at least 15 min. INGESTION: give large amounts of water and induce vomiting; get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral rat LD_{50} = 1,386 mg/kg. 5.7 Late Toxicity: Induces contact dermatitis in some people. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS

- 6.1 Flash Point: Non flammable solution.
 6.2 Flammable Limits in Air: Not pertinent.
 6.3 Fire Extinguishing Agents: Not pertinent.
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent.
 6.5 Special Hazards of Combustion Products: Not pertinent.
 6.6 Behavior in Fire: Not pertinent.
 6.7 Ignition Temperature: Not pertinent.
 6.8 Electrical Hazard: Not pertinent.
 6.9 Burning Rate: Not pertinent.

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): Data not available.
 8.4 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

1. Union Carbide Corporation
 Chemicals and Processes Division
 270 Park Avenue
 New York, N.Y. 10017
 2. Polysciences, Inc.
 P.O. Box 108, Industrial Park
 Warrington, Pa. 18976

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
 7.2 Reactivity with Common Materials: No reaction.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: 25% aqueous solution, 40% aqueous solution.
 10.2 Storage Temperature: Ambient.
 10.3 Inert Atmosphere: No requirement.
 10.4 Venting: Open.

11. HAZARD ASSESSMENT CODE

See Response Methods Handbook, CG 445-4, for details.
 A.P.

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed.
 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed.
 12.3 NFPA Hazard Classifications: Not listed.

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid.
 13.2 Molecular Weight: Mixture.
 13.3 Boiling Point at 1 atm:
 $>212^{\circ}\text{F} = >100^{\circ}\text{C} = >37^{\circ}\text{C}$
 - Freezing Point:
 $<-20^{\circ}\text{C} = <-26^{\circ}\text{C}$
 13.5 Critical Temperature: None.
 13.6 Critical Pressure: Not pertinent.
 13.7 Specific Gravity:
 1.062-1.124 at 20°C (liquid).
 13.8 Liquid Surface Tension: (est.)
 $<40 \text{ dynes/cm} = <0.080 \text{ N/m}$ at 20°C.
 13.9 Liquid-Water Interfacial Tension: Not pertinent.
 13.10 Vapor (Gas) Specific Gravity: Not pertinent.
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.
 13.12 Latent Heat of Vaporization: Not pertinent.
 13.13 Heat of Combustion: Not pertinent.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: Not pertinent.

(Continued on pages 5 and 6.)

NOTES

GCR

GLYCERINE

Common Synonyms 1,2,3-Propanetriol 1,2,3-Trihydroxypropane Glycerol		Only liquid	Colorless	Odorless
		Soluble and mixes with water. Freezing point is 64° F.		
Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Combustible Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
Exposure		Not harmful		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-4. Disperse and flush.		2 LABELS No hazard label required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Glycerol 1,2,3-Propanetriol 1,2,3-Trihydroxypropane 3.2 Coast Guard Compatibility Classification: None 3.3 Chemical Formula: HOCH ₂ CH(OH)CH ₂ OH 3.4 IMCO United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Odorless		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, goggles. 5.2 Symptoms Following Exposure: No hazard. 5.3 Treatment for Exposure: No hazard. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Slight irritant effect. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is non-irritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to skin. 5.10 Odor Threshold: Not pertinent.				

6 FIRE HAZARDS 6.1 Flash Point: 180°F (82°C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide, water fog 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 695°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 0.000 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 20% (theoretical) 5 days 8.4 Food Chain Concentration Potential: None																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Lever Brothers Co. 60 Park Ave. New York, N.Y. 10022 2. Procter & Gamble Co. 401 East Ninth St. Cincinnati, Ohio 45201 3. Shell Chemical Co. Industrial Chemicals Division Houston, Tex. 77001																																				
	10 SHIPPING INFORMATION 10.1 Grades or Purity: (P 99.5%) USP 99.5% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame, pressure, or pressure vacuum																																				
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-3 A P Q	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 92.10 13.3 Boiling Point at 1 atm: 290.2°F (149°C) 13.4 Freezing Point: 64.5°F (18°C) 13.5 Critical Temperature: Not listed 13.6 Critical Pressure: Not listed 13.7 Specific Gravity: 1.261 at 20°C (liquid) 13.8 Liquid Surface Tension: Not listed 13.9 Liquid-Water Interfacial Tension: Not listed 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not listed 13.13 Heat of Combustion: Not listed 13.14 Heat of Decomposition: Not listed 13.15 Heat of Solution: Not listed 13.16 Heat of Polymerization: Not pertinent																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation:<table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td>0</td></tr><tr><td>Vapor Irritant</td><td>0</td></tr><tr><td>Liquid Irritant</td><td>0</td></tr><tr><td>Poisons</td><td>0</td></tr><tr><td>Water Pollution</td><td>0</td></tr><tr><td>Human Toxicity</td><td>0</td></tr><tr><td>Aquatic Toxicity</td><td>0</td></tr><tr><td>Aesthetic Effect</td><td>0</td></tr><tr><td>Reactivity</td><td>0</td></tr><tr><td>Other Chemicals</td><td>2</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table> 12.3 NFPA Hazard Classifications:<table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>	Category	Rating	Fire	1	Health	0	Vapor Irritant	0	Liquid Irritant	0	Poisons	0	Water Pollution	0	Human Toxicity	0	Aquatic Toxicity	0	Aesthetic Effect	0	Reactivity	0	Other Chemicals	2	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	0	Continued on pages 2 and 3
Category	Rating																																				
Fire	1																																				
Health	0																																				
Vapor Irritant	0																																				
Liquid Irritant	0																																				
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Health Hazard (Blue)	1																																				
Flammability (Red)	1																																				
Reactivity (Yellow)	0																																				
NOTES																																					

GCM

GLYCIDYL METHACRYLATE

Common Synonyms Glycidyl alpha-methylacrylate Methacrylic acid 2,3-epoxy propyl ester	Liquid Colorless Fruity odor Floats on water
Avoid contact with liquid. Keep people away. Wear rubber overclothing including gloves. Call fire department. Stop discharge if possible. Isolate and remove discharged material. Notify local health and environmental agencies.	
Fire	Combustible Wear goggles, self-contained breathing apparatus and rubber overclothing. Flush eyes with clean, cool water for 15 minutes. Flush exposed skin with plenty of water. Water may be ineffective on fire.
Exposure	CALL FOR MEDICAL AID LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, induce vomiting. DO NOT induce vomiting if the person is unconscious. Have victim drink water if possible.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Needs to be treated and will be difficult to remove. Needs operation of nearby water intakes.
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444.4. Mechanical containment. Should be removed. Chemical and physical treatment.	2 LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Glycidyl alpha-methylacrylate Methacrylic acid 2,3-epoxy propyl ester 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $\text{CH}_2=\text{CH}(\text{CH}_2\text{CH}(\text{COOCH}_2\text{CHCH}_3)_2)$ 3.4 IMCO United Nations Numerical Designation: Not listed.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Data not available.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Polyethylene coated apron and gloves and close fitting mask. 5.2 Symptoms Following Exposure: The liquid irritates eyes about as much as soap. Prolonged contact with skin produces irritation and dermatitis. 5.3 Treatment for Exposure: SKIN: wash thoroughly with soap and water and treat as a chemical burn. EYES: irrigate with clean water for 15 min. and get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2. LD ₅₀ 0.01 mg/kg rat. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and 1st degree burns on short exposure; may cause secondary burns on long exposure. In eyes the irritation is similar to that caused by ordinary soap. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 100°F (38°C). 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Data not available. 6.4 Fire Extinguishing Agents Not to be Used: Data not available. 6.5 Special Hazards of Combustion Products: Irritating vapors are generated when heated. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Heat, peroxide and catalysts cause polymerization; the reaction is not considered hazardous. 7.6 Inhibitor of Polymerization: Hydroquinone, monomethyl ether, Nitrogen.	9 SELECTED MANUFACTURERS 1. Akzo, Inc. 4401 Fairfield Rd. Baltimore, Md. 21220 2. American Alcolac & Extract Co., Inc. Vandalia, Ind. Philadelphia, Pa. 19134 Polytechnic, Inc. Washington, Pa. 15376.
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 441. VIUNYZ	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 92+. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arresters.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 172. 13.3 Boiling Point at 1 atm: Very high. 13.4 Freezing Point: Data not available. 13.5 Critical Temperature: Not listed. 13.6 Critical Pressure: Not listed. 13.7 Specific Gravity: 1.17 at 15°C liquid. 13.8 Liquid Surface Tension: 32.5 dyne/cm at 20°C liquid. 13.9 Liquid-Water Interfacial Tension: 10.5 dyne/cm at 20°C liquid. 13.10 Vapor (Gas) Specific Gravity: Not listed. 13.11 Ratio of Specific Heats of Vapor (Gas): Not listed. 13.12 Latent Heat of Vaporization: Not listed. 13.13 Heat of Combustion: Not listed. 13.14 Heat of Decomposition: Not listed. 13.15 Heat of Solution: Not listed. 13.16 Heat of Polymerization: Not listed.
NOTES	

GOS

GLYOXAL, 40% SOLUTION

Common Synonyms Biformal Biformal Ethanedial Oxal Oxaldehyde		Liquid	Light yellow	Weak sour odor
Mixes with water				
Stop discharge if possible. Keep people away. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Not flammable			
Exposure	Call for medical aid. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and symptoms persist, have someone drink water or milk.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not known to harm health and wildlife directly. Not known to harm health and wildlife indirectly.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: water contaminant. Disperse and flush.		2. LABELS No label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Biformal, Biformal, Biformal, Ethanedial, Oxal, Oxaldehyde. 3.2 Coast Guard Competibility Classification: To be developed. 3.3 Chemical Formula: CHO - CHO (in water). 3.4 IMCO/United Nations Chemical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Pale yellow. 4.3 Odor: Weak sour.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes some irritation of nose and throat. Contact with liquid irritates eyes and causes mild irritation of skin; stains skin yellow. (No information available on symptoms of ingestion.) 5.3 Treatment for Exposure: INHALATION: remove from exposure. EYES OR SKIN: flush with water for 15 min. INGESTION: no information on treatment. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 4 irritant, LD ₅₀ 2,020 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 6.1 Flash Point: Non flammable solution 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Heat may cause polymerization to a combustible viscous material 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterbody Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Feed Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Corrosive to most metals. The reaction is slow 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Union Carbide Corporation Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017 2. Eastman Kodak Co. Eastman Organic Products Rochester, N.Y. 14650 3. Aldrich Chemical Co. 940 West St. Paul Avenue Milwaukee, Wis. 53233																												
	10. SHIPPING INFORMATION 10.1 Grades or Purity: 40% in water 10.2 Storage Temperature: 13-120°F 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open																												
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3 A P	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Mixture 13.3 Boiling Point at 1 atm: Data not available 13.4 Freezing Point: °F = -15 (°C = -24.4) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.29 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td>1</td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td>1</td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Acute Toxicity</td><td>1</td></tr><tr><td>Reactivity</td><td>1</td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Vapor</td><td>1</td></tr><tr><td>Sol Reaction</td><td>1</td></tr></tbody></table> 12.3 NFPA Hazard Classifications: Not listed	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	1	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	1	Acute Toxicity	1	Reactivity	1	Other Chemicals	1	Vapor	1	Sol Reaction	1	(Continued on pages 1 and 6)
Category	Rating																												
Fire	1																												
Health	1																												
Vapor Irritant	1																												
Liquid or Solid Irritant	1																												
Poisons	1																												
Water Pollution	1																												
Human Toxicity	1																												
Aquatic Toxicity	1																												
Acute Toxicity	1																												
Reactivity	1																												
Other Chemicals	1																												
Vapor	1																												
Sol Reaction	1																												
NOTES																													

Common Synonyms 1,4,5,6,7,8,8-Heptachloro-3a,4a-tetrahydro-4H-methanocine 1,4,5,6,7,8,8-Heptachloro-4a-cyclopentadecalin E3314		Solid	White to light tan	Camphor-like odor
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear goggles and self-contained breathing apparatus. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Not flammable Irritating gases may be produced when heated		
		DUST POISONOUS IF INHALED If inhaled will cause headache or loss of consciousness. If inhaled, remove person to fresh air and keep breathing mask on until after first medical attention. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed will cause nausea and vomiting. If swallowed, contain mouth, do not swallow. Do not allow affected areas with skin to be wet. If IN EYES, flush eyes with plenty of water. If SWALLOWED and person is conscious, have person drink water or milk. If NOT ALLOWED TO SWALLOW, DO NOT INDUCE VOMITING OR CONVULSIONS. If nothing else is available, give water.		
Exposure				
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify local health and pollution control agencies.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG and 4.) Issue warning - water contaminant. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 31 Synonyms: 1,3,12,14,5,6,7,8,8a-Heptachlorodicyclopentadiene; 1,4,5,6,7,8,8a-Heptachloro-3a,4a-tetrahydro-4H-methanocine; Nelsol 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: C ₁₄ H ₁₀ Cl ₇ 34 IMCCG/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: White, light tan 43 Odor: Camphor-like		
5. HEALTH HAZARDS				
51 Personal Protective Equipment: Protective respiratory, rubber gloves, clean clothes 52 Symptoms Following Exposure: Inhalation of dust causes irritation, tremors, and collapse. Ingestion causes nausea, vomiting, diarrhea, and irritation of the gastrointestinal tract. Contact with dust causes irritation of eyes and moderate irritation of skin. 53 Treatment for Exposure: Get medical attention following all overexposures to heptachlor. INHALATION: move to fresh air; if exposure is dust was severe, get medical attention. INGESTION: lavage stomach with warm tap water (unless convulsions are imminent). EYES and skin should be avoided, as they increase the rate of absorption of all chlorinated hydrocarbons. EYES: wash repeatedly with water. SKIN: flush with water, then wash with soap and water. 54 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m 55 Short-Term Inhalation Limits: 2 mg/m for 30 min 56 Toxicity by Ingestion: Grade 4 oral LD ₅₀ = 40 mg/kg (rat) 57 Late Toxicity: Liver damage may develop 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: 0.02 ppm				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating hydrogen chloride fumes may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.1 ppm/24 hr trout 30% ± 10 fresh water 0.230 ppm 96 hr goldfish 11 m fresh water 0.25 ppm/48 hr white shrimp 11 m salt water 8.2 Waterfowl Toxicity: 2000 mg/kg 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Contamination Potential: Bioconcentration of up to 17,600 in oysters and 3,200 in bluegills. A spill could cause potential problem with shellfish.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Vehco Chemical Corp 3411 Ohio St Chicago, Ill 60654
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 445-3) II	10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial, 22+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 HFA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 373.5 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 115° ± 16°F = 26.7°C ± 2.9 °C/78°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.66 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

continued on pages 5 and 6.

NOTES

HPT

HEPTANE

Common Synonyms n-Heptane	Watery liquid Colorless Gasoline-like odor Floats on water. Flammable vapor is produced.
No discharge of number. Keep proper flow. Shut off sprayer nozzle and allow spray to clear nozzle and the water spray. If flame is in vapor isolate and remove discharging material. Never use breath and pipe for cleaning purposes.	
Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, carbon dioxide, or water. Water may be ineffective if used on burning liquid. Extinguish with foam.
Exposure	ALL TOXIC MEDICAL AID VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause coughing or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, flush immediately with plenty of water. IF ON SKIN, wash immediately with plenty of water. IF SWALLOWED, do not induce vomiting. DO NOT INDUCE VOMITING.
Water Pollution	Dangerous to aquatic life in high concentrations. Feeding to livestock. May be dangerous if it enters water intakes. Not a health and safety hazard. Not a pollution hazard.
1. RESPONSE TO DISCHARGE See Response Manual for release. CG 4.4. Extinguishing: High flameability. Flammable gas. Explosion and flash.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: n-Heptane 3.2 Coast Guard Compatibility Classification: Paraffin 3.3 Chemical Formula: C ₇ H ₁₆ 3.4 ICAO United Nations Numerical Designation: 1.2 (D)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Gasoline
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety glasses, gloves, and shoes. 5.2 Symptoms Following Exposure: INHALATION - Irritation to respiratory tract, coughing, depression, cardiac arrhythmias. ASPIRATION - Irritation to respiratory tract, coughing, mild emphysema. INGESTION - Nausea, vomiting, cardiac depression, depression, headache. 5.3 Treatment for Exposure: INHALATION - Move to fresh air, give oxygen if needed. ASPIRATION - Administer oxygen. INGESTION - Do not induce vomiting. SKIN/ EYES - Remove contaminated clothing and shoes and wash with soap and water. Flush eyes with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: 500 ppm for 15 min 5.6 Toxicity by Ingestion: Grade III Poisoning (p. 4) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to eyes and skin. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. Irritation to skin and eyes if contact with skin, eyes, clothing and clothing of the skin. 5.10 Odor Threshold: 220 ppm	

6. FIRE HAZARDS

- 6.1 Flash Point: 25°F (4°C)
- 6.2 Flammable Limits in Air: 1.0% - 7.0%
- 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide.
- 6.4 Fire Extinguishing Agents Not to be Used: None.
- 6.5 Special Hazards of Combustion Products: None.
- 6.6 Behavior in Fire: Non-peroxide.
- 6.7 Ignition Temperature: 473°F
- 6.8 Electrical Hazard: Class I, Group 1.
- 6.9 Burning Rate: 1.0 ft/min

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: 400 ppm (24 hr continuous) LC50, fish.
- 8.2 Waterway Toxicity: Data not available.
- 8.3 Biological Oxygen Demand (BOD): 10 mg/l (24 hr).
- 8.4 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

Hampton Chemical Co.
Deisen
North Hill Chemicals
Phillips Petroleum Co.
Baker Chemicals
Natch Oils
Kaiser Chemical

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
- 7.2 Reactivity with Common Materials: No reaction.
- 7.3 Stability During Transport: Stable.
- 7.4 Neutralizing Agents for Acids and Corrosives: None.
- 7.5 Polymerization: Not peroxide.
- 7.6 Inhibitor of Polymerization: Not peroxide.

10. SHIPPING INFORMATION

- 10.1 Grades or Purities: Various grades, all per ASTM.
- 10.2 Storage Temperature: Ambient.
- 10.3 Inert Atmosphere: None.
- 10.4 Venting: Vapor and liquid.

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Manual, CG 4.4.
A T T S W

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable liquid.
- 12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
1.2	1
Health	
Vapor Irritant	
Liquid or Solid Irritant	
Water Pollution	
Harmful to Aquatic Life	
Aquatic Toxicity	
Acute Toxicity	
Reactivity	
Other Hazards	
Water	
Self Reaction	
- 12.3 NFPA Hazard Classifications: Not listed.

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid.
- 13.2 Molecular Weight: 98.19
- 13.3 Boiling Point at 1 atm: 98.4°C (209°F)
- 13.4 Freezing Point: -90.6°C (-131°F)
- 13.5 Critical Temperature: 371.6°C (699°F)
- 13.6 Critical Pressure: 28.7 atm (424 psia)
- 13.7 Specific Gravity: 0.684 (at 15°C)
- 13.8 Liquid Surface Tension: 20.8 dyne/cm (at 15°C)
- 13.9 Liquid-Water Interfacial Tension: 31 dyne/cm (at 0.051 N/m at 30°C)
- 13.10 Vapor (Gas) Specific Gravity: 3.44 (at 15°C)
- 13.11 Ratio of Specific Heats of Vapor (Gas): 1.10
- 13.12 Latent Heat of Vaporization: 351 Btu/lb (810 cal/g) (at 15°C)
- 13.13 Heat of Combustion: 19,300 Btu/lb (45,700 cal/g) (at 15°C)
- 13.14 Heat of Decomposition: None.
- 13.15 Heat of Solution: None.
- 13.16 Heat of Polymerization: None.

NOTES

HTE

1-HEPTENE

Common Synonyms Heptene	Waters liquid Colorless Gasoline-like odor Floats on water. Flammable, irritating vapor is produced.
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and out water spray 150 ft downwind. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Respirators contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED, do not induce vomiting. Do not drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Toxic to fish. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE Under Spill Response Methods Handbook, CG 600-1-10 Isolate warning: High flammability. Restrict access. Evacuate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Heptene 3.2 Coast Guard Compatibility Classification: Other 3.3 Chemical Formula: C ₇ H ₁₄ 3.4 IBCO United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Gasoline
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety goggles or face shield, similar to gasoline. 5.2 Symptoms Following Exposure: High concentrations may produce slight irritation of eyes and respiratory tract; may also act as simple asphyxiant and cause anesthesia. 5.3 Treatment for Exposure: Remove from exposure. Administer artificial respiration if needed. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause staining and reddening of the skin. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 29°F (4°C) 6.2 Flammable Limits in Air: 1.1 - 6.0% (LFL not listed) 6.3 Fire Extinguishing Agents: Foam, dry chemical or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 500°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 6.4 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Bases: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. American Petroleum Inc., Camden Oil and Chemical Co., Bay Spring, Texas 77620. 2. Exxon Chemical Co., Houston, Texas 77001. 3. Phillips Petroleum Co., Bartlesville, OK 74004.																												
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 600-1-10 A T C U W	10. SHIPPING INFORMATION 10.1 Grades or Purities: Technical. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arresters).																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table data-bbox="907 1485 1142 1747"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td>1</td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>0</td></tr> <tr> <td>Water Pollution</td><td>0</td></tr> <tr> <td>Harmful Toxics</td><td>0</td></tr> <tr> <td>Aquatic Toxics</td><td>0</td></tr> <tr> <td>Anesthetics, 1 Day</td><td>2</td></tr> <tr> <td>Reactions</td><td>0</td></tr> <tr> <td>Other Chemicals</td><td>0</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classification: Not listed.	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	0	Water Pollution	0	Harmful Toxics	0	Aquatic Toxics	0	Anesthetics, 1 Day	2	Reactions	0	Other Chemicals	0	Water	0	Self Reaction	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 98.15. 13.3 Boiling Point at 1 atm: 98.4°C (209.1°F). 13.4 Freezing Point: -94.1°C (-137.4°F). 13.5 Critical Temperature: 273.9°C (522.9°F). 13.6 Critical Pressure: 4.50 MPa (64.8 psi). 13.7 Specific Gravity: 0.684 at 15°C (60°F). 13.8 Liquid Surface Tension: 21.5 mN/m at 15°C (60°F). 13.9 Liquid-Water Interfacial Tension: 1.5 mN/m at 15°C (60°F). 13.10 Vapor (Gas) Specific Gravity: 1.4. 13.11 Rate of Specific Heats of Vapor (Gas): 1.4. 13.12 Latent Heat of Vaporization: 35.5 kJ/mol at 15°C (60°F). 13.13 Heat of Combustion: -44.4 MJ/kg at 15°C (60°F). 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	1																												
Health	1																												
Vapor Irritant	1																												
Liquid or Solid Irritant	1																												
Poisons	0																												
Water Pollution	0																												
Harmful Toxics	0																												
Aquatic Toxics	0																												
Anesthetics, 1 Day	2																												
Reactions	0																												
Other Chemicals	0																												
Water	0																												
Self Reaction	1																												
NOTES																													

REVISED 1978

HCC

HEXACHLOROCYCLOPENTADIENE

Common Synonyms Perchlorocyclopentadiene		Liquid	Greenish yellow	Harsh, unpleasant odor
		Sinks in water		
AVOID CONTACT WITH LIQUID AND VAPOR. STEEP TO 1/4 AWAY. Wear goggles, self contained breathing apparatus and rubber, wetting (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Not flammable Poisonous gases may be produced when heated		
 Exposure		CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED, D and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 448-4) Issue warning: poison, water contaminant, air contaminant. Restrict access. Should be removed. Chemical and physical treatment.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Perchlorocyclopentadiene 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C_5Cl_6 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow or greenish yellow 4.3 Odor: Harsh pungent		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing, including rubber gloves and rubber shoes or boots, self contained breathing apparatus, face shield. 5.2 Symptoms Following Exposure: Inhalation of mist is highly irritating to mucous membranes causing lachrymation, sneezing, and salivation, pulmonary edema may occur. Ingestion causes nausea, vomiting, diarrhea, depression. Contact with eyes causes severe irritation. Liquid is extremely irritating to the skin, causing blistering and burning. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, give artificial respiration and/or oxygen as needed. INGESTION: give large amounts of water and induce vomiting, give saline laxative. EYES: flush with water for at least 15 min., if irritation remains, get medical attention. SKIN: wash with soap and water until no odor remains. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 ppm (proposed) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: (grade 4, oral) LD ₅₀ = 0.505 mg/kg (mouse) 113 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: 0.15 - 0.33 ppm				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: If water is used on adjacent fires, do not allow water to enter drums or storage tanks 6.5 Special Hazards of Combustion Products: Toxic hydrogen chloride, chlorine and phosgene gases may form in fires 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Highly toxic 8.2 Waterlow Toxicity: Highly toxic 8.3 Biological Oxygen Demand (BOD) Data not available 8.4 Food Chain Concentration Potential: Possible accumulation of breakdown products
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts slowly to form hydrochloric acid. The reaction is not hazardous 7.2 Reactivity with Common Materials: In presence of moisture will corrode iron and other metals. Flammable and explosive hydrogen gas may collect in enclosed space 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Rinse with dilute solution of sodium bicarbonate or soda ash 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Hooker Chemical Corporation Industrial Chemicals Division Niagara Falls, N. Y. 14302 2 Velvol Chemical Corporation 341 East Ohio Street Chicago Ill 60611
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 97+%, Synthesis grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 448-3) A N	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 272.7 13.3 Boiling Point at 1 atm: 462°F = 239°C = 512°K 13.4 Freezing Point: 50°F = 10°C = 283°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.71 at 20°C (liquid) 13.8 Liquid Surface Tension 37.5 dynes/cm = 0.0375 N/m at 20°C 13.9 Liquid-Water Interfacial Tension Data not available 13.10 Vapor (Gas) Specific Gravity: 9.42 13.11 Ratio of Specific Heats of Vapor (Gas) Data not available 13.12 Latent Heat of Vaporization: (est.) 76 Btu/lb = 42 cal/g = 1.8 x 10⁵ J/kg 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poison Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

H'

HEXADECYL SULFATE, SODIUM SALT

Common Synonyms Sodium cetyl sulfate solution Cetyl sodium sulfate		Solid paste or liquid	White	Mild odor
May float or sink in water				
Stop discharge if possible. Keep people away. Isolate and remove discharge from area. Notify local health and pollution control agencies.				
Fire	Not Flammable			
Exposure	CALL FOR MEDICAL AID LIQUID OR SOLID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS have victim drink water or milk IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS do nothing, call to keep victim warm			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446.4) Dilute and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cetyl sodium sulfate Sodium cetyl sulfate solution 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{CH}_3(\text{CH}_2)_{14}\text{CH}_2\text{OSO}_3\text{Na} \cdot \text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped) Paste, solid or liquid 4.2 Color: White 4.3 Odor: Mild		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Plastic or rubber gloves, goggles or face shield 5.2 Symptoms Following Exposure: Contact with eyes causes mild irritation. May cause skin to dry out and become irritated 5.3 Treatment for Exposure: EYES or SKIN: flush with water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0-76 ppm/24 hr or less 11 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Akzo Inc. 3440 Fairfield Rd Baltimore, Md 21226
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446.3) (Liquid) A P (Solid) SS	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inner Atmosphere: No requirement 10.4 Venting: Open
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or liquid 13.2 Molecular Weight: Not pertinent (mixture) 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent <i>(Continued on pages 5 and 6)</i>

NOTES

HAC

HEXADECYLTRIMETHYLAMMONIUM CHLORIDE

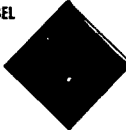
Common Synonyms Cetyltrimethylammonium chloride solution		Liquid	Clear to pale yellow	Rubbing alcohol odor
Floats or sinks in water				
Stop discharge if possible. Keep people away. Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		FLAMMABLE: Irritating gases may be produced when heated. Flashback vapor along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.		
Exposure		CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm. DO NOT INDUCE VOMITING.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cetyltrimethylammonium chloride solution 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula $C_{16}H_{33}(CH_3)_3NCl \cdot H_2O$ (CH ₃) ₃ COH 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Almost clear to pale yellow 4.3 Odor: Like rubbing alcohol		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Ingestion may produce toxic effects. Contact with eyes or skin may cause severe damage. 5.3 Treatment for Exposure: INGESTION: do NOT induce vomiting; drink large quantities of fluid and call a physician immediately. EYES: flush with water for at least 15 min. and call a physician. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 240 mg/kg(rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: 69°F C.C. (for isopropyl alcohol solutions only) 6.2 Flammable Limits in Air: 2% - 12% (isopropyl alcohol) 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Irritating fumes of hydrogen chloride may form in fires 6.6 Behavior in Fire: Solvent vapors are heavier than air and may travel to a source of ignition and flash back 6.7 Ignition Temperature: 750°F (isopropyl alcohol) 6.8 Electrical Hazard: (for isopropyl alcohol) Class I, Group D 6.9 Burning Rate: (isopropyl alcohol solutions) 2.3 mm/min		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. Armat Chemicals Div. Box 1805 Chicago, Ill. 60690 2. Lonza Inc. Fair Lawn, N.J. 07410 3. Ashland Chemical Co. P.O. Box 2219 Columbus, Ohio 43216	
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-P		10 SHIPPING INFORMATION 10.1 Grades or Purities: 25% solution in water. 50% solution in a mixture of isopropyl alcohol and water, which is flammable. If the chemical for a solution with concentration greater than 50% is shipped, contact with skin and eyes should be avoided. 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 319 (sol. te. only) 13.3 Boiling Point at 1 atm: (isopropyl alcohol) 180°F = 82.2°C = 355.5°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: (approx.) 0.9 at 25°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
<i>(Continued on pages 4 and 5)</i>			
NOTES			

(Continued on pages 4 and 5)

HAL

n-HEXALDEHYDE

Common Synonyms Capronic aldehyde Caproaldehyde Hexanal Capronaldehyde n-Caproaldehyde	Liquid Colorless Sharp unpleasant odor Floats on water Flammable, irritating vapor is produced
Stop discharge if possible. Keep people away. Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Combustible Flammable along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk and have stomach induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability. Restrict access. Mechanical containment. Should be removed. Chemical and physical treatment.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Caproaldehyde, Capronic aldehyde, Capronaldehyde, Hexanal, n-Caproaldehyde. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: $C_6H_{12}O$ 3.4 IMCO/United Nations Numerical Designation: 111207	
2. LABEL 	
4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Ingestion causes irritation of mouth and stomach. Contact with vapor or liquid irritates eyes. Liquid irritates skin. 5.3 Treatment for Exposure: INGESTION: Give large amount of water and induce vomiting. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, oral LD ₅₀ = 4,900 mg/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS

- 6.1 **Flash Point:** 90°F O.C.
 6.2 **Flammable Limits in Air:** Data not available.
 6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide.
 6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
 6.5 **Special Hazards of Combustion Products:**
 6.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back.
 6.7 **Ignition Temperature:** Data not available.
 6.8 **Electrical Hazard:** Data not available.
 6.9 **Burning Rate:** 5.21 mm/min.

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available.
 8.2 **Waterfowl Toxicity:** Data not available.
 8.3 **Biological Oxygen Demand (BOD):** Data not available.
 8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

1. Aldrich Chemical Co.
 940 W. Saint Paul Ave.
 Milwaukee, Wis. 53233
 2. Pfaltz & Bauer, Inc.
 375 Fairfield Ave.
 Stamford, Conn. 06902

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction.
 7.2 **Reactivity with Common Materials:** May attack some forms of plastics.
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
 7.5 **Polymerization:** Not pertinent.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** 99+%, Commercial.
 10.2 **Storage Temperature:** Ambient.
 10.3 **Inert Atmosphere:** No requirement.
 10.4 **Venting:** Open (flame arrester).

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 A-T-U

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Flammable liquid.
 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.
 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 3 |
| Reactivity (Yellow) | 1 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid.
 13.2 **Molecular Weight:** 100.
 13.3 **Boiling Point at 1 atm:** 262°F = 128°C = 401°K.
 13.4 **Freezing Point:** Not pertinent.
 13.5 **Critical Temperature:** Not pertinent.
 13.6 **Critical Pressure:** Not pertinent.
 13.7 **Specific Gravity:** 0.83 at 20°C (liquid).
 13.8 **Liquid Surface Tension:** Data not available.
 13.9 **Liquid-Water Interfacial Tension:** Data not available.
 13.10 **Vapor (Gas) Specific Gravity:** 3.5.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** (est.) 1.061 at 20°.
 13.12 **Latent Heat of Vaporization:** (est.) 153 Btu/lb = 85 cal/g = 1.6×10^5 J/kg.
 13.13 **Heat of Combustion:** (est.) -17,000 Btu/lb = -9,430 cal/g = -3.94×10^5 J/kg.
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** Not pertinent.
 13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 1 and 6)

NOTES

HMD

HEXAMETHYLENEDIAMINE

Common Synonyms 1,6-Hexamethanamine 1,6-Diaminohexane		Solid or watery liquid	Colorless	Weak ammoniac odor																												
		Floats and mixes with water																														
Avoid contact with liquid. Keep people away. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.																																
Fire	Combustible Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Extinguish with water, foam, dry chemical or carbon dioxide.																															
	CALL FOR MEDICAL AID LIQUID OR SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.																															
Exposure																																
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.																															
1. RESPONSE TO DISCHARGE (See Personnel Methods Handbook, CG 448-4) Issue warning: corrosive, water contaminant. Disperse and flush.		2. LABEL 																														
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,6-Diaminohexane 1,6-Hexanediamine HMDA 3.2 Coast Guard Competibility Classification: Amine 3.3 Chemical Formula: $\text{NH}_2(\text{CH}_2)_6\text{NH}_2$ 3.4 IMCO/United Nations Numerical Designation: X 0/1783		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid (anhydrous) or liquid (70% solution) 4.2 Color: Glassy solid, clear liquid 4.3 Odor: Weak, fishy																														
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing, eye protection. 5.2 Symptoms Following Exposure: Vapors cause irritation of eyes and respiratory tract. Liquid irritates eyes and skin; may cause dermatitis. 5.3 Treatment for Exposure: SKIN OR EYES: flush immediately with water for 15 min.; call a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Repeated exposure can cause anemia and damage kidney and liver. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: 0.0041 mg/m ³																																
6. FIRE HAZARDS 6.1 Flash Point: 160°F (71°C) 6.2 Flammable Limits in Air: 0.7% - 6.8% 6.3 Fire Extinguishing Agents: Data not available. 6.4 Fire Extinguishing Agents Not to be Used: Data not available. 6.5 Special Hazards of Combustion Products: Data not available. 6.6 Behavior in Fire: Data not available. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Data not available.																																
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.																																
8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																																
9. SELECTED MANUFACTURERS 1. Celanese Corp. Celanese Chemical Co. Division 245 Park Ave. New York, N.Y. 10017 2. E. I. du Pont de Nemours & Co., Inc. Plastics Department Wilmington, Del. 19898 3. Monsanto Co. Monsanto Textiles Co. 800 N. Lindbergh Blvd. St. Louis, Mo. 63166																																
10. SHIPPING INFORMATION 10.1 Grades or Purity: Anhydrous 99.8%, 70% solution. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Nitrogen. 10.4 Venting: Pressure-vacuum.																																
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-3) A P Q																																
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive material. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td></td></tr><tr><td> Vapor Irritant</td><td>1</td></tr><tr><td> Liquid or Solid Irritant</td><td>2</td></tr><tr><td> Poisons</td><td>3</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td> Human Toxicity</td><td>2</td></tr><tr><td> Aquatic Toxicity</td><td>3</td></tr><tr><td> Acute Effect</td><td>1</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td> Other Chemicals</td><td>3</td></tr><tr><td> Water</td><td>0</td></tr><tr><td> Self Reaction</td><td>0</td></tr></tbody></table> 12.3 NFPA Hazard Classifications: Not listed.					Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	3	Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	Acute Effect	1	Reactivity		Other Chemicals	3	Water	0	Self Reaction	0
Category	Rating																															
Fire	1																															
Health																																
Vapor Irritant	1																															
Liquid or Solid Irritant	2																															
Poisons	3																															
Water Pollution																																
Human Toxicity	2																															
Aquatic Toxicity	3																															
Acute Effect	1																															
Reactivity																																
Other Chemicals	3																															
Water	0																															
Self Reaction	0																															
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid (anhydrous); Liquid (70% solution). 13.2 Molecular Weight: 116.21. 13.3 Boiling Point at 1 atm: 478°K = 205°C = 401°F. 13.4 Freezing Point: (anhyd.) 104.9°F = 40.5°C = 313°K; (70% soln.) 25°F = -2°C = 269°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: (anhyd.) 0.799 at 60°C (liquid); (70% soln.) 0.933 at 20°C (liquid). 13.8 Liquid Surface Tension: (anhyd.) 34 dynes/cm = 0.034 N/m at 60°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 203 Btu/lb = 11 kcal/g = 4.73 X 10 ³ J/kg. 13.13 Heat of Combustion: (est.) 12,200 Btu/lb = -6,790 kcal/g = -284 X 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: (est.) -9 Btu/lb = -5 kcal/g = -0.2 X 10 ³ J/kg. 13.16 Heat of Polymerization: Not pertinent. (continued on pages 5 and 6)																																
NOTES																																

REVISED 1978

HMI

HEXAMETHYLENEIMINE

Common Synonyms Hexahydroazepine Azacycloheptane	Liquid Colorless to light yellow Ammonia-like odor Floats and mixes slowly with water Irritating vapor is produced
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY Stop all ignition sources (CFL's, etc.) Stop discharge if possible Evacuate and remove all discharges! Notify local health and fire departments	
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Wear goggles and self-contained breathing apparatus Extinguish with dry chemical, alkali, foam, or carbon dioxide Water may be ineffective in fire Do not seal container with water
 Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing, difficult breathing or loss of consciousness If in eyes, hold eyelids open and flush with plenty of water If breathing has stopped, give artificial respiration If unconscious, tilt the head back LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes If swallowed will cause nausea Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS, have them drink water or milk IF SWALLOWED and victim is UNCONSCIOUS, OR HAVING CONVULSIONS, Do nothing except keep the person DONOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and waste treatment authorities Notify local fire department with releases
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: corrosive, air contaminant, water contaminant Restrict access Disperse and flush	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Azacycloheptane Hexahydroazepine, Homopiperidine 3.2 Coast Guard Compatibility Classification: Aliphatic amine 3.3 Chemical Formula: <chem>C1CNCCCC1</chem> 3.4 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light yellow 4.3 Odor: Ammonia-like
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, impervious gloves, chemical safety goggles, impervious apron and boots 5.2 Symptoms Following Exposure: Inhalation of vapor irritates respiratory tract; high concentrations may cause disturbance of the central nervous system. Ingestion causes burns of mouth and stomach. Contact with concentrated vapor may cause severe eye injury. Contact with liquid causes burns of eyes and skin. 5.3 Treatment for Exposure: INHALATION: remove victim to uncontaminated atmosphere; get medical attention. INGESTION: give large amount of water; do NOT induce vomiting; get medical attention if large amount was swallowed. EYES: flush with water for 15 min. and get medical attention. SKIN: flush with water; wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4, oral LD ₅₀ = 32 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: 99°F (3°C) 6.2 Flammable Limits in Air: 1.6% - 2.3% 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire 6.6 Behavior in Fire: Vapor is heavier than air and may travel to a source of ignition and flash back 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Celanese Chemical Company 245 Park Avenue New York, N.Y. 10017 2. Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233 3. Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P Q	10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial, Pure 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 99 13.3 Boiling Point at 1 atm: 270°F = 132°C = 403°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.880 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
NOTES (Continued on pages 1 and 6)	

HMT

HEXAMETHYLENETETRAMINE

Common Synonyms HEXA Urotropine Hexamine Methacramine Ammoniaformaldehyde		Solid crystals or powder White Mild ammonia odor
		Sinks and mixes with water
Avoid contact with solid Call fire department Isolate and remove discharged material Notify local health and pollution control agencies		
Fire	Combustible Extinguish with water, foam, dry chemical, or carbon dioxide Cool exposed containers with water	
Exposure	CALL FOR MEDICAL AID SOLID Irritating to skin and eyes Remove contaminated clothing and shoes Flush affected areas with plenty of water If IN EYES, hold eyelids open and flush with plenty of water	
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife agencies Notify operators of nearby water intakes	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Disperse and flush		2 LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonia Ammonium Hexamine Methacramine Urotropine 3.2 Coast Guard Compatibility Classification Alkylideneamine 3.3 Chemical Formula: $C_6H_{12}N_4$ 3.4 IMCO United Nations Numerical Designation: 4.1, 1.2X		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Mild ammonia-like
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Gloves for dusts or splatter conditions; use dust filter respirator and goggles 5.2 Symptoms Following Exposure: Prolonged and repeated contact may cause skin irritation 5.3 Treatment for Exposure: Wash skin or eyes thoroughly with water; call a physician 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 2 (D _{0.5} 5 to 5 g/kg human) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to the eyes and throat 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled, flushing and allowed to remain may cause stinging and redness of the skin 5.10 Odor Threshold: Not pertinent		

6 FIRE HAZARDS 6.1 Flash Point: 422°F (C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Formaldehyde gas and ammonia may be given off when hot 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: $>700^{\circ}\text{F}$ 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1 Borden Inc. Borden Chemical Division 50 W. Broad St. Columbus, Ohio 43215 2 Hooker Chemical Corp. Waukegan, Ill. 3 Wright Chemical Corp. Rice Lake, Wis.
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) SS		10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical USP 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrestor)
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 HFA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 140.19 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.35 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: $-13,400\text{ Btu/lb}$ $= -7490\text{ cal/g}$ $= -310 \times 10^3\text{ J/kg}$ 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES		

(continued on page 1 and 2)

HXA

HEXANE

Common Synonyms n-Hexane	Watery liquid Colorless Gasoline-like odor Floats on water. Flammable, irritating vapor is produced.
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE: Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to nose and throat. If inhaled, will cause coughing or dizziness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and vomiting: CONSULTS have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability. Evacuate area. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Paraffin. 3.3 Chemical Formula: C ₆ H ₁₄ (H & CH). 3.4 IMCO/United Nations Numerical Designation: 1, 1208.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Like gasoline.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Eye protection (like gasoline). 5.2 Symptoms Following Exposure: INHALATION causes irritation of respiratory tract, cough, mild depression, cardiac arrhythmias. ASPIRATION causes severe lung irritation, coughing, pulmonary edema, excretion, followed by depression. INGESTION causes nausea, vomiting, swelling of abdomen, headache, depression. 5.3 Treatment for Exposure: Call doctor. INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, give oxygen if needed. INGESTION: do NOT induce vomiting. SKIN OR EYES: wipe off, wash skin with soap and water, wash eyes with copious amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 500 ppm. 5.5 Short-Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Very slight. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: -77°F (-50°C) 6.2 Flammable Limits in Air: 1.1% - 7.7% 6.3 Fire Extinguishing Agents: foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Vapors may explode. 6.7 Ignition Temperature: 437°F 6.8 Electrical Hazard: (Class I group D) 6.9 Burning Rate: 7.4 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 0% (theoretical) 7 days. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Humphries Chemical Co. Des Moines North Haven, Conn. 06473 2. Phillips Petroleum Co. Bartlesville, Okla. 74004 3. Shell Oil Co. Kansas City, Mo. 64141.																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U S W	10. SHIPPING INFORMATION 10.1 Grades or Purities: Research grade, technical grade. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arresters or pressure vacuum.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="901 1458 1140 1720"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>0</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>0</td></tr> <tr> <td>Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>1</td></tr> <tr> <td>Aquatic Toxicity</td><td>1</td></tr> <tr> <td>Aesthetic Effect</td><td>1</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other chemicals</td><td>0</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="901 1764 1140 1817"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	0	Liquid or Solid Irritant	0	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity		Other chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 86.17. 13.3 Boiling Point at 1 atm: 155.7°F = 68.7°C = 341.9°K. 13.4 Freezing Point: -219.3°F = -139.6°C = 133.7°K. 13.5 Critical Temperature: 453.6°F = 234.2°C = 507.4°K. 13.6 Critical Pressure: 436.6 psia = 29.7 atm = 3.01 MPa. 13.7 Specific Gravity: 0.659 at 20°C (liquid). 13.8 Liquid Surface Tension: 18.4 dynes/cm = 0.0184 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 5.1 dynes/cm = 0.0511 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: 1.0. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.061. 13.12 Latent Heat of Vaporization: 144 Btu/lb = 800 cal/g = 3.35 x 10 ³ J/kg. 13.13 Heat of Combustion: +19,246 Btu/lb = -10,692 cal/g = -447.65 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	0																																				
Liquid or Solid Irritant	0																																				
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Health Hazard (Blue)	1																																				
Flammability (Red)	3																																				
Reactivity (Yellow)	0																																				
NOTES (Continued on pages 5 and 6.)																																					

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HXN

HEXANOL

Common Synonyms 1-Hexanol n-Hexyl alcohol n-Amylcarbitol	Clear liquid Floats on water	Colorless	Sweet odor
No pre-discharge is possible. Keep people away. Call fire department. Avoid contact with liquid. Wash and remove discharged material. Notify local health and pollution control agencies.			
Fire	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire.		
Exposure	CALL FOR MEDICAL AID LIQUID Will burn eyes. Harmful if swallowed. Remove clothing immediately. Flush and flush. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water. Notify operators of nearby water bodies.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operators of nearby water bodies.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 666-4) Mechanical containment Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Amylcarbitol 1-Hexanol n-Hexyl alcohol n-Hydroxyhexane 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: C ₆ H ₁₄ O or C ₆ H ₁₃ OH 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweet, mild	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical gloves, chemical goggles 5.2 Symptoms Following Exposure: Liquid causes eye burns and skin irritation. Breathing vapors is not expected to cause systemic illness. 5.3 Treatment for Exposure: In case of contact, immediately flush skin and eyes with plenty of water. Wash eyes at least 15 min. and get medical care. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 2 (1.0-10.0 mg/kg body wt.) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure; may cause second-degree burns on long exposure. 5.10 Odor Threshold: Data not available			

6. FIRE HAZARDS 6.1 Flash Point: 149°F (60-148°F C) 6.2 Flammable Limits in Air: 1.2% - 7.7% (vol.) 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 582°F (est.) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterbody Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 57% in 10 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Continental Oil Co. Chemical Division Park Plaza East Saddle Brook, N.J. 07662 2. Ethyl Corp. Industrial Chemical Division 451 Florida St. Baton Rouge, La. 70801 3. Union Carbide Corp. Chemical and Plastics Division 270 Park Ave. New York, N.Y. 10017
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 666-3) A-T-L	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame protected
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible liquid 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 102.18 13.3 Boiling Point at 1 atm: 148.5°F = 65.3°C = 291.5°K 13.4 Freezing Point: -45.3°F = -42.6°C = 226.6°K 13.5 Critical Temperature: 453.6°F = 234.8°C = 507.8°K 13.6 Critical Pressure: 455 psia = 31.3 atm = 3.14 MPa (abs.) 13.7 Specific Gravity: 0.810 at 20°C (liquid) 13.8 Liquid Surface Tension: 24 dynes/cm = 0.024 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 6.8 dynes/cm = 0.0068 N/m at 25°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.05 13.12 Latent Heat of Vaporization: 209 Btu/lb = 46.4 cal/g = 2.56 x 10 ⁵ J/kg 13.13 Heat of Combustion: 16,610 Btu/lb = 39,527 cal/g = 1.65 x 10 ⁷ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

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HXE

1-HEXENE

Common Synonyms: alpha-Hexene Hexene	Watery liquid Colorless Mild pleasant odor Floats on water Flammable, irritating vapor is produced
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Avoid contact with liquid and vapor. Stay upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective in fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID VAPOR If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If swallowed, flush mouth and drink plenty of water. IF SWALLOWED AND VOMITING OCCURS, DO NOT DRINK WATER OR MILK. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4. Issue warning: high flammability. Evacuate area. Dispense and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: alpha-Hexene 3.2 Coast Guard Compatibility Classification: OGCN 3.3 Chemical Formula: C_6H_{12} or $CH_2=CH(CH_2)_3CH_3$ 3.4 IMCO United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild pleasant
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved organic vapor respirator or air line mask, protective goggles or face shield. 5.2 Symptoms Following Exposure: Irritation may cause giddiness, dizziness, and stimulation similar to that from gasoline vapor. Prolonged exposure to high concentrations may induce loss of consciousness or death. 5.3 Treatment for Exposure: SKIN OR EYES: wash exposed area as with soap and water. Thoroughly flush eyes with water to remove any splashes. Launder clothing before reuse. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not given suggested. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Slight smarting of the eyes or respiratory system if present in high concentrations. Effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: -15°C (-5°F) 6.2 Flammable Limits in Air: LEL (vol %) = 2.1 LEL (wt %) = 2.1 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 521°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterlow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 1.5% 7 days. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1 Gulf Oil Corp. Petrochemical Division Cedar Bayou, Texas 77620 2 The Humphrey Chemical Co. Devine, N. North Haven, Conn. 06473 3 Phillips Petroleum Co. Bartlesville, Okla. 74004
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-2. A T U A W	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 99.9% Pure 99.9% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame atmosphere, pressure vacuum.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: 1.3 flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Liquid. 13.2 Molecular Weight: 84.16. 13.3 Boiling Point at 1 atm.: 126.3°F or 52.4°C or 325.5°K . 13.4 Freezing Point: -219.7°F or -155°C or 118.2°K . 13.5 Critical Temperature: 447.4°F or 230.8°C or 504.0°K . 13.6 Critical Pressure: 480 psia or 3.3 atm or 3.3 MPa. 13.7 Specific Gravity: 0.672 at 20°C and 1 atm. 13.8 Liquid Surface Tension: 22.5 dynes/cm at 20°C . 13.9 Liquid-Water Interfacial Tension: 31.6 dynes/cm or 0.0316 N/m at 22.7°C . 13.10 Vapor (Gas) Specific Gravity: 2.9. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.68. 13.12 Latent Heat of Vaporization: 140 Btu/lb or 80 cal/g or $3.3 \times 10^4 \text{ J/kg}$. 13.13 Heat of Combustion: $-19,134 \text{ Btu/lb}$ or $-10,664 \text{ cal/g}$ or $-44,669 \text{ J/kg}$. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES continued on page 1 and 2	

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HXG

HEXYLENE GLYCOL

Common Synonyms: 2-Methyl-2-Pentadecanol	Only liquid Colorless Mild sweet odor Floats and mixes slowly with water
Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Combustible. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID. LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response to Methods Handbook, CG 446.4.) Evacuate area. High flammability. Ventilate. Remove excess. Chemical and physical treatment.	2. LABEL  CORROSIVE
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: None common with hexyls. 3.2 Coast Guard Compatibility Classification: Glycol. 3.3 Chemical Formula: $\text{C}_{16}\text{H}_{34}\text{O}$. 3.4 IMCO United Nations Numerical Designation: N.O. 2040.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Ammoniacal-like.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Ammonia-type gas mask, self-contained breathing apparatus, protective rubber gloves, clothes, and apron; safety shower must be available. 5.2 Symptoms Following Exposure: Vapors cause itching, swelling, and blistering of eyelids, skin, nose and throat; symptoms may be delayed for several hours. Temporary blindness may occur. Liquid causes a caustic-like burn if not washed off at once. Ingestion or absorption may cause nausea, diarrhea, headache. Severe exposure may cause death. 5.3 Treatment for Exposure: Call a doctor at once. INHALATION: remove to fresh air; observe for development of delayed symptoms. Keep quiet. INGESTION: do NOT induce vomiting; give egg whites or other emollient. SKIN OR EYES: wash with large amounts of water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm. 5.5 Short-Term Inhalation Limits: 10 ppm for 15 min. 5.6 Toxicity by Ingestion: Grade 3 (LD ₅₀ 5000 mg/kg rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact; very serious on the eyes. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 261°F (128°C). 6.2 Flammable Limits in Air: 1.7% (lower). 6.3 Fire Extinguishing Agents: Water, alcohol foam, carbon dioxide, or dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic vapors generated when heated. 6.6 Behavior in Fire: May explode if confined. 6.7 Ignition Temperature: May ignite spontaneously (N.A.F. type 1). 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 1 mm/min (est.).	8. WATER POLLUTION 8.1 Aquatic Toxicity: 140 ppm 95 hr rainbow trout died; fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 100% 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Can catch fire when in contact with porous materials such as wood, asbestos, cloth, earth and rusty metal. 7.3 Stability During Transport: Stable at ordinary temperatures. When heated, can decompose to nitrogen and ammonia gases; but decomposition is not hazardous unless material is confined. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water. Neutralize the resulting solution with calcium hypochlorite (HTH) (chlorine of hydrazine). 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Eastmont Chemical Co., Inc. 117 Blanchard St. Newark, N.J. 07104 2. Olin Corp. Chemicals Division 120 Long Ridge Rd. Stamford, Conn. 06904 3. Unival Inc. Unival Chemical Division Spencer St. New Bedford, Mass. 01905																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3. A-P-Q	10. SHIPPING INFORMATION 10.1 Grades or Purity: Anhydrous, 95-98% water solutions. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Padded. 10.4 Venting: Pressure-vacuum.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive material. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="1159 1415 1408 1677"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>4</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>4</td></tr> <tr><td>Liquid or Solid Irritant</td><td>4</td></tr> <tr><td>Poison</td><td>4</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>4</td></tr> <tr><td>Aquatic Toxicity</td><td>3</td></tr> <tr><td>Acute Toxicity</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>4</td></tr> <tr><td>Water</td><td>3</td></tr> <tr><td>Self Reaction</td><td>4</td></tr> </tbody> </table> 12.3 MFPA Hazard Classifications: <table data-bbox="1159 1699 1408 1793"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>3</td></tr> <tr><td>Flammability (Red)</td><td>3</td></tr> <tr><td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poison	4	Water Pollution		Human Toxicity	4	Aquatic Toxicity	3	Acute Toxicity	2	Reactivity		Other Chemicals	4	Water	3	Self Reaction	4	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	3	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 226. 13.3 Boiling Point at 1 atm: 264.3°C = 505.7°F = 538.7°K. 13.4 Freezing Point: 14.7°C = 58.5°F = 274.7°K. 13.5 Critical Temperature: 306.1°C = 583.0°F = 639.1°K. 13.6 Critical Pressure: 2130 psia = 145 atm = 14.7 MPa. 13.7 Specific Gravity: 1.00 at 20°C (liquids). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.14. 13.12 Latent Heat of Vaporization: 535 Btu/lb = 260 cal/g = 1255 J/kg. 13.13 Heat of Combustion: 14,345 Btu/lb = 4636 cal/g = 1941 J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 225 Btu/lb = 12 cal/g = 50 J/kg. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	4																																				
Health																																					
Vapor Irritant	4																																				
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NOTES Continued on pages 2 and 3.																																					

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HDZ

HYDRAZINE

Common Synonyms	Watery liquid Colorless Ammonia odor Mixes with water. Poisonous, flammable vapor is produced. Freezing point is 35° F.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear chemical protective suit with self-contained breathing apparatus. Combat fumes from safe distance or protected location. Block discharge area with water. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Cool exposed containers with water. Continue cooling after fire has been extinguished.
 Exposure	CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Not a local health and wildlife offense. Not a degradation of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability, corrosive. Restrict access. Chemical and physical treatment.	2. LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: N_2H_4 . 3.4 IMCO/United Nations Numerical Designation: N/A 2010.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Ammonia like.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Ammonia type gas mask, self-contained breathing apparatus, plastic coated or rubber gloves, clothes, and apron; safety shower must be available. 5.2 Symptoms Following Exposure: Vapors cause itching, swelling, and blistering of eyelids, with nose and throat symptoms may be delayed for several hours. Temporary blindness may occur. Liquid causes a caustic like burn if not washed off at once. Ingestion or absorption through skin causes nausea, dizziness, headache. Severe exposure may cause death. 5.3 Treatment for Exposure: Call a doctor at once. INHALATION: remove to fresh air, where for development of delayed symptoms. Keep quiet. INGESTION: do NOT induce vomiting, give eggs, whites, or other emollients. SKIN OR EYES: wash with large amounts of water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm. 5.5 Short-Term Inhalation Limits: 1 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade III (Dose 50 to 500 mg/kg rat). 5.7 Late Toxicity: Causes lung cancer in mice. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact; very injurious to the eyes. 5.10 Odor Threshold: 3-4 ppm.	

6. FIRE HAZARDS 6.1 Flash Point: 100°F (38°C). 6.2 Flammable Limits in Air: 4% - 100%. 6.3 Fire Extinguishing Agents: Water, alcohol foam, carbon dioxide, or dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: None pertinent. 6.5 Special Hazards of Combustion Products: Toxic vapors generated when heated. 6.6 Behavior in Fire: May explode, decompose. 6.7 Ignition Temperature: Maximum: 500°C (932°F). 6.8 Electrical Hazard: Non-pertinent. 6.9 Burning Rate: 1 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 140 ppm 96 hr. rainbow trout, dried, fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 100% 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Can catch fire when in contact with porous materials, such as wood, asbestos, cloth, earth and dry matter. 7.3 Stability During Transport: Stable at ordinary temperatures. When heated, can decompose to nitrogen and ammonia gases, but decomposition not hazardous unless material is confined. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water. Neutralize the resulting solution with calcium hypochlorite (HTH) 10% per lb of hydrazine. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Fairmount Chemical Co., Inc. 101 Blanchard St. Newark, N.J. 07102 2. Olin Corp. Chemicals Division 120 Long Ridge Rd. Stamford, Conn. 06904 3. Universal Inc. Universal Chemical Division Spreckel St. Napa, Calif. 94558																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-P-Q	10. SHIPPING INFORMATION 10.1 Grades or Purities: Anhydrous, 40% and water solutions. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Padded. 10.4 Venting: Pressure/vacuum.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid. 12.2 HAS Hazard Rating for Bulk Water Transportation: <table data-bbox="896 1474 1152 1845"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>4</td></tr> <tr><td>Health</td><td>4</td></tr> <tr><td>Vapor Irritant</td><td>4</td></tr> <tr><td>Liquid or Solid Irritant</td><td>4</td></tr> <tr><td>Poisons</td><td>4</td></tr> <tr><td>Water Pollution</td><td>4</td></tr> <tr><td>Human Toxics</td><td>4</td></tr> <tr><td>Aquatic Toxics</td><td>4</td></tr> <tr><td>Acute Skin Effect</td><td>4</td></tr> <tr><td>Reactivity</td><td>4</td></tr> <tr><td>Other Chemicals</td><td>4</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self Reaction</td><td>4</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="896 1758 1152 1845"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>3</td></tr> <tr><td>Flammability (Red)</td><td>3</td></tr> <tr><td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Rating	Fire	4	Health	4	Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	4	Water Pollution	4	Human Toxics	4	Aquatic Toxics	4	Acute Skin Effect	4	Reactivity	4	Other Chemicals	4	Water	0	Self Reaction	4	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	3	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 32.07. 13.3 Boiling Point at 1 atm: 246.1°F = 125°C = 398.1°K. 13.4 Freezing Point: 32.1°F = 0°C = 273.1°K. 13.5 Critical Temperature: 716°F = 375°C = 648°K. 13.6 Critical Pressure: 218.7 atm = 22,440 psi = 1,547 MN/m². 13.7 Specific Gravity: 1.016 at 15°C liquid. 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 10.8 kJ/mol = 2,590 cal/mol = 1.04 Btu/lb. 13.13 Heat of Combustion: 19,420 kJ/mol = 4,640,000 cal/mol = 1,975 Btu/lb. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 215 Btu/lb. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	4																																				
Health	4																																				
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Reactivity (Yellow)	2																																				
NOTES																																					

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HCL

HYDROCHLORIC ACID

Common Synonyms Muriatic Acid	Waters liquid Colorless Sharp, irritating odor Sinks and mixes with water. Irritating vapor is produced.
AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Stop discharge if possible. Stop spraying and use water spray to "break" down vapor. Isolate and remove discharged material. Notify local health and public safety authorities.	
Fire	Not flammable. Flammable gas may be produced on contact with metals. Wear chemical protective suit with self-contained breathing apparatus.
Exposure	CALL FOR MEDICAL AID: VAPOR Irritating to eyes, nose and throat. If inhaled, will cause coughing or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give artificial respiration. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush exposed areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and conscious: have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and public safety authorities. Notify appropriate local water treatment.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-4. Issue warning - evacuate. Restrict access. Dispense and flush.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Muriatic acid. 3.2 Coast Guard Competency Classification: Non-oxidizing mineral acid. 3.3 Chemical Formula: HCl, HClO. 3.4 IMCO United Nations Numerical Designation: 4.0 1749.	2. LABEL  4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless to light yellow. 4.3 Odor: Pungent, sharp, pungent, irritating.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing equipment; air line mask; or industrial water or type gas mask; rubber or rubber coated gloves; apron; and overalls; shoes. 5.2 Symptoms Following Exposure: Irritation of tissues results in coughing and choking; vesicles; and irritation of nose and lungs. Liquid causes burns. 5.3 Treatment for Exposure: INHALATION: remove person to fresh air; keep him warm and quiet and get medical attention immediately; start artificial respiration if breathing stops; INGESTION: have person drink water or milk; do NOT induce vomiting; EYES: immediately flush with plenty of water for at least 15 min. and get medical attention; continue flushing for another 15 min. if physician does not arrive promptly; SKIN: immediately flush with water; removing contaminated clothing; get medical attention promptly; use soap and wash area for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm. 5.5 Short-Term Inhalation Limits: 5 ppm for 5 min. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant; may cause pain and second degree burns after a 15-minute contact. 5.10 Odor Threshold: 1.5 ppm.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic and irritating vapors are produced when heated. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not flammable.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 242 ppm 96 hr. mosquitofish 11 mg fresh water; 100% Cluppen 48 hr. shrimp 100 salt water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Corrosive to most metals with evolution of hydrogen gas which may form explosive mixtures with air. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water; apply powdered limestone; slaked lime; soda ash; or sodium bicarbonate. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Diamond Shamrock Corp. Hays Chemical Division 461 East Commerce Bldg. Cleveland, Ohio 44115. 2. Swaffler Chemical Co. Industrial Chemical Division 290 Park Ave. New York, N.Y. 10017. 3. Vulcan Materials Co. Chemical Division Wichita, Kan. 67201.																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-3. A P	10. SHIPPING INFORMATION 10.1 Grade or Purity: Food processing or technical; 1st Br. 20% 20 Br. 31.5% 22% Br. 35.2% Reagent, ACS and USP 23% Br. 37.5% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive material. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="997 1388 1249 1668"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>0</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td></td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>1</td></tr> <tr> <td>Aquatic Toxicity</td><td>1</td></tr> <tr> <td>Acute Toxicity</td><td>1</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Organic Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="997 1675 1249 1776"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (H1)</td><td>1</td></tr> <tr> <td>Flammability (F1)</td><td>0</td></tr> <tr> <td>Reactivity (R1)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	0	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons		Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Acute Toxicity	1	Reactivity		Organic Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (H1)	1	Flammability (F1)	0	Reactivity (R1)	0	13. PHYSICAL AND CHEMICAL PROPERTIES* 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: Not pertinent. 13.3 Boiling Point at 1 atm: 23.1°C and 5°C = 121.8°C. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.18 at 20°C (aqueous). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 178 Btu/lb = 98.6 cal/g = 4.13 x 10 ³ J/kg. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 840 Btu/lb = 480 cal/g = 20 x 10 ³ J/kg. 13.16 Heat of Polymerization: Not pertinent. *Physical properties are given at 20°C unless noted.
Category	Rating																																				
Fire	0																																				
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HFA

HYDROFLUORIC ACID

Common Synonyms		Watery liquid	Colorless to green	Irritating, odor
		Sinks and mixes with water. Harmful vapor is produced.		
AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Spill/discharge: Containable. Spill: Upwind and use water spray to knock down vapor. Evacuate and remove discharge material. Notify local health and pollution control agencies.				
Fire	Not flammable. Flammable gas may be produced on contact with metals. Wear chemical protective suit with self-contained breathing apparatus.			
Exposure	CALL FOR MEDICAL AID. VAPOR Will burn eyes, nose and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. IF IN EYES: Flush with clean water and flush with plenty of water. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Flush with clean water and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Have victim drink water if available. DO NOT INDUCE VOMITING.			
Water Pollution	HAZARFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water bodies. Notify local health and wildlife officials. Notify appropriate cleanup water bodies.			
1. RESPONSE TO DISCHARGE (see Response Mapping Handbook, CG 445.4) Isolate warning continue. Restrict access. Deplete and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Non-oxidizing mineral acid. 3.3 Chemical Formula: HF (H4) 3.4 IMCO United Nations Numerical Designation: 4.0 (240)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless to slightly yellow. 4.3 Odor: Faintest irritative.		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Proper protective clothing must be worn that encompasses the body, including the face. All persons handling this product must be familiar with and must observe all the precautions contained in the Manufacturer's Chemical Association Chemical Safety Data Sheet SD-25. A shower and an eye wash must be available. 5.2 Symptoms Following Exposure: Severe and painful burns of eyes and skin. 5.3 Treatment for Exposure: INGESTION: Have victim drink water or milk, do NOT induce vomiting. SKIN: If victim has come in contact with liquid or vapor, put him in a shower and call a physician. EYES: Flush with water for at least 15 min. and consult physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 3 ppm. 5.5 Short-Term Inhalation Limit: 40 ppm for 60 min. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eye and throat and can cause eye and lung injury. This cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact. Very dangerous to the eyes. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS

- 6.1 Flash Point: Not flammable.
- 6.2 Flammable Limits in Air: Not flammable.
- 6.3 Fire Extinguishing Agents: Not pertinent.
- 6.4 Fire Extinguishing Agents Not to Be Used: Not pertinent.
- 6.5 Special Hazards of Combustion Products: Toxic and irritating vapors are generated when heated.
- 6.6 Behavior in Fire: Not pertinent.
- 6.7 Ignition Temperature: Not flammable.
- 6.8 Electrical Hazards: Not pertinent.
- 6.9 Burning Rate: Not flammable.

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: 60 ppm/l¹ fish lethal, fresh water. *Time period not specified.
- 8.2 Waterbody Toxicity: Data not available.
- 8.3 Biological Oxygen Demand (BOD): None.
- 8.4 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

- Allied Chemical Corp.
Industrial Chemicals Division
P. O. Box 1139 R
Morristown, N. J. 07960
1. I. du Pont de Nemours & Co., Inc.
Industrial & Biochemicals Dept.
D. P. Bldg.
Wilmington, Del. 19898
- Kaiser Aluminum & Chemical Corp.
Kaiser Chemicals Division
P. O. Box 317
Gardiner, La. 70022

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Nearest 44.5% technical, 42.44% 70% grade.
- 10.2 Storage Temperature: Ambient.
- 10.3 Inert Atmosphere: No requirement.
- 10.4 Venting: Pressure vacuum.

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 445.3

A P

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Corrosive material.
- 12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Toxic | 0 |
| Health | |
| Vapor Irritant | 4 |
| Liquid or Solid Irritant | 4 |
| Poisons | 4 |
| Water Pollution | |
| Human Toxicity | 4 |
| Aquatic Toxicity | 4 |
| Acute Toxicity | 2 |
| Reactivity | |
| Other Chemicals | 1 |
| Water | 0 |
| Self-Reaction | 0 |

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	4
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES*

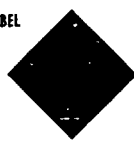
- 13.1 Physical State at 15°C and 1 atm: Liquid.
- 13.2 Molecular Weight: 20.01 g/mol.
- 13.3 Boiling Point at 1 atm: 19.5°C (67.1°F).
- 13.4 Freezing Point: -114.5°C (-174.1°F).
- 13.5 Critical Temperature: 32.8°C (91.0°F).
- 13.6 Critical Pressure: 8.4 atm.
- 13.7 Specific Gravity: 1.14 at 20°C liquid.
- 13.8 Liquid Surface Tension: 22.4 dyne/cm.
- 13.9 Liquid-Water Interfacial Tension: Not pertinent.
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent.
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.
- 13.12 Latent Heat of Vaporization: 649 Btu/lb = 36 cal/g = 151 × 10³ J/kg.
- 13.13 Heat of Combustion: Not pertinent.
- 13.14 Heat of Decomposition: Not pertinent.
- 13.15 Heat of Solution: 46.6 Btu/lb = 37.0 cal/g = 155 × 10³ J/kg.
- 13.16 Heat of Polymerization: Not pertinent.

*Physical properties are for 100% pure material.

NOTES

HBR

HYDROGEN BROMIDE

Common Synonyms Hydrobromic Acid anhydrous		Liquefied compressed gas Colorless Irritating odor Sinks and mixes with water. Poisonous visible vapor cloud is produced.								
AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Stop discharge if possible. Stop upward and downward spray by knocking down vapor. Isolate and remove or have it evacuated. Notify local health and pollution control agencies.										
Fire	Not flammable Flammable gas may be produced on contact with metals. Wear chemical protective suit with self-contained breathing apparatus.									
 Exposure	CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. Will cause frostbite. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED: do not induce vomiting. Have victim drink water or milk. DO NOT INDUCE VOMITING. DO NOT RE-BREATHE AFFECTED AREAS.									
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify police in case of nearby water intake.									
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-3) Issue warning: poison, corrosive, air contaminant. Restrict access. Evacuate area. Disperse and flush.		2. LABEL 								
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Hydrobromic acid, anhydrous; Hydrogen bromide, anhydrous. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: HBr. 3.4 IMCO/United Nations Numerical Designation: 2/104x.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Compressed liquefied gas. 4.2 Color: Colorless. 4.3 Odor: Sharp pungent irritating.								
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Full face mask and acid gas canister, self-contained breathing apparatus, chemical goggles, rubber apron and gloves, acid-proof clothing, safety shower. 5.2 Symptoms Following Exposure: Inhalation causes severe irritation of nose and upper respiratory tract, lung injury. Ingestion causes burns of mouth and stomach. Contact with eyes causes severe irritation and burns. Contact with skin causes irritation and burns. 5.3 Treatment for Exposure: Get medical attention after all overexposures to this chemical. INHALATION: move victim to fresh air and keep him warm and quiet; if a qualified person is available to give oxygen, such treatment may be helpful. INGESTION: give large amounts of water or milk, do NOT induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water, treat acid burns. 5.4 Toxicity by Inhalation (Threshold Limit Value): 3 ppm. 5.5 Short-Term Inhalation Limits: 5 ppm for 5 min. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.										
6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Pressurized container may explode and release toxic, irritating vapor. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.										
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Moderate reaction with evolution of heat. 7.2 Reactivity with Common Materials: Rapidly absorbs moisture, forming hydrobromic acid. Highly corrosive to most metals, with evolution of flammable hydrogen gas. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.										
8. WATER POLLUTION 8.1 Aquatic Toxicity: 10 - 100 ppm/96 hr ¹⁰ /11 m ³ ¹⁰ ¹⁰ Species and water type not specified. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.										
9. SELECTED MANUFACTURERS 1. Union Carbide Corp. Linde Division 270 Park Avenue New York, N.Y. 10017 2. Matheson Gas Products 932 Paterson Plank Road East Rutherford, N.J. 07073 3. Air Products and Chemicals, Inc. Industrial Gas Division Box 575 Allentown, Pa. 18105.										
10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.8+%. 10.2 Storage Temperature: Ambient or lower. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Safety relief.										
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) A C K M N O										
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Nonflammable compressed gas. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>3</td></tr><tr><td>Flammability (Red)</td><td>0</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>			Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	0
Category	Classification									
Health Hazard (Blue)	3									
Flammability (Red)	0									
Reactivity (Yellow)	0									
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas. 13.2 Molecular Weight: 80.92. 13.3 Boiling Point at 1 atm: -86.2°F = -66.8°C = 206.4°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: 193.6°F = 89.8°C = 163.0°K. 13.6 Critical Pressure: 1,235 psia = 84 atm = 8.52 MN/m ² . 13.7 Specific Gravity: 2.14 at -67°C (liquid). 13.8 Liquid Surface Tension: 27.1 dynes/cm = 0.0271 N/m at -67.1°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 2.71. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.38. 13.12 Latent Heat of Vaporization: 92.7 Btu/lb = 51.3 cal/g = 2.15 x 10 ⁵ J/kg. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 445 Btu/lb = 247 cal/g = 10.3 x 10 ⁵ J/kg. 13.16 Heat of Polymerization: Not pertinent. (Continued on pages 5 and 6)										
NOTES										

HDC

HYDROGEN CHLORIDE

Common Synonyms Hydrochloric Acid, anhydrous		Liquefied compressed gas	Colorless to slightly yellow	Irritating odor
Sinks and mixes with water. Poisonous visible vapor cloud is produced.				
AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear chemical protective suit with self-contained breathing apparatus. Stop discharge if possible. Stay upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Not flammable Flammable gas may be produced on contact with metals. Wear chemical protective suit with self-contained breathing apparatus.		
		CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes. Will cause frostbite. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING. DO NOT RUB AFFECTED AREAS.		
Exposure				
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - poison, corrosive, air contaminant. Restrict access. Evacuate area. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Hydrochloric acid, anhydrous. 3.2 Coast Guard Compatibility Classification: Inorganic acid. 3.3 Chemical Formula: HCl. 3.4 IMCO/United Nations Numerical Designation: 2.0/1050.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Compressed, liquefied gas. 4.2 Color: Colorless to slightly yellow. 4.3 Odor: Sharp, pungent, irritating.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Full face mask and acid gas canister, self-contained breathing apparatus, chemical goggles, rubber apron and gloves, acid-proof clothing, safety shower. 5.2 Symptoms Following Exposure: Severely irritating to nose and upper respiratory tract; lung injury. 5.3 Treatment for Exposure: INHALATION: immediately remove patient to fresh air; keep him warm and quiet and call a physician immediately; if a qualified person is available to give oxygen, such treatment may be helpful. INGESTION: have victim drink water or milk; do NOT induce vomiting. EYES OR SKIN: immediately flush with plenty of water for at least 15 min.; for eyes get medical attention promptly; air contaminated clothing and wash before reuse. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm. 5.5 Short-Term Inhalation Limits: 5 ppm for 5 min. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant; may cause pain and second degree burns after a few minutes' contact. 5.10 Odor Threshold: 1-5 ppm.				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Pressurized container may explode and release toxic, irritating vapors 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: 282 ppm/96 hr/mosquito fish; 11 ppm/fresh water 100-330 ppm/48 hr/shrimp; 1 C/g/salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Moderate reaction with evolution of heat 7.2 Reactivity with Common Materials: Rapidly absorbs moisture, forming hydrochloric acid. Highly corrosive to most metals with evolution of flammable hydrogen gas 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Diamond Shamrock Corp. Electro Chemicals Division 300 Union Commerce Bldg Cleveland, Ohio 44115 2. Stauffer Chemical Co. Industrial Chemicals Division 299 Park Ave. New York, N.Y. 10017 3. Vulcan Materials Co. Chemical Division Wichita, Kan. 67201																																				
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 97.5-99% 10.2 Storage Temperature: Ambient or lower 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A C-A M N-O	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 36.46 13.3 Boiling Point at 1 atm: -121.5° = -85.0° = 188.2°K 13.4 Freezing Point: -175.5° = -115° = 158°K 13.5 Critical Temperature: 124.5° = 514° = 324.6°K 13.6 Critical Pressure: 1200 psia = 81.6 atm = 8.27 MN/m² 13.7 Specific Gravity: 1.191 at -85°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.3 13.11 Ratio of Specific Heats of Vapor (Gas): 1.395 13.12 Latent Heat of Vaporization: 185 Btu/lb = 103 cal/g = 4.31 x 10³ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -84 Btu/lb = -491 cal/g = -20.6 x 10³ J/kg 13.16 Heat of Polymerization: Not pertinent																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Nonflammable compressed gas 12.2 NAS Hazard Rating for Bulk Water Transportation:<table><tr><td>Category</td><td>Rating</td></tr><tr><td>Fire</td><td>0</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>4</td></tr><tr><td>Liquid or Solid Irritant</td><td>3</td></tr><tr><td>Poisons</td><td>3</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>2</td></tr><tr><td>Aquatic Toxicity</td><td>2</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>4</td></tr><tr><td>Water</td><td>2</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table> 12.3 NFPA Hazard Classifications:<table><tr><td>Category</td><td>Classification</td></tr><tr><td>Health Hazard (Blue)</td><td>3</td></tr><tr><td>Flammability (Red)</td><td>0</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>	Category	Rating	Fire	0	Health		Vapor Irritant	4	Liquid or Solid Irritant	3	Poisons	3	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	4	Water	2	Self Reaction	0	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	0	
Category	Rating																																				
Fire	0																																				
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Vapor Irritant	4																																				
Liquid or Solid Irritant	3																																				
Poisons	3																																				
Water Pollution																																					
Human Toxicity	2																																				
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Health Hazard (Blue)	3																																				
Flammability (Red)	0																																				
Reactivity (Yellow)	0																																				

NOTES

(Continued on pages 4 and 5)

REVISED 1978

HCN

HYDROGEN CYANIDE

Common Synonyms Hydrocyanic acid Prussic acid	Watery liquid, or gas Colorless Bitter almond odor
Sinks and mixes with water. Poisonous, flammable vapor is produced and rises. Boiling point is 78° F.	
AVOID CONTACT WITH LIQUID AND VAPOR. EVACUATE AREA. WEAR CHEMICAL PROTECTIVE SUIT WITH SELF-CONTAINED BREATHING APPARATUS. Stop discharge if possible. Call fire department. Shut off ignition sources. Stay upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. WEAR CHEMICAL PROTECTIVE SUIT WITH SELF-CONTAINED BREATHING APPARATUS. Stop discharge if possible. Cool exposed containers as directed in effecting shut-off with water. Let fire burn.
Exposure	CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. Move to fresh air. If breathing has stopped, give artificial respiration (but NOT mouth to mouth). If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1.) Issue warning. High flammability. Water contaminant. Restrict access to water area.	2. LABELS 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Hydrocyanic acid Prussic acid 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: HCN 3.4 IMO/United Nations Numerical Designation: 20 1051	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to bluish white 4.3 Odor: Characteristic sweetish like almond
5 HEALTH HAZARDS CAUTION: Class 3 poison gas hazard can be caused by ingestion, inhalation, or absorption of liquid or vapor through skin, particularly eyes, mucous membranes, and feet. 5.1 Personal Protective Equipment: Escape purposes only: air escape mask with 5 minute air cylinder. Work purposes: vapor proof emergency suit or vinyl coated coverall plus air mask with clear view facepiece, speaking diaphragm, demand regulator and 30-minute air cylinder. Rubber gloves, chemical safety goggles, quick opening safety shower. 5.2 Symptoms Following Exposure: Irritation of throat, palpitation, difficult breathing, reddening of eyes, salivation, nausea, headache, weakness of arms and legs, dizziness, followed by collapse and convulsions. 5.3 Treatment for Exposure: Call doctor. If breathing has stopped, give artificial respiration until doctor arrives. IMMEDIATELY remove patient to fresh air. SKIN CONTACT: remove contaminated clothing and wash skin thoroughly with copious quantities of water and soap. EYE CONTACT: hold eyelids apart and wash eyes with continuous gentle stream of water for at least 15 min. If patient is unconscious, administer amyl nitrite by crushing a pearl (ampule) in a cloth and holding this under patient's nose or 15 seconds every 15 minutes. Do not interrupt artificial respiration. Replace amyl nitrite pearl when its strength is spent. Continue treatment until patient's condition improves or doctor arrives. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 5.5 Short-Term Inhalation Limits: 20 ppm for 30 min 5.6 Toxicity by Ingestion: Grade 4: Less than 50 mg/kg	

6 FIRE HAZARDS 6.1 Flash Point: 0.1°C 6.2 Flammable Limits in Air: 5.6% - 40.0% 6.3 Fire Extinguishing Agents: Stop flow of gas. 6.4 Fire Extinguishing Agents Not to be Used: None. 6.5 Special Hazards of Combustion Products: Extremely toxic vapors are generated even at ordinary temperatures. 6.6 Behavior in Fire: Containers may explode with ignition of contents. 6.7 Ignition Temperature: 1004°C 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 1.5 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.16 ppm/72 hr. young bass; 11 mg/l fresh water. 0.069 ppm/24 hr. pin perch; 11 mg/l salt water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Dissolves with a moderate reaction. 7.2 Reactivity with Common Materials: None. 7.3 Stability During Transport: May become unstable and subject to explosion if stored for extended time or exposed to high temp. and pressure. 7.4 Neutralizing Agents for Acids and Caustics: The weak acidity can be neutralized by slaked lime, but this does not destroy the poisonous property. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. E. I. du Pont de Nemours & Co., Inc., Electrochemicals Dept., Wilmington, Del. 19898. 2. Monsanto Polymers & Petrochemicals Co., 800 North Lindbergh Blvd., St. Louis, Mo. 63156. 3. Rohm and Haas Co., Independence Mall West, Philadelphia, Pa. 19105.																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-2.) A B C D E M N	10 SHIPPING INFORMATION 10.1 Grades or Purity: 96% sometimes shipped as a water solution or absorbed on an inert solid. All forms are extremely toxic. 10.2 Storage Temperature: Data not available. 10.3 Inert Atmosphere: May be padded. 10.4 Venting: Data not available.																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous gas or liquid, Class A. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>4</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>2</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>4</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>4</td></tr><tr><td>Aquatic Toxicity</td><td>4</td></tr><tr><td>Aesthetic Effect</td><td>1</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>3</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self-Reaction</td><td>3</td></tr></tbody></table> 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>4</td></tr><tr><td>Flammability (Red)</td><td>4</td></tr><tr><td>Reactivity (Yellow)</td><td>2</td></tr></tbody></table>	Category	Rating	Fire	4	Health		Vapor Irritant	2	Liquid or Solid Irritant	1	Poisons	4	Water Pollution		Human Toxicity	4	Aquatic Toxicity	4	Aesthetic Effect	1	Reactivity		Other Chemicals	3	Water	0	Self-Reaction	3	Category	Classification	Health Hazard (Blue)	4	Flammability (Red)	4	Reactivity (Yellow)	2	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 27.03. 13.3 Boiling Point at 1 atm: 75.3°F = 25°C = 298.9°K. 13.4 Freezing Point: 5.1°F = -15.3°C = 249.9°K. 13.5 Critical Temperature: 362.3°F = 183.5°C = 456.7°K. 13.6 Critical Pressure: 735 psia = 50 atm = 5.07 MN/m². 13.7 Specific Gravity: 0.689 at 20°C (liquid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 0.9. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.303. 13.12 Latent Heat of Vaporization: 444 Btu/lb = 247 cal/g = 10.3 X 10³ J/kg. 13.13 Heat of Combustion: -10,860 Btu/lb = -5864 cal/g = -245.3 X 10³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	4																																				
Health																																					
Vapor Irritant	2																																				
Liquid or Solid Irritant	1																																				
Poisons	4																																				
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Aesthetic Effect	1																																				
Reactivity																																					
Other Chemicals	3																																				
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Health Hazard (Blue)	4																																				
Flammability (Red)	4																																				
Reactivity (Yellow)	2																																				
5. HEALTH HAZARDS (Cont'd) 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is not very irritating but is extremely poisonous. 5.9 Liquid or Solid Irritant Characteristics: Liquid is not irritating but is extremely poisonous if absorbed through skin or eyes. 5.10 Odor Threshold: 1 mg/m³.																																					

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HYDROGEN FLUORIDE

Common Synonyms Hydrofluoric acid anhydrous		Liquid	Colorless	Sharp irritating odor
Sinks and mixes with water. Poisonous vapor is produced and slowly rises. Boiling point is 67° F.				
AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear chemical protective suit including self-contained breathing apparatus. Stop discharge if possible. Stay upwind and use water spray to knock down vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Not flammable. Flammable gas may be produced on contact with metals. Wear chemical protective suit including self-contained breathing apparatus.		
 Exposure		CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 448-4) Issue warning: poison corrosive. Restrict access. Evacuate area. Disperse and flush.		2. LABEL  CORROSIVE		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Hydrofluoric acid anhydrous 3.2 Coast Guard Compatibility Classification: Inorganic acid 3.3 Chemical Formula: HF 3.4 IMCO/United Nations Numerical Designation: 2.0 1052		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent irritating		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Acid resistant hat, safety goggles, face shield, jacket, overalls, gauntlet type gloves, and boots. The goggles and face shield must have plastic lenses. There must be a shower and an eye wash. Observe all precautions contained in the Manufacturing Chemists' Association Chemical Safety Data Sheet SD-25. 5.2 Symptoms Following Exposure: Serious and painful burns of eyes, skin and respiratory tract, pulmonary edema. 5.3 Treatment for Exposure: INGESTION: have victim drink water or milk, do NOT induce vomiting. SKIN: flush with water, consult physician. EYES: flush with water for at least 15 min., consult physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 3 ppm 5.5 Short-Term Inhalation Limits: 3 ppm for 15 min. 5.6 Toxicity by Ingestion: Oral LD ₅₀ = 80 mg/kg (guinea pig) 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eye and throat and ear, cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact, very injurious to the eyes. 5.10 Odor Threshold: 0.03 mg/m ³				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents Not pertinent 6.4 Fire Extinguishing Agents Not to be Used. Not pertinent 6.5 Special Hazards of Combustion Products Toxic and irritating vapors are generated when heated 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8 WATER POLLUTION 8.1 Aquatic Toxicity: 40 ppm * fish lethal, fresh water. *Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Dissolves with liberation of heat 7.2 Reactivity with Common Materials: Will attack glass, concrete and certain metals, especially those containing silica, such as cast iron. Will attack natural rubber, leather, and many organic materials. May generate flammable hydrogen gas in contact with some metals. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, apply powdered limestone, slaked lime, soda ash, or sodium bicarbonate 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Allied Chemical Corp. Industrial Chemicals Division Morristown, N. J. 07960 2. E. I. duPont de Nemours & Co. Inc. Industrial & Biochemical Dept. Wilmington, Del. 19898 3. Kaiser Aluminum & Chemical Corp. Kaiser Chemicals Division Gramercy, La. 70052																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 448-3) ACKMNO	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.999% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive material 12.2 NAS Hazard Rating for Bulk Water Transportation:<table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>0</td></tr><tr><td>Health:</td><td></td></tr><tr><td>Vapor Irritant</td><td>4</td></tr><tr><td>Liquid or Solid Irritant</td><td>4</td></tr><tr><td>Poisons</td><td>4</td></tr><tr><td>Water Pollution:</td><td></td></tr><tr><td>Human Toxicity</td><td>4</td></tr><tr><td>Aquatic Toxicity</td><td>3</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity:</td><td></td></tr><tr><td>Other Chemicals</td><td>4</td></tr><tr><td>Water</td><td>2</td></tr><tr><td>Self Reaction</td><td>0</td></tr></tbody></table> 12.3 NFPA Hazard Classifications:<table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>4</td></tr><tr><td>Flammability (Red)</td><td>0</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></tbody></table>	Category	Rating	Fire	0	Health:		Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	4	Water Pollution:		Human Toxicity	4	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity:		Other Chemicals	4	Water	2	Self Reaction	0	Category	Classification	Health Hazard (Blue)	4	Flammability (Red)	0	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 20.01 13.3 Boiling Point at 1 atm: 67.1°F = 19.5°C = 292.7°K 13.4 Freezing Point: -134°F = -92.2°C = 181.0°K 13.5 Critical Temperature: 447°F = 230.6°C = 503.8°K 13.6 Critical Pressure: 1100 psia = 74.8 atm = 7.58 MN/m² 13.7 Specific Gravity: 0.992 at 19.5°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 0.7 13.11 Ratio of Specific Heats of Vapor (Gas): 1.39 13.12 Latent Heat of Vaporization: 145 Btu/lb = 80.5 cal/g = 3.7 × 10⁴ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -1322 Btu/lb = -746 cal/g = -30.76 × 10⁴ J/g 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	0																																				
Health:																																					
Vapor Irritant	4																																				
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NOTES (Continued on pages 4 and 6)																																					

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HYDROGEN, LIQUEFIED

Common Synonyms		Liquefied compressed gas	Colorless	Odorless
Liquid hydrogen		Floats and boils on water. Flammable visible vapor cloud is produced.		
Shut off ignition sources. Call fire department. Avoid contact with liquid. Keep people away. Stop discharge if possible. Stay upwind. Use water spray to knock down vapor.				
Fire	FLAMMABLE Flame is almost invisible. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Evacuate surrounding area. Stop flow of gas if possible. Cool exposed containers and protect neck effecting shutoff with water.			
Exposure	VAPOR If inhaled in high concentrations will cause difficult breathing or loss of consciousness. Move victim to fresh air. If breathing has stopped, give artificial respiration. LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RE-ENTRATED AREAS.			
Water Pollution	Not harmful to aquatic life.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-1) Issue warning - high flammability. Restrict access. Evacuate area.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Liquid hydrogen para Hydrogen 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: H ₂ 3.4 IMCO/United Nations Numerical Designation: 2.1966		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety goggles or face shield, insulated gloves and long sleeves, cuffless trousers worn outside boots or over high top shoes to be spilled liquid, self-contained breathing apparatus containing air (never use oxygen). 5.2 Symptoms Following Exposure: If atmosphere does not contain enough oxygen, inhalation can cause dizziness, unconsciousness or even death. Contact of liquid with eyes or skin causes freezing similar to a burn. 5.3 Treatment for Exposure: The only effect of exposure to liquid hydrogen is that caused by its unusually low temperature and its action as a simple asphyxiant. INHALATION: if victim is unconscious (due to oxygen deficiency), move him to fresh air and apply resuscitation methods, call physician. EYES: treat for frostbite. SKIN: treat for frostbite, soak in lukewarm water, get medical attention if burn is severe. 5.4 Toxicity by Inhalation (Threshold Limit Value): Gas is non-poisonous but can act as a simple asphyxiant. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Not pertinent (gas with low boiling points). 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: 4.0% - 7.0% 6.3 Fire Extinguishing Agents: Let fire burn, shut off gas supply 6.4 Fire Extinguishing Agents Not to be Used: Carbon dioxide 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Burns with an almost invisible flame 6.7 Ignition Temperature: 1,065°F 6.8 Electrical Hazard: Class I, Group B 6.9 Burning Rate: 9.9 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Ambient temperature of water will cause vigorous vaporization of hydrogen 7.2 Reactivity with Common Materials: No chemical reaction, but low temperature causes most materials to become very brittle 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Union Carbide Corporation Linde Division Morristown, N.J. 03355 2. Air Products and Chemicals, Inc. Specialty Gases Division P.O. Box 538 Allentown, Pa. 18105 3. Chemtron Corp. Industrial Gases Division 111 E. Wacker Drive Chicago, Ill. 60601								
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: -434°F 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A B C D E F G	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 2.0 13.3 Boiling Point at 1 atm: -422°F = -253°C = 20°K 13.4 Freezing Point: -431°F = -259°C = 14°K 13.5 Critical Temperature: -400°F = -240°C = 33°K 13.6 Critical Pressure: 188 psia = 12.8 atm = 1.30 MN/m² 13.7 Specific Gravity: 0.071 at -253°C (liquid) 13.8 Liquid Surface Tension: 2.3 dynes/cm = 0.023 N/m at -255°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 0.067 13.11 Ratio of Specific Heats of Vapor (Gas): 1.3962 13.12 Latent Heat of Vaporization: 190.5 Btu/lb = 105 Kcal/g = 4,427 x 10³ J/kg 13.13 Heat of Combustion: -50,080 Btu/lb = -22,821 Kcal/g = -1164 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>4</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	4	Reactivity (Yellow)	0	
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	4								
Reactivity (Yellow)	0								
(Continued on pages 4 and 6.) NOTES									

HPO

HYDROGEN PEROXIDE

Common Synonyms Peroxide Alboox Superoxol		Watery liquid	Colorless	Slightly sharp odor
		Sinks and mixes with water. Irritating vapor is produced.		
AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear chemical protective suit including self-contained breathing apparatus. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Not flammable May cause fire and explode on contact with combustibles and metals Containers may explode when heated Wear chemical protective suit including self-contained breathing apparatus Flood discharge area with water			
	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat Harmful if inhaled Move to fresh air If breathing has stopped, give artificial respiration If breathing is difficult, give oxygen LIQUID Will burn skin and eyes Harmful if swallowed			
Exposure	Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4.) Issue warning, warn others Restrict access Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Peroxide, Alboox, Superoxol 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: H ₂ O ₂ , H ₂ O 3.4 IMCO United Nations Numerical Designation: 5.1, 2015		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Slightly sharp		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective garments, both outer and inner, made of a woven polyester fabric or of modacrylic or polyvinylidene chloride impervious apron made of polyvinyl chloride or polyethylene film, neoprene gloves and boots, goggles 5.2 Symptoms Following Exposure: Although solutions and vapors are non-toxic, they are irritating. Vapors cause discomfort of eyes and nose. Moderately concentrated liquid can cause stinging of the skin and severe stinging sensation. In most cases the stinging subsides quickly and the skin gradually returns to normal without any damage. Highly concentrated liquid, in case blistering of skin is left on for any length of time, can also cause eye damage. 5.3 Treatment for Exposure: Contact should be avoided, but immediate flushing with water will prevent any reaction in case of accidental contact. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation, such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant. May cause pain and second degree burns after a few minutes contact. 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable but may cause fire and react violently on contact with combustibles and metals

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Water for fires resulting from spillage

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** May explode in fire

6.7 **Ignition Temperature:** Not flammable

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not flammable

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** Dirt and many metals cause a rapid decomposition with liberation of oxygen gas occurs particularly if concentration is above 40%

7.3 **Stability During Transport:** Pure grades are quite stable, but contamination with metals or dirt can cause rapid or violent decomposition

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** >40 ppm *fingerting trout toxic, salt water
*Time period not specified

8.2 **Waterlow Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1 I I du Pont de Nemours & Co., Inc.
Electrochemicals Dept.
Wilmington, Del. 19898

2 I M C Corp.
Inorganic Chemicals Division
633 Third Ave.
New York, N.Y. 10017

3 Shell Chemical Co.
Industrial Chemicals Division
Houston, Texas 77001

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** Common commercial strengths are 27.5%, 35%, 50%, 70%, 90% and 98%. High Strength means greater than 52% Purity. Technical M.I. Spec. At 5, the hazard increases with the strength

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief or pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See HAZARD ASSESSMENT HANDBOOK, CG 446.3)
A P /

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Oxidizer

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	
Vapor Irritant	2
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	3
Aesthetic Effect	1
Reactivity	
Other Chemical	4
Water	1
Self Reaction	1

12.3 **NFPA Hazard Classifications**

Category	Classification
% by wt = 27.5%	2
Health Hazard (Blue)	2
Flammability (Red)	0
Reactivity (Yellow)	1
	3
	0

13 PHYSICAL AND CHEMICAL PROPERTIES*

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 34.01

13.3 **Boiling Point at 1 atm:** 25°C = 125°C = 509°K

13.4 **Freezing Point:** -40°C = -40°C = 222°K

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 1.29 at 20°C (liquid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.241

13.12 **Latent Heat of Vaporization:** 412 Btu/lb = 301 cal/g = 126 x 10³ J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** -1220 Btu/lb = -67 cal/g = -28 x 10³ J/kg

13.15 **Heat of Solution:** -20.2 Btu/lb = -11.2 cal/g = -469 x 10³ J/kg

13.16 **Heat of Polymerization:** Not pertinent

*Physical properties apply to 70% solution

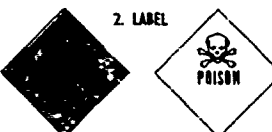
Continued on pages 5 and 6

NOTES

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HYDROGEN SULFIDE

Common Synonyms: Sulfuretted hydrogen	Liquefied compressed gas: Colorless Rotten egg odor, but odorless at poisonous concentrations Sinks and boils in water. Poisonous, flammable, visible vapor cloud is produced.
Avoid contact with gas. Keep people away. Wear goggles and self-contained breathing apparatus. Shut off gas supply at source and isolate area. No open flames or sparks. Evacuate area. Notify local health and police control agencies.	FLAMMABLE: Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Shut off gas supply at source. Evacuate area and isolate area.
Fire	ALL FORMS OF VAPOR VAPOR POISONOUS IF INHALED Irritating to eyes. May be fatal if inhaled. Breathing apparatus required. If in EYES: hold closed, pour and flush with plenty of water.
Exposure	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and police control agencies.
Water Pollution	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability, poison. Restrict access. Evacuate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Sulfuretted hydrogen 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: H ₂ S 3.4 IMCO United Nations Numerical Designation: 2.0 1053	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid under pressure 4.2 Color: Colorless 4.3 Odor: Offensive odor, like rotten eggs
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber framed goggles, approved respiratory protection. 5.2 Symptoms Following Exposure: Irritation of eyes, nose and throat. If high concentrations are inhaled, hyperpnea and respiratory paralysis may occur. Very high concentrations may produce pulmonary edema. 5.3 Treatment for Exposure: INHALATION: Remove victim from exposure, if breathing has stopped, give artificial respiration, administer oxygen if needed, consult physician. EYES: wash with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 5.5 Short-Term Inhalation Limit: 200 ppm for 10 min., 100 ppm for 30 min., and 50 ppm for 60 min. 5.6 Toxicity by Ingestion: Hydrogen sulfide is present as a gas at room temperature, so ingestion not likely. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of the skin. 5.10 Odor Threshold: 0.0047 ppm	

6. FIRE HAZARDS 6.1 Flash Point: Flammable gas. 6.2 Flammable Limits in Air: 4.3% - 45% 6.3 Fire Extinguishing Agents: Stop flow of gas. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic gases are generated in fires. 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 500°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 2.3 mm/min (liquid)	8. WATER POLLUTION 8.1 Aquatic Toxicity: 1.35 ppm (48 hr.) fathead minnow, 11 m fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. PPG Industries, Inc. Industrial Chemicals Division One Gateway Center Pittsburgh, Pa. 15020 2. Union Oil Co. of California Union Oil Center Los Angeles, Cal. 90017 3. Will Ross, Inc. A. Theron Gas Products Division Los Rutherford, N. J. 07073								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-5 ABCDEFG	10. SHIPPING INFORMATION 10.1 Grades or Purity: Purified technical. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Safety relief.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>3</td> </tr> <tr> <td>Flammability (Red)</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	4	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Gas. 13.2 Molecular Weight: 34.08 13.3 Boiling Point at 1 atm.: -60.3°C = -76.5°F 13.4 Freezing Point: -127.5°C = -197.5°F 13.5 Critical Temperature: 127.2°C = 261.0°F 13.6 Critical Pressure: 8.94 MPa = 88.9 atm = 90.6 MN/m ² 13.7 Specific Gravity: 0.916 at -60°C (liquid) 13.8 Liquid Surface Tension: 16.4 mN/m at 0°C 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: 1.2 13.11 Ratio of Specific Heats of Vapor (Gas): 1.322 13.12 Latent Heat of Vaporization: 214 Btu/lb = 130 cal/g = 541 kJ/kg 13.13 Heat of Combustion: -6552 Btu/lb = -1506 kJ/kg at p = 1 atm. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	3								
Flammability (Red)	4								
Reactivity (Yellow)	0								
NOTES									

HDQ

HYDROQUINONE

Common Synonyms 1,4-Benzediol p-Dihydroxybenzene Hydroquinol Pyrocatonic acid Quinol		Solid White, light tan to gray Sinks and mixes with water
Avoid contact with solid and dust. Keep people away. Shut off ignition sources. Call fire department. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible Dust cloud may explode if ignited in an enclosed area. Extinguish with water, dry chemicals, foam, or carbon dioxide.	
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. Harmful if inhaled. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID Will burn eyes. Irritating to eyes. If swallowed will cause headache, dizziness, nausea, vomiting or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-1) Is it a warning, water contaminant, dispersant and flash?		2. LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,4-Benzediol, p-Dihydroxybenzene, Hydroquinol, Pyrocatechol, and Quinol. 3.2 Code/Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: 1,4-C ₆ H ₄ (OH) ₂ 3.4 IMCO/United Nations Numerical Designation: Not listed.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Light tan to light gray, white. 4.3 Odor: None.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, respirator, or protection of dust is present. 5.2 Symptoms Following Exposure: Ingestion can cause ringing in the ears, nausea, dizziness, a sense of suffocation, increased respiration rate, vomiting, pallor, muscular twitchings, headache, dyspnea, cyanosis, delirium, and collapse; the urine is green or brownish green. Lethal adult dose is 2 grams. Direct contamination of the eye with particles of hydroquinone can cause "mild" eye irritation and may result in ulceration of the cornea. Contact with skin may cause dermatitis. 5.3 Treatment for Exposure: INGESTION: induce vomiting, perform gastric lavage, and follow with a saline cathartic and demulcents; get medical attention. EYES: flush in cool 2% with plenty of water for 15 min; and get medical attention. SKIN: wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 2 mg/m. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3, LD ₅₀ 370 mg/kg (rats). 5.7 Late Toxicity: Causes bladder cancer in mice; discoloration of eyelids and eye changes in men. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS

- 6.1 **Flash Point:** (molten) 350°F (177°C)
 6.2 **Flammable Limits in Air:** Not pertinent.
 6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical, carbon dioxide.
 6.4 **Fire Extinguishing Agents Not to be Used:**
 6.5 **Special Hazards of Combustion Products:**
 6.6 **Behavior in Fire:** Dust explosion is possible.
 6.7 **Ignition Temperature:** Data not available.
 6.8 **Electrical Hazard:** Data not available.
 6.9 **Burning Rate:** Not pertinent.

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction.
 7.2 **Reactivity with Common Materials:**
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
 7.5 **Polymerization:** Not pertinent.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 0.287 ppm/48 hr. goldfish/TL_m/fresh water.
 8.2 **Waterfowl Toxicity:** Data not available.
 8.3 **Biological Oxygen Demand (BOD):** 53%, 5 days; 25% (theo.), 0.5 days as catechol.
 8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

- 1 Eastman Chemical Products, Inc., Kingsport, Tenn. 37662
 2 Allied Chemical Corp., Specialty Chemicals Div., P.O. Box 1087R, Morristown, N.J. 07960
 3 Aldrich Chemical Co., 940 W. Saint Paul Ave., Milwaukee, Wis. 53213

10. SHIPPING INFORMATION

- 10.1 **Grades or Purity:** Pure Technical.
 10.2 **Storage Temperature:** Ambient.
 10.3 **Inert Atmosphere:** No requirement.
 10.4 **Ventilating:** Open.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 444-2)
 NS

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid.
 13.2 **Molecular Weight:** 110.11.
 13.2 **Boiling Point at 1 atm:** 285°C = 545°F.
 13.4 **Freezing Point:** 13°C = 55°F = 41°F.
 13.5 **Critical Temperature:** Not pertinent.
 13.6 **Critical Pressure:** Not pertinent.
 13.7 **Specific Gravity:** 1.33 at 20°C (solid).
 13.8 **Liquid Surface Tension:** Not pertinent.
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
 13.12 **Latent Heat of Vaporization:** Not pertinent.
 13.13 **Heat of Combustion:** -11,200 Btu/lb = -6,270 cal/g = -260 × 10³ J/kg.
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** Not pertinent.
 13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 4 and 6)

NOTES

HAS

HYDROXYLAMINE SULFATE

Common Synonyms Oxammonium sulfate	Solid White Odorless Sinks and mixes with water
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Not Flammable POISONOUS GASES MAY BE PRODUCED IN FIRE
 Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing or loss of consciousness. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed will cause nausea or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning - water contaminant. Restrict access. Impervise and flush.	2 LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Oxammonium sulfate. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: $(NH_2OH)_2 H_2SO_4$. 3.4 IMCO/United Nations Numerical Designation: Not listed.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Crystals. 4.2 Color: White. 4.3 Odor: None.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Acid resistant protective clothing, including coveralls, wrist-length gloves, cap, goggles, and dust mask. 5.2 Symptoms Following Exposure: Inhalation of dust or ingestion may cause systemic poisoning characterized by exanema, methemoglobinemia, convulsions, and coma. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, get medical attention if symptoms occur. INGESTION: give large amounts of water, induce vomiting, get medical attention. EYES: flush with water for at least 15 min. and get medical attention. SKIN: flush immediately with plenty of water, then wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade III Dose 50-500 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Sulfuric acid fumes may form in fire. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	7 POLLUTION 7.1 Aquatic Toxicity: Data not available. 7.2 Waterfowl Toxicity: Data not available. 7.3 Biological Oxygen Demand (BOD): Data not available. 7.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: May be corrosive to metals in presence of moisture. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Commercial Solvents Corp. 245 Park Avenue New York, N.Y. 10017 2. Virginia Chemicals, Inc. 3340 W. Norfolk Road Portsmouth, Va. 23703 3. Dow-Badische Co. Williamsburg, Va. 23185.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 97-99% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAE Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 164.14. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: >1 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on page 5 and 6)	

HPA

HYDROXYPROPYL ACRYLATE

Common Synonyms Propylene glycol monoacrylate 1,2-Propenediol-1-acrylate	Liquid Colorless Faint unpleasant odor May float or sink in water
Avoid contact with liquid and vapor. Keep people away from ignition sources. Call fire department. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Combustible CONTAINERS MAY EXPLODE IN FIRE Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cover exposed containers with water. COMBAT FROM A SAFE DISTANCE OR PROTECTED LOCATION.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing is stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operator if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant Restrict access Disperse and flush	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,2-Propenediol-1-acrylate Propylene glycol monoacrylate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{CH}_2\text{HOCH}_2\text{HCOOCH}=\text{CH}_2$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Slightly acrid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, apron, and boots; worker's goggles or face shield. 5.2 Symptoms Following Exposure: Inhalation irritates nose and throat and causes coughing. Lung injury may occur. Ingestion causes irritation and burning of mouth and stomach. Vapor irritates eyes. Contact with liquid causes severe burns of eyes and burns of skin. 5.3 Treatment for Exposure: INHALATION: If all effects occur, get patient to fresh air, keep him quiet and warm, and get medical attention. If breathing stops, start artificial respiration. INGESTION: Force milk or water immediately, induce vomiting only at physician's recommendation. EYES: Promptly flush with plenty of water and get medical attention. SKIN: Promptly flush with plenty of water. Get medical attention if burning occurs. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 1,230 mg/kg rats. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS

- 6.1 **Flash Point:** 212°F (100°C)
 6.2 **Flammable Limits in Air:** 1.1% (LFL)
 6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol, foam, carbon dioxide
 6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
 6.5 **Special Hazards of Combustion Products:**
 6.6 **Behavior in Fire:**
 6.7 **Ignition Temperature:** Data not available
 6.8 **Electrical Hazard:** Data not available
 6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:**
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 7.5 **Polymerizability:** May occur, avoid exposure to high temperatures, ultraviolet light, free radical initiators.
 7.6 **Inhibitor of Polymerization:** 200 ppm hydroquinone

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterfowl Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co.
 Design Products Dept.
 Midland, Mich. 48640
 2. Polysciences, Inc.
 Paul Valley Industrial Park
 Warrington, Pa. 18976

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** Commercial 97%
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446)
 APQZ

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 1 |
| Health | |
| Vapor Irritant | 3 |
| Liquid or Solid Irritant | 4 |
| Poisons | 3 |
| Water Pollution | |
| Human Toxics | 2 |
| Aquatic Toxics | 2 |
| Acute Effect | 1 |
| Reactivity | |
| Other Chemicals | 2 |
| Water | 1 |
| Self-Reaction | 1 |
- 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 1 |
| Reactivity (Yellow) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid
 13.2 **Molecular Weight:** 130
 13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
 13.4 **Freezing Point:** Not pertinent
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 1.06 at 25°C (liquid)
 13.8 **Liquid Surface Tension:** Data not available
 13.9 **Liquid-Water Interfacial Tension:** Data not available
 13.10 **Vapor (Gas) Specific Gravity:** 4.5
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 13.12 **Latent Heat of Vaporization:** Data not available
 13.13 **Heat of Combustion:** (cal) -12,300 Btu/lb
 $= -6,550 \text{ cal/g} = -287 \times 10^3 \text{ J/kg}$
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** Not pertinent
 13.16 **Heat of Polymerization:** Data not available

NOTES

(continued on page 2 and 3)

IAA

ISOAMYL ALCOHOL

Common Synonyms Fuel oil Fermentable amyl alcohol Isopentyl alcohol 3-Methyl-1-butanol		Liquid Colorless Mild, choking alcohol odor Floats and mixes with water. Irritating vapor is produced.
Spill discharged to sewer. Keep people away. Call fire department. Avoid contact with hazard. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible: Extinguish with water, dry chemical, alcohol foam, or carbon dioxide. Avoid exposure of containers to water.	
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose, and throat. Harmful if inhaled. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to eyes. IF IN EYES: Hold eyelids open and flush with plenty of water.	
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 68-14) Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Fermentation amyl alcohol; Fuel oil; Isopentyl alcohol; Isopentyl alcohol; 3-Methyl-1-butanol; Ferment oil. 3.2 Coast Guard Compatibility Classification: A1 (small). 3.3 Chemical Formula: C ₅ H ₁₂ O 3.4 IMCO United Nations Numerical Designation: 1.1 (H200, 1.2, 1.20)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Mild odor, alcohol, non-repulsive.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Face shield to avoid splash. 5.2 Symptoms Following Exposure: Very high vapor concentrations irritate eyes and upper respiratory tract. Continued contact with skin may cause irritation. 5.3 Treatment for Exposure: IF IN: Immediately flush with plenty of water for at least 15 minutes. Get medical attention. SKIN: Flush with water; wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm. 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Grade 2.1 D ₅₀ 0.5 to 1 g/kg. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Liquid may irritate skin. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS 6.1 Flash Point: 114°F (40°C) 6.2 Flammable Limits in Air: 1.2% - 9.0% (21.2°F) 6.3 Fire Extinguishing Agents: Water spray, dry chemical, alcohol foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 662°F 6.8 Electrical Hazard: Class I, Group C 6.9 Burning Rate: 16 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: 100 ppm 48 hr; goldfish, acetic acid, fresh water; 400-600 ppm 24 hr; green shrimp, acetic acid, fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 186% 5 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Pubco Industries, Inc. 1429 Walnut St. Philadelphia, Pa. 19102 2. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017
	10 SHIPPING INFORMATION 10.1 Grades or Purities: Pure fuel oil 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arrester
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 68-3 A P-Q-T-U	12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid 12.2 Molecular Weight: 88.15 12.3 Boiling Point at 1 atm: 131°F = 55°C = 328°K 12.4 Freezing Point: Not pertinent 12.5 Critical Temperature: 455°F = 235°C = 457°K 12.6 Critical Pressure: Not pertinent 12.7 Specific Gravity: 0.81 at 20°C (liquid) 12.8 Liquid Surface Tension: 23.5 dynes/cm = 0.0235 N/m at 20°C 12.9 Liquid-Water Interfacial Tension: 5 dynes/cm = 0.005 N/m at 15°C 12.10 Vapor (Gas) Specific Gravity: Not pertinent 12.11 Ratio of Specific Heats of Vapor (Gas): 1.07-1.10 12.12 Latent Heat of Vaporization: 25.6 Btu/lb = 519 kcal/kg = 5016 J/g 12.13 Heat of Combustion: 13,200 Btu/lb = 5,500 kcal/kg = 17,400 J/g 12.14 Heat of Decomposition: Not pertinent 12.15 Heat of Solution: 45°F Btu/lb = 11 kcal/kg = 33,000 J/g 12.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Category Classification Health Hazard (H) 2 Flammability (F) 3 Reactivity (R) 0	
NOTES	

(Continued on pages 1 and 2)

6 FIRE HAZARDS 6.1 Flash Point: 111°F (44°C) 6.2 Flammable Limits in Air: 1.5% - 8.2% 6.3 Fire Extinguishing Agents: Non-flammable gas 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 460°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 9.4 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterborne Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Atlantic Richfield Co. APCO Chemical Co. Division 260 South Broad St. Philadelphia, Pa. 19106 2 Cities Service Co. Inc. Petrochemical Division 10 Wall St. New York, N.Y. 10038 3 Phillips Petroleum Co. Bartlesville, Okla. 74004
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, GHS 2 A 50 D 11 G	10 SHIPPING INFORMATION 10.1 Grades or Purty: Pure technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas 12.2 MAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 44.12 13.3 Boiling Point at 1 atm: 104.1°F (-17.7°C, 258.4°K) 13.4 Freezing Point: -122°F (-157.8°C, 115.4°K) 13.5 Critical Temperature: 255.5°F (124.7°C, 397.8°K) 13.6 Critical Pressure: 229 psia (15.68 bar, 1.568 MPa) 13.7 Specific Gravity: 0.555 (vs. water) 13.8 Liquid Surface Tension: 22 dyne/cm (25.48 N/m, 0.02548 N/cm) 13.9 Liquid-Water Interfacial Tension: 10.5 dyne/cm (11.98 N/m, 0.01198 N/cm) 13.10 Vapor (Gas) Specific Gravity: 1.5 13.11 Rate of Specific Heats of Vapor (Gas): 1705 13.12 Latent Heat of Vaporization: 105 Btu/lb (3.92 kJ/kg, 4.29 x 10³ J/kg) 13.13 Heat of Combustion: 19,425 Btu/lb (22,410 kJ/kg, 22,410 J/g) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

Continued on page 7 and 8

NOTES

IBA

ISOBUTYL ACETATE

Common Synonyms Acetic acid, isobutyl ester	Watery Liquid Colorless Pleasant fruity odor Floats on water. Flammable, irritating vapor is produced.
No discharge of possible toxic vapors. No off-gassing in storage and distribution. No off-gassing in use. No off-gassing in waste disposal. No off-gassing in incineration.	
Fire	FLAMMABLE Flashback along vapor trail may occur. May explode if ignited in an enclosed area. Extinguish with water, carbon dioxide, or dry chemical. Water may be ineffective.
Exposure	CAUTION MEDICAL USE VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, dizziness, or loss of consciousness. May be fatal if inhaled in high concentrations. LIQUID Irritating to skin and eyes. No serious effects if swallowed. Flush mouth with water if swallowed. IF IN EYES Flush with water for at least 15 minutes.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Manual Handbook, CG 446-4) Issue warning of high flammability. Evacuate if a Dispense and flush.	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms Acetic acid isobutyl ester 2 Methyl-1-propyl acetate Beta Methylpropyl ethanoate 3.2 Coast Guard Compatibility Classification Ester 3.3 Chemical Formula $(CH_3)_2CHCOOCH_2CH_3$ 3.4 IMCO/United Nations Numerical Designation 3.2, 1213	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Agreeable, fruity odor in low concentrations; disagreeable in higher concentrations; mild characteristic ester nonresidual.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: At risk or organic canister mask, chemical goggles. 5.2 Symptoms Following Exposure: Vapors may irritate upper respiratory tract and cause nausea, vomiting, dizziness, and loss of consciousness. Liquid irritates eyes and may irritate skin. 5.3 Treatment for Exposure: INHALATION: Remove from exposure if breathing is irregular or has stopped; start resuscitation and give oxygen; call a doctor. EYES: Flush with water for at least 15 minutes. 5.4 Toxicity by Inhalation (Threshold Limit Value): 150 ppm 5.5 Short-Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Lele Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause stinging and reddening of the skin. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 62°F C.C., 85°F O.C. 6.2 Flammable Limits in Air: 2.4% - 10.5% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide and dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 93°F 6.8 Electrical Hazard: Class I group D. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 1200 ppm/24 hr/brown shrimp/TLM. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 47% of theoretical in 5 days, freshwater, acclimated seed. 8.4 Food Chain Concentration Potential: None.																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Solvents and dissolves many plastics. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1 Eastman Kodak Co. Tennessee Eastman Division Kingsport, Tenn. 37662 2 Fritzsche Dodge and Olcott, Inc. 76 Ninth Ave. New York, N.Y. 10011 3 Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017.																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U	10 SHIPPING INFORMATION 10.1 Grades or Purity: 95.99% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (Bottle, Cylinder).																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="999 1444 1246 1714"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Toxic</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>1</td></tr> <tr> <td>Aquatic Toxicity</td><td>1</td></tr> <tr> <td>Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="999 1724 1246 1811"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Toxic	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 116.16. 13.3 Boiling Point at 1 atm: 243.1°F = 117.3°C = 390.5°K. 13.4 Freezing Point: -142.8°F = -97.1°C = 176.1°K. 13.5 Critical Temperature: 565°F = 296°C = 569°K. 13.6 Critical Pressure: 470 psia = 32 atm = 3.2 MN/m. 13.7 Specific Gravity: 0.871 at 20°C (liquid). 13.8 Liquid Surface Tension: 23.7 dynes/cm = 0.0237 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: (est.) 13,000 dyne/cm = 0.04 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 133 Btu/lb = 73.2 cal/g = 3.09 x 10 ⁵ J/kg. 13.13 Heat of Combustion: (est.) -13,000 Btu/lb = -7220 cal/g = -302 x 10 ⁵ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Toxic	3																																				
Health																																					
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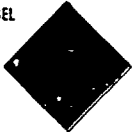
ISOBUTYL ALCOHOL

Common Synonyms Isobutanol Isopropylcarbinol 2-Methyl-1-propanol		Only liquid Colorless Mild alcohol, choking odor
Fire		FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Extinguish with dry chemical, alcohol, carbon dioxide Water may be ineffective Cool exposed containers with water
Exposure		CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled, will cause nausea, dizziness, or headache Move to fresh air If breathing has stopped, give artificial respiration If breathing is difficult, give oxygen LIQUID Irritating to eyes Harmful if swallowed IF SWALLOWED, DO NOT INDUCE VOMITING. Flush with plenty of water IF SWALLOWED and soon is CONSCIOUS, have victim drink water or milk
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes No toxic effects reported with fish No reported effects on birds or other animals
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Isobutanol Isopropylcarbinol 2-methyl-1-propanol Fermentation butyl alcohol 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: (CH ₃) ₂ CHCH ₂ OH 3.4 IMCO/United Nations Numerical Designation: 3.3/1212		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Slightly suffocating, nonresidual, alcoholic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air pack or organic canister, chemical goggles 5.2 Symptoms Following Exposure: Contact with eyes is extremely irritating and may cause burns. Breathing vapors will be irritating to the nose and throat. In high concentrations, may cause nausea, dizziness, headache, and stupor. 5.3 Treatment for Exposure: INHALATION: If victim is overcome by vapors, remove him from exposure immediately, call a physician. If breathing is irregular or has stopped, start resuscitation, administer oxygen. IF EYES: Flush with water for at least 15 min. 5.4 Toxicity by Inhalation: Threshold Limit Value: 100 ppm 5.5 Short-Term Inhalation Limit: 200 ppm for 60 min 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 to 5 g/kg (rat) 5.7 Lethal Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS 6.1 Flash Point: 82°F C.C. 90°F O.C. 6.2 Flammable Limits in Air: 1.6% - 10.9% 6.3 Fire Extinguishing Agents: Alcohol foam dry chemical carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 800°F 6.8 Electrical Hazard: Class I, group D 6.9 Burning Rate: 3.5 mm/min		8. WATER POLLUTION 8.1 Aquatic Toxicity: 3686 ppm/l hr/fish/lethal to fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 162%, 5 days 8.4 Food Chain Concentration Potential: None																													
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1 Eastman Kodak Co. Tennessee Eastman Division Kingsport, Tenn. 37662 2 Oxchem Enterprises Penuelas, Puerto Rico 00724 3 Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N. Y. 10017																													
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-P-Q		10. SHIPPING INFORMATION 10.1 Grade or Purity: 99+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)																													
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>3</td></tr><tr><td>Health</td><td></td></tr><tr><td> Vapor Irritant</td><td>1</td></tr><tr><td> Liquid or Solid Irritant</td><td>0</td></tr><tr><td> Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td> Human Toxicity</td><td>2</td></tr><tr><td> Aquatic Toxicity</td><td>1</td></tr><tr><td> Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td> Other Chemicals</td><td>2</td></tr><tr><td> Water</td><td>0</td></tr><tr><td> Self Reaction</td><td>0</td></tr></table>		Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	0	Poisons	1	Water Pollution		Human Toxicity	2	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 74.12 13.3 Boiling Point at 1 atm: 226.2°F = 107.9°C = 381.1°K 13.4 Freezing Point: -162°F = -108°C = 165°K 13.5 Critical Temperature: 526.3°F = 274.6°C = 547.8°K 13.6 Critical Pressure: 623 psia = 42.4 atm = 4.26 dN/cm ² 13.7 Specific Gravity: 0.802 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 248 Btu/lb = 13 kcal/g = 5.78 x 10 ³ J/kg 13.13 Heat of Combustion: -14,220 Btu/lb = -7,900 cal/g = -33,088 kJ/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution, test 1: -9 Btu/lb = -5 cal/g = -0.2 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent	
Category	Rating																														
Fire	3																														
Health																															
Vapor Irritant	1																														
Liquid or Solid Irritant	0																														
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IAM

ISOBUTYLAMINE

Common Synonyms Monoisobutylamine 1-Amino-2-methylpropane	Liquid Colorless Strong ammonia odor
Floats and mixes with water	
Stop discharge if possible. Keep people away. Shut off ignition sources. Call fire department. Evacuate area with liquid and vapor. Locate and contain any discharged material. Notify local health and environmental agencies.	
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical or carbon dioxide. Water may be on the fire line. Confined containers with water.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing, difficult breathing or loss of consciousness. If eyes are not, eyelids open and flush with plenty of water. If breathing is not, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. If swallowed will cause nausea or loss of consciousness. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS, do not drink water or milk. and call for medical assistance.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operator of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability air contaminant - water contaminant Restrict access Evacuate area Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Amino-2-methylpropane Iso Butylamine, Monoisobutylamine 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: (CH₃)₂CHCH₂NH₂ 3.4 IMCO/United Nations Numerical Designation: 3.2/1214	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Strong ammoniacal
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, butyl rubber gloves, chemical face shield, butyl rubber apron. 5.2 Symptoms Following Exposure: Inhalation causes severe coughing and chest pain due to irritation of air passages; can cause lung edema. Compound is sympathomimetic and is also a cardiac depressant, and convulsant. Ingestion causes nausea and profuse salivation. Contact with eyes causes severe irritation and edema of the cornea. Contact with skin causes severe irritation. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air. If he is not breathing, give artificial respiration, if breathing is difficult, give oxygen, call a physician. INGESTION: give large amount of water followed by dilute vinegar or lemon juice. Keep patient warm. EYES: flush with water for 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 oral LD₅₀ = 120 mg/kg (rabbits); 250 mg/kg (rats) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS

- 6.1 **Flash Point:** 15°F C.C.
 6.2 **Flammable Limits in Air:** 1.4% - 9%
 6.3 **Fire Extinguishing Agents:** Dry chemical "alcohol" foam, carbon dioxide.
 6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
 6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may be formed in fire.
 6.6 **Behavior in Fire:** Vapor is heavier than air and may travel to a source of ignition and flash back. Containers may explode.
 6.7 **Ignition Temperature:** 712°F
 6.8 **Electrical Hazard:** Data not available
 6.9 **Burning Rate:** 6.03 mm/min

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterfowl Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals, Inc.
 U.S. Highway 90
 P.O. Box 32502
 Philadelphia, Pa. 19102
 2. Pennwalt Corp.
 Three Parkway
 Philadelphia, Pa. 19102
 3. Aldrich Chemical Co.
 940 W. Saint Paul Ave.
 Milwaukee, Wis. 53233

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:**
 7.3 **Stability during Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** Technical 99+%
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 A P Q R S

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:**
 Flammable liquid
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 3 |
| Health | |
| Vapor Irritant | 3 |
| Liquid or Solid Irritant | 4 |
| Poisons | 4 |
| Water Pollution | |
| Human Toxicity | 2 |
| Aquatic Toxicity | 2 |
| Aesthetic Effect | 1 |
| Reactivity | |
| Other Chemicals | 3 |
| Water | 0 |
| Self-Reaction | 0 |
- 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 3 |
| Reactivity (Yellow) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid
 13.2 **Molecular Weight:** 73.1
 13.3 **Boiling Point at 1 atm:** 153.3°F = 67.4°C = 340.6°K
 13.4 **Freezing Point:** -121.9°F = -85.5°C = 187.7°K
 13.5 **Critical Temperature:** 469.4°F = 243.0°C = 516.2°K
 13.6 **Critical Pressure:** 620 psia = 42.7 atm = 4.3 MN/m²
 13.7 **Specific Gravity:** 0.739 at 20°C (liquid)
 13.8 **Liquid Surface Tension:** 23.70 dynes/cm = 0.0237 N/m at 20°C
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** 2.5
 13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.073 at 20°C
 13.12 **Latent Heat of Vaporization:** 162 Btu/lb = 101 cal/g = 4.23 × 10³ J/kg
 13.13 **Heat of Combustion:** -17,550 Btu/lb = -9,760 cal/g = -408 × 10³ J/kg
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** -148 Btu/lb = -82 cal/g = -3.4 × 10³ J/kg
 13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 4 and 6)

NOTES

IBL

ISOBUTYLENE

Common Synonyms Isobutene 2-Methylpropene	Liquefied compressed gas. Colorless. Sweet gasoline-like odor. Floats and boils on water. Flammable visible vapor cloud is produced.
No fire hazard if possible. Keep people away. Shut off ignition sources and all fire department. Stay upwind and low water may be knocked down. Vapor. Avoid contact with liquid. Soak and remove from gas mixture. No fire hazard if possible. Control fire.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Stop flow if possible. If not exposed containers a minimum of 100 feet should be shut off with water. For fire burn. Extinguish small fires with water. If large, use carbon dioxide.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing is stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will cause frostbite. Frostbite affects areas with greatest exposure to water. DO NOT RUB AFFECTED AREAS.
Water Pollution	Not harmful to aquatic life.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4.) Issue warning: high flammability. Restrict access. Evacuate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Isobutene 2-Methylpropene 3.2 Coast Guard Compatibility Classification: Other 3.3 Chemical Formula: (C_4H_8) 3.4 IMCO/United Nations Numerical Designation: 2.1055	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid under pressure. 4.2 Color: Colorless. 4.3 Odor: Mild, sweetish.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical gloves and eye protection on organic vapor canister or self-contained breathing apparatus. 5.2 Symptoms Following Exposure: Inhalation of moderate concentrations causes dizziness, drowsiness, and unconsciousness. Contact with eyes or skin may cause irritation. Frostbite may cause frostbite. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air and apply resuscitation call a physician promptly if victim is unconscious. EYES: if irritated, wash with water. SKIN: if irritated, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1000 ppm (8 hr). 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Not pertinent. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to skin because it is very volatile and evaporates quickly. May cause frostbite. 5.10 Odor Threshold: Data not available.	

FIRE HAZARDS 6.1 Flammable Limits: -10.5% to 6.7% 6.2 Flammable Limits in Air: 1.8% to 9.6% 6.3 Fire Extinguishing Agents: Let fire burn. Stop flow of gas. Water fog, dry chemical or carbon dioxide may be used for small fires. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Containers may explode in fire. Vapor is heavier than air and may travel a long distance to a source of ignition and flash back. 6.7 Ignition Temperature: $869^\circ F$ 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: None. 8.2 Waterlow Toxicity: None. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Petro-Tex Chemical Corp. 8600 Park Place Houston, Texas 77017 2. Exxon Chemical Co. Houston, Texas 77001								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3. A B C D E F G	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial, polymerization. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Safety relief.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	4	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at $15^\circ C$ and 1 atm: Gas. 13.2 Molecular Weight: 56.10. 13.3 Boiling Point at 1 atm: $19.6^\circ F = -6.9^\circ C = 266.3^\circ K$. 13.4 Freezing Point: $-220^\circ F = -140.3^\circ C = 132.9^\circ K$. 13.5 Critical Temperature: $292.5^\circ F = 144.7^\circ C = 417.9^\circ K$. 13.6 Critical Pressure: 590 psia = 39.48 atm = 3.99 MN/m ² . 13.7 Specific Gravity: 0.59 at $20^\circ C$ (liquid). 13.8 Liquid Surface Tension: 15.8 dynes/cm = 0.0158 N/m at $20^\circ C$. 13.9 Liquid-Water Interfacial Tension: 140 dynes/cm = 0.04 N/m at $10^\circ C$. 13.10 Vapor (Gas) Specific Gravity: 1.9. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.061. 13.12 Latent Heat of Vaporization: 170 Btu/lb = 94.3 cal/g = $3.95 \times 10^5 J/kg$. 13.13 Heat of Combustion: $-19,359 Btu/lb = -10,755 cal/g = -450.29 \times 10^3 J/kg$. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	4								
Reactivity (Yellow)	0								
NOTES									

IBR

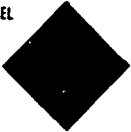
ISOBUTYRIC ACID

Common Synonyms: Dimethylacetic acid Isopropylformic acid 2-Methylpropanoic acid Propane-2-carboxylic acid	Liquid Colorless Unpleasant, acid odor Floats and mixes with water
Avoid contact with liquid and vapor. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber or plastic clothing including gloves. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Combustible Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED, hold victim's COME TO LIFE victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: corrosive Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dimethylacetic acid, Isopropylformic acid, 2-Methylpropanoic acid, alpha-Methylpropanoic acid, Propane-2-carboxylic acid 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: (CH ₃) ₂ CHCOOH 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Unpleasant, acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic chemical respirator, goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min., get medical attention if irritation persists. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold/Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3, oral LD ₅₀ = 280 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 170°F (0°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: 135°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 2.6 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Corrosive to aluminum and other metals. Flammable hydrogen gas may accumulate in enclosed spaces. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Amze can Hoechst Corp. Route 202, 206 North Somerville, N.J. 08876 2. BASI Wyandotte 1609 Biddle Avenue Wyandotte, Mich. 48192 3. Eastman Organic Chemicals 143 State Street Rochester, N.Y. 14650
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-P-Q	10. SHIPPING INFORMATION 10.1 Grade or Purity: 99+ % 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 88 13.3 Boiling Point at 1 atm: 100°F = 154°C = 427°K 13.4 Freezing Point: -51°F = -46°C = 227°K 13.5 Critical Temperature: 617°F = 336°C = 609°K 13.6 Critical Pressure: 588 psia = 40 atm = 4.06 MN/m ² 13.7 Specific Gravity: 0.949 at 20°C (liquid) 13.8 Liquid Surface Tension: 25.1 dynes/cm = 0.0251 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.9 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 202 Btu/lb = 112 cal/g = 4.68 x 10 ⁵ J/kg 13.13 Heat of Combustion: -10,600 Btu/lb = -5,880 cal/g = -246 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -20.5 Btu/lb = -11.4 cal/g = -0.477 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent
NOTES <i>(Continued on pages 5 and 6)</i>	

IBN

ISOBUTYRONITRILE

Common Synonyms Isopropyl Cyanide IBN 2-Methylpropanenitrile 2-Methylisobutyronitrile		Liquid Colorless Almond-like
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear goggles, self-contained breathing apparatus, and protective clothing. Do not breathe vapors. If you get it on your skin, wash it off with plenty of water. If you get it in your eyes, flush them with water for at least 15 minutes. If you swallow it, do not eat or drink. Get medical attention immediately.		Floats on water. Flammable vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Do not breathe vapors. If you get it on your skin, wash it off with plenty of water. If you get it in your eyes, flush them with water for at least 15 minutes. If you swallow it, do not eat or drink. Get medical attention immediately.	
 Exposure	CALL FOR MEDICAL AID VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat. May be fatal if inhaled. If you get it in your eyes, flush them with water for at least 15 minutes. If you get it on your skin, wash it off with plenty of water. If you swallow it, do not eat or drink. Get medical attention immediately.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not recommended for discharge into water. Not recommended for incineration.	
1 RESPONSE TO DISCHARGE Issue warning: high flammability, poison. Restrict access. Evacuate area. Mechanical containment. Should be removed. Chemical and physical treatment.	2. LABEL 	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: IBN, Isopropylcyanide, 2-Methylpropanenitrile, 2-Methylisobutyronitrile. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: $(CH_3)_2CHCN$. 3.4 IMCO/United Nations Numerical Designation: Not listed.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Like almonds or benzaldehyde.	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation, ingestion, or skin contact causes weakness, headache, confusion, nausea, vomiting, acute cyanide poisoning may result. Contact with eyes causes irritation. 5.3 Treatment for Exposure: Get medical attention following all overexposures to this chemical. Watch for symptoms of cyanide poisoning. INHALATION: move patient to fresh air; apply artificial respiration if breathing stops. INGESTION: break an amyl nitrite pearl in a cloth and hold tightly under patient's nose for 15 sec. if he is conscious, induce vomiting and repeat until vomit is clear; repeat inhalation of amyl nitrite 5 times at 15 sec. intervals. EYES: flush with water for at least 15 min. SKIN: flush with water, remove contaminated clothing, destroy contaminated shoes. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion, Grade 1 oral LD ₅₀ = 100 mg/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS 6.1 Flash Point: 47°F (8°C). 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Toxic, oxides of nitrogen may form in fire. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Data not available.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Air Products and Chemicals, Inc. P. O. Box 538 Allentown, Pa. 18105 2. Acemstar Corp. P. O. Box 68 Scarborough, N. Y. 10510 3. Eastman Chemical Products, Inc. Kingsport, Tenn. 37662.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446, 3). A T U-V-W	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical Pure. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 69.1. 13.3 Boiling Point at 1 atm: 219°F = 104°C = 377°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Data not available. 13.6 Critical Pressure: Data not available. 13.7 Specific Gravity: 0.774 at 20°C (liquid). 13.8 Liquid Surface Tension: 24.9 dynes/cm = 0.0249 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: 2.4. 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available. 13.12 Latent Heat of Vaporization: 200 Btu/lb = 110 cal/g = 4.7×10^4 J/kg. 13.13 Heat of Combustion: 14,960 Btu/lb = 8,310 cal/g = 348×10^3 J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on pages 5 and 6)	

IOC

ISOCTALDEHYDE

Common Synonyms: 6-Methylheptanal Octo aldehyde Isooctaldehyde		Liquid Colorless Mild fruity odor Floats on water
Not to be discharged if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible Extinguish with dry chemical, foam, or carbon dioxide	
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to eyes. If in eyes, flush eyelids, open and flush with plenty of water.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operators of nearby water intakes.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-7) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dimethylhexanals Isooctyl aldehyde 6-Methylheptanal 3.2 Coast Guard Competibility Classification: Aldehyde 3.3 Chemical Formula: $(CH_3)_2CH(CH_2)_5CHO$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild fruity
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical goggles 5.2 Symptoms Following Exposure: High vapor concentrations produce eye irritation. Liquid may irritate eyes. 5.3 Treatment for Exposure: Remove from exposure. Wash eyes with water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS

6.1 **Flash Point:** 104°F C C
 6.2 **Flammable Limits in Air:**
 Data not available
 6.3 **Fire Extinguishing Agents:**
 Data not available
 6.4 **Fire Extinguishing Agents Not to be Used:**
 Data not available
 6.5 **Special Hazards of Combustion Products:**
 Not pertinent
 6.6 **Behavior in Fire:** Not pertinent
 6.7 **Ignition Temperature:** 320°F
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Data not available

8. WATER POLLUTION

8.1 **Aquatic Toxicity:**
 Data not available
 8.2 **Waterfowl Toxicity:**
 Data not available
 8.3 **Biological Oxygen Demand (BOD):**
 Data not available
 8.4 **Food Chain Concentration Potential:**
 None

9 SELECTED MANUFACTURERS

1 Exxon Chemical Co.
 Houston, Texas 77001
 2 Getty Oil Co.
 Los Angeles, Calif. 90054
 3 Union Carbide Corp.
 Chemicals and Plastics Division
 270 Park Ave.
 New York, N. Y. 10017

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:**
 No reaction
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:**
 Not pertinent

10 SHIPPING INFORMATION

10.1 **Grade or Purity:** Data not available
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A-T U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:**
 Combustible Liquid
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	1

12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
 13.2 **Molecular Weight:** 126.22
 13.3 **Boiling Point at 1 atm:** 307-352°F
 $= 153-178^{\circ}\text{C} = 426-451^{\circ}\text{K}$
 13.4 **Freezing Point:**
 $-150^{\circ}\text{F} = -115^{\circ}\text{C} = 155^{\circ}\text{K}$
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 0.82 at 20°C (liquid)
 13.8 **Liquid Surface Tension:**
 $26.9 \text{ dynes/cm} = 0.0269 \text{ N/m at } 20^{\circ}\text{C}$
 13.9 **Liquid-Water Interfacial Tension:**
 $(\text{est.}) 40 \text{ dynes/cm} = 0.04 \text{ N/m at } 20^{\circ}\text{C}$
 13.10 **Vapor (Gas) Specific Gravity:**
 Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):**
 $(\text{est.}) 1.040$
 13.12 **Latent Heat of Vaporization:**
 $140 \text{ Btu/lb} = 77 \text{ cal/g} = 3.2 \times 10^5 \text{ J/kg}$
 13.13 **Heat of Combustion:** (est.) $-17,000 \text{ Btu/lb}$
 $= -9600 \text{ cal/g} = -400 \times 10^3 \text{ J/kg}$
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** Not pertinent
 13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 4 and 5)

NOTES

IPA

ISODECALDEHYDE

Common Synonyms: Isodecaldehyde, Isodecylaldehyde	Liquid Floats on water	Colorless Fruity odor
Notes: 1. The white crystalline solid is the pure isodecylaldehyde. The liquid is a mixture of isodecylaldehyde and other aldehydes.		
Fire	Combustible	
Exposure	LIQUID Irritating to skin and eyes Irritating to mucous membranes Irritating to respiratory tract	
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Isodecylaldehyde, isodecylal, 10-methylnonanal 3.2 Coast Guard Compatibility Classification Aldehyde 3.3 Chemical Formula: $C_{11}H_{22}O$ 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Somewhat fruity
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing, chemical goggles 5.2 Symptoms Following Exposure: Low general toxicity. Liquid may irritate eyes and skin. 5.3 Treatment for Exposure: Wash eyes and skin with plenty of water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the mucous membranes of the respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: 185°F (6°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																													
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N. Y. 10017																													
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T L		10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)																													
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Toxics</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>2</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>1</td></tr></tbody></table> 12.3 NFPA Hazard Classification: Not listed		Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Toxics	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 156.28 13.3 Boiling Point at 1 atm: Data not available 13.4 Freezing Point: Data not available 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: (est.) 0.84 at 15° (liquid) 13.8 Liquid Surface Tension: (est.) 20 dynes/cm = 0.02 N/m at 20° 13.9 Liquid-Water Interfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20° 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Rating																														
Fire	1																														
Health																															
Vapor Irritant	1																														
Liquid or Solid Irritant	1																														
Toxics	1																														
Water Pollution																															
Human Toxicity	1																														
Aquatic Toxicity	1																														
Aesthetic Effect	2																														
Reactivity																															
Other Chemicals	2																														
Water	0																														
Self Reaction	1																														
16. COMMENTS AND PREPARED BY																															
NOTES																															

REVISED 1978

IAI

ISODECYL ACRYLATE, INHIBITED

Common Synonyms		Liquid	Colorless	Weak odor
Isodecyl acrylate		Floats on water		
May discharge if possible. Keep people away. Call fire department. Isolate and remove discharged material. No fire, health, and pollution control charges.				
Fire	Combustible Mix liquid with dry chemicals (e.g., carbon dioxide). Water may be ineffective in fire. On exposed containers with water.			
Exposure	Can be medical aid. LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES: Hold eyelids open and flush with plenty of water. If SWALLOWED: If conscious, have victim drink water. If not conscious, do not give anything by mouth.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. No known acute toxicity to fish. No known potential for long-term effects.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: no Decylacrylate 3.2 Coast Guard Competibility Classification: Monomers (14) 3.3 Chemical Formula: $C_{11}H_{20}O_2$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weak acrylate		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation causes mild irritation of nose and throat. Eyes are mildly irritated by vapor, more severely by liquid. Prolonged contact of liquid with skin may cause irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. EYES: flush with water for at least 15 min. after contact with liquid. SKIN: wipe off, wash well with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade I LD ₅₀ 5 to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging on the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS

- 6.1 Flash Point: 240°F (110°C)
 6.2 Flammable Limits in Air: Data not available.
 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide.
 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.
 6.5 Special Hazards of Combustion Products: Not pertinent.
 6.6 Behavior in Fire: May polymerize to gums/solid. Reaction is not violent.
 6.7 Ignition Temperature: Data not available.
 6.8 Electrical Hazard: Data not available.
 6.9 Burning Rate: Not pertinent.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): Data not available.
 8.4 Food Chain Concentration Potential: None.

9 SELECTED MANUFACTURERS

Union Carbide Corporation
 Chemicals and Plastics Division
 270 Park Avenue
 New York, N.Y. 10017

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: 97.5%
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement.
 10.4 Venting: Open (flame arrester).

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 A11Z

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 212.4
 13.3 Boiling Point at 1 atm: Not pertinent (polymers).
 13.4 Freezing Point: -148°F = -100°C = 173°K.
 13.5 Critical Temperature: Not pertinent.
 13.6 Critical Pressure: Not pertinent.
 13.7 Specific Gravity: 0.885 at 20°C (liquid).
 13.8 Liquid Surface Tension: (est.)
 30 dynes/cm = 0.030 N/m at 20°C.
 13.9 Liquid-Water Interfacial Tension: (est.)
 30 dynes/cm = 0.030 N/m at 20°C.
 13.10 Vapor (Gas) Specific Gravity: Not pertinent.
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.
 13.12 Latent Heat of Vaporization: 110 Btu/lb
 = 61 cal/g = 2.6×10^5 J/kg.
 13.13 Heat of Combustion: (est.)
 -16,300 Btu/lb = -9,100 cal/g
 = -1.6×10^7 J/kg.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: (est.)
 -119 Btu/lb = -66 cal/g = -2.8×10^6 J/kg.

(Continued on pages 4 and 6)

NOTES

ISA

ISODECYL ALCOHOL

Common Synonyms		Liquid	Colorless	Mild alcohol odor
		Soluble in water		
Read MSDS for liquid, keep away from heat, flame, or open flame. Do not use in confined spaces. Do not use in areas where smoking is prohibited. Do not use in areas where food or drink is consumed. Do not use in areas where children are present. Do not use in areas where pets are present. Do not use in areas where electrical equipment is present. Do not use in areas where flammable materials are present. Do not use in areas where oxidizing materials are present. Do not use in areas where corrosive materials are present. Do not use in areas where toxic materials are present. Do not use in areas where radioactive materials are present. Do not use in areas where hazardous materials are present. Do not use in areas where environmental hazards are present. Do not use in areas where safety hazards are present. Do not use in areas where health hazards are present. Do not use in areas where property hazards are present. Do not use in areas where other hazards are present.				
Fire		Combustible Flash point: 220°F (82°C) Autoignition: 400°F (204°C) Extinguishing: Alcohol foam, dry chemicals or carbon dioxide		
Exposure		CAUTION: MEDICAL LIQUID Will burn skin and eyes. R1: Irritant R2: Harmful R3: May cause drowsiness or dizziness R4: May cause fatigue or numbness R5: May cause loss of consciousness R6: May cause respiratory irritation R7: May cause skin irritation R8: May cause eye irritation R9: May cause allergic reaction R10: May cause harm to the environment R11: Very Irritant R12: Harmful to Aquatic Life R13: May cause environmental damage R14: May cause harm to the ozone layer R15: May cause harm to the atmosphere R16: May cause harm to the soil R17: May cause harm to the water R18: May cause harm to the land R19: May cause harm to the air R20: May cause harm to the water R21: May cause harm to the land R22: May cause harm to the air R23: May cause harm to the water R24: May cause harm to the land R25: May cause harm to the air R26: May cause harm to the water R27: May cause harm to the land R28: May cause harm to the air R29: May cause harm to the water R30: May cause harm to the land R31: May cause harm to the air R32: May cause harm to the water R33: May cause harm to the land R34: May cause harm to the air R35: May cause harm to the water R36: May cause harm to the land R37: May cause harm to the air R38: May cause harm to the water R39: May cause harm to the land R40: May cause harm to the air R41: May cause harm to the water R42: May cause harm to the land R43: May cause harm to the air R44: May cause harm to the water R45: May cause harm to the land R46: May cause harm to the air R47: May cause harm to the water R48: May cause harm to the land R49: May cause harm to the air R50: May cause harm to the water R51: May cause harm to the land R52: May cause harm to the air R53: May cause harm to the water R54: May cause harm to the land R55: May cause harm to the air R56: May cause harm to the water R57: May cause harm to the land R58: May cause harm to the air R59: May cause harm to the water R60: May cause harm to the land R61: May cause harm to the air R62: May cause harm to the water R63: May cause harm to the land R64: May cause harm to the air R65: May cause harm to the water R66: May cause harm to the land R67: May cause harm to the air R68: May cause harm to the water R69: May cause harm to the land R70: May cause harm to the air R71: May cause harm to the water R72: May cause harm to the land R73: May cause harm to the air R74: May cause harm to the water R75: May cause harm to the land R76: May cause harm to the air R77: May cause harm to the water R78: May cause harm to the land R79: May cause harm to the air R80: May cause harm to the water R81: May cause harm to the land R82: May cause harm to the air R83: May cause harm to the water R84: May cause harm to the land R85: May cause harm to the air R86: May cause harm to the water R87: May cause harm to the land R88: May cause harm to the air R89: May cause harm to the water R90: May cause harm to the land R91: May cause harm to the air R92: May cause harm to the water R93: May cause harm to the land R94: May cause harm to the air R95: May cause harm to the water R96: May cause harm to the land R97: May cause harm to the air R98: May cause harm to the water R99: May cause harm to the land R100: May cause harm to the air		
Water Pollution		Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 444-4)		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: No common synonyms		4.1 Physical State (as shipped): Liquid		
3.2 Coast Guard Compatibility Classification: Alcohol		4.2 Color: Colorless		
3.3 Chemical Formula: C ₁₁ H ₂₄ O		4.3 Odor: Weak alcoholic		
3.4 IMCO/United Nations Numerical Designation: Not listed				
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Chemical goggles				
5.2 Symptoms Following Exposure: Direct contact with skin can produce irritation				
5.3 Treatment for Exposure: Wash affected area with water for 15 min				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Data not available				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to the eyes and throat				
5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure				
5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS

- 6.1 Flash Point: 220°F (82°C)
 6.2 Flammable Limits in Air: Data not available
 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemicals or carbon dioxide
 6.4 Fire Extinguishing Agents Not to Be Used: Water or foam may cause frothing
 6.5 Special Hazards of Combustion Products: Not pertinent
 6.6 Behavior in Fire: Not pertinent
 6.7 Ignition Temperature: Data not available
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: Data not available

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
 8.2 Waterfowl Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD): Data not available
 8.4 Feed Concentration Potential: None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co.
Houston, Texas 77001
 2. Getty Oil Co.
Los Angeles, Calif. 90054
 3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

- 10.1 Grades or Purities: Technical mixed isomers
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Open (flame arrester)

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 444-3)
A-T-L

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 158.29
 13.3 Boiling Point at 1 atm: 426°F = 220°C = 493°K
 13.4 Freezing Point: <140°F = <60°C = <133°K
 13.5 Critical Temperature: Not pertinent
 13.6 Critical Pressure: Not pertinent
 13.7 Specific Gravity: 0.841 at 20°C (liquid)
 13.8 Liquid Surface Tension: Data not available
 13.9 Liquid-Water Interfacial Tension: Data not available
 13.10 Vapor (Gas) Specific Gravity: Not pertinent
 13.11 Ratio of Specific Heats of Vapor (G_{sc}): Not listed
 13.12 Latent Heat of Vaporization: (est.) 120 Btu/lb = 67 cal/g = 2.8 x 10⁵ J/kg
 13.13 Heat of Combustion: Data not available
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 4 and 5)

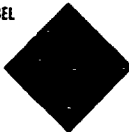
12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
 12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Fire | 1 |
| Health | |
| Vapor Irritant | 0 |
| Liquid or Solid Irritant | 2 |
| Poison | 0 |
| Water Pollution | |
| Human Toxicity | 0 |
| Aquatic Toxicity | 1 |
| Aesthetic Effect | 2 |
| Reactivity | |
| Other Chemicals | 2 |
| Water | 0 |
| Self Reaction | 0 |
- 12.3 NFPA Hazard Classifications: Not listed

NOTES

IHA

ISOHEXANE

Common Synonyms * Methylpentane	Watery liquid Gasoline-like odor Floats on water. Flammable, irritating vapor is produced.
Vapors are flammable. Keep away from heat, sparks, open flames, and other sources of ignition. Do not use near water. Do not use in confined spaces. Do not use in areas where smoking is prohibited. Do not use in areas where fire is prohibited. Do not use in areas where fire is prohibited.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Do not use in confined spaces.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing, or loss of consciousness. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Do not use in confined spaces.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability. Evacuate area. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2 Methylpentane 3.2 Coast Guard Compatibility Classification: Paraffin 3.3 Chemical Formula: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ 3.4 IMCO/United Nations Numerical Designation: 3.1/1208	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Gasoline
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Eye protection (as for gasoline). 5.2 Symptoms Following Exposure: Inhalation causes irritation of respiratory tract, cough, mild depression, cardiac arrhythmias. Aspiration causes severe lung irritation, coughing, pulmonary edema, excitement followed by depression. Ingestion causes nausea, vomiting, swelling of abdomen, headache, depression. 5.3 Treatment for Exposure: INHALATION: maintain respiration, give oxygen if needed. ASPIRATION: enforce bed rest, give oxygen. INGESTION: do NOT induce vomiting, call a doctor. EYES: wash with copious amount of water. SKIN: wipe off, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Color Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: -20°F (-29°C) 6.2 Flammable Limits in Air: 1.2% - 7.7% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, or dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 585°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 8.7 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. The Humphrey Chemical Co. Devine Street North Haven, Conn. 06473 2. Pennzoil United, Inc. Atlas Processing Co. 3546 Midway St. Shreveport, La. 71109 3. Phillips Petroleum Co. Bartlesville, Okla. 74004																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U V W	10. SHIPPING INFORMATION 10.1 Grades or Purity: Research 99.95% pure, 99.0%, technical 95.0% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrestor) or pressure vacuum																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 N.A.S. Hazard Rating for Bulk Water Transportation: <table data-bbox="982 1455 1221 1724"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>0</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>0</td></tr> <tr> <td>Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>1</td></tr> <tr> <td>Aquatic Toxicity</td><td>1</td></tr> <tr> <td>Aesthetic Effect</td><td>1</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>0</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classification: Not listed.	Category	Rating	Fire	3	Health		Vapor Irritant	0	Liquid or Solid Irritant	0	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 86.15 13.3 Boiling Point at 1 atm: $140.5^\circ\text{F} = 60.3^\circ\text{C} = 333.5^\circ\text{K}$. 13.4 Freezing Point: $-244.6^\circ\text{F} = -153.7^\circ\text{C} = 119.5^\circ\text{K}$. 13.5 Critical Temperature: $435.7^\circ\text{F} = 224.3^\circ\text{C} = 497.5^\circ\text{K}$. 13.6 Critical Pressure: 437 psia = 29.7 atm = 3.01 MN/m ² . 13.7 Specific Gravity: 0.653 at 20°C (liquid). 13.8 Liquid Surface Tension: 17.38 dynes/cm = 0.01738 N/m at 20°C . 13.9 Liquid-Water Interfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20°C . 13.10 Vapor (Gas) Specific Gravity: 2.9. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.062. 13.12 Latent Heat of Vaporization: 139 Btu/lb = 77.1 cal/g = $2.23 \times 10^3 \text{ J/kg}$. 13.13 Heat of Combustion: -19,147 Btu/lb = -10,637 cal/g = $-445.35 \times 10^3 \text{ J/kg}$. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	3																												
Health																													
Vapor Irritant	0																												
Liquid or Solid Irritant	0																												
Poisons	1																												
Water Pollution																													
Human Toxicity	1																												
Aquatic Toxicity	1																												
Aesthetic Effect	1																												
Reactivity																													
Other Chemicals	0																												
Water	0																												
Self Reaction	0																												
NOTES																													

REVISED 1978

ISOOCTYL ALCOHOL

Common Synonyms 6-Methyl heptanol Octylalcohol		Liquid	Colorless	Mild odor
		Floats on water		
Spills or leakage if possible call fire department Avoid contact with eyes Flush and remove before and after use of emergency eye wash or irrigation				
Fire	Combustible Extends with flame, chemical, and water Extinguish with water			
Exposure	CALL FORMER MEDICAL ID LIQUID Irritating to skin and eyes Harmful if swallowed Remove from contact Wash affected area with water IF IN EYES: Flush with water for 15 min IF SWALLOWED: Do not induce vomiting. Seek medical attention			
Water Pollution	Effect of low concentration on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes Not a health and safety hazard Not a pollution hazard			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Mechanical containment Should be recovered Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dimethyl heptanols 6-Methyl heptanol 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: (C ₈ H ₁₈ O) 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild, characteristic		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supplied mask in confined areas; plastic gloves, goggles, eye bath and safety shower 5.2 Symptoms Following Exposure: Inhalation hazard slight. Skin contact results in moderate irritation. Liquid contact with eyes causes severe irritation and possible eye damage 5.3 Treatment for Exposure: Remove to fresh air. Flush skin and eye contact area at once for at least 15 min. Get medical care for eyes 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 to 5 g/kg (lab animals) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS

6.1 Flash Point: 130°F (4°C)
6.2 Flammable Limits in Air:
0.9% (calc.) - 5.7% (test)
6.3 Fire Extinguishing Agents: Water,
foam, dry chemical, or carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used:
Not pertinent
6.5 Special Hazards of Combustion Products:
Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: 510°F (test)
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Data not available

7. CHEMICAL REACTIVITY

7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials:
No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and
Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization:
Not pertinent

8. WATER POLLUTION

8.1 Aquatic Toxicity:
Data not available
8.2 Waterland Toxicity:
Data not available
8.3 Biological Oxygen Demand (BOD):
Data not available
8.4 Food Chain Concentration Potential:
None

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co.
Houston, Texas 77001
2. Getty Oil Co.
Los Angeles, Calif. 90054
3. Union Carbide Corp.
Chemicals and Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 Grades or Purity:
99+ % (mixed isomers)
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)

A 1-11

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations:
Combustible Liquid
12.2 NAS Hazard Rating for Bulk Water
Transportation:

Category	Rating
Toxic	1
Health	
Vapor Irritant	0
Liquid for Solid Irritant	0
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Anesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 NFPA Hazard Classification: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: 130.22
13.3 Boiling Point at 1 atm:
167°F = 186°C = 459°K
13.4 Freezing Point:
<21°F = <10°C = <12°K
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 0.812 at 20°C (liquid)
13.8 Liquid Surface Tension:
29.5 dynes/cm = 0.0295 N/m at 20°C
13.9 Liquid-Water Interfacial Tension:
(est.) 40 dynes/cm = 0.04 N/m at 20°C
13.10 Vapor (Gas) Specific Gravity:
Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas):
(est.) 1.040
13.12 Latent Heat of Vaporization:
(est.) 180 Btu/lb = 77 cal/g = 3.2×10^3 J/kg
13.13 Heat of Combustion: (est.) $-17,870$ Btu/lb
= -9640 cal/g = -404×10^3 J/kg
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

NOTES

IPH

ISOPHORONE

Common Synonyms 1,3,5-Trimethyl-2-cyclohexene Isomer	Liquid Colorless Camphor like odor Floats and moves slowly with water
Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Toxic: Irritating to water, mild irritant Persistent: None Mechanism: Irritant Should be removed: Chemically and physically	2. LABELS No other requirements Code = Toxic: Irritant
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,3,5-Trimethyl-2-cyclohexene Isomer 3.2 Coast Guard Compatibility Classification: None 3.3 Chemical Formula: C ₉ H ₁₆ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Camphor-like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Not listed 5.2 Symptoms Following Exposure: Inhalation irritates eye, nose and throat, causes central depression and has some anesthetic effect. Contact: Liquid with eyes causes severe irritation and possible blindness. No irritation by liquid and may cause prolonged contact. Ingestion: Irritation of mouth and stomach. Treatment for Exposure: INHALATION: Remove from exposure, move to fresh air, give artificial respiration if breathing has stopped. Give artificial respiration and oxygen. EYES: Flush with water. Contact: Flush with water. Ingestion: Give milk or water. Do NOT induce vomiting unless directed. 5.3 Toxicity by Inhalation (Threshold Limit Value): Not listed 5.4 Short-Term Inhalation Limits: Data not available 5.5 Toxicity by Ingestion: Grade 3, oral LD ₅₀ = 4.0 g/kg rat 5.6 Late Toxicity: Data not available 5.7 Vapor (Gas) Irritant Characteristics: Vapor causes moderate irritation with high but no permanent irritation at concentrations above 100 ppm 5.8 Liquid or Solid Irritant Characteristics: Causes irritation of the skin and may cause severe burns on short exposure. May cause second degree burns on long exposure. 5.9 Odor Threshold: Data not available	

6 FIRE HAZARDS

- 6.1 Flash Point: 204°F (96°C) (ASTM D 56)
- 6.2 Flammable Limits in Air: 1.5% - 10.5%
- 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide
- 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
- 6.5 Special Hazards of Combustion Products: Not pertinent
- 6.6 Behavior in Fire: Not pertinent
- 6.7 Ignition Temperature: Not listed
- 6.8 Electrical Hazard: Data not available
- 6.9 Burning Rate: 4.0 mm/min

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials: No reaction
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: 440 ppm, 48 hr, rainbow trout, LC₅₀
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Feed Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1. Union Carbide Corporation
 Chemicals and Plastics Division
 270 Park Avenue
 New York, N.Y. 10017
2. Eastman Chemicals
 P.O. Box 1272
 Houston, Texas 77001

10. SHIPPING INFORMATION

- 10.1 Grades or Purities: 99+%
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirements
- 10.4 Venting: Open flame arresters

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446.3)
 A P Q T 1

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
- 12.2 NAC Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|----------------------------|--------|
| Fire | 1 |
| Health | 1 |
| Vapor Irritant | 1 |
| Exposure to Solid Irritant | 2 |
| Poison | 1 |
| Water Pollution | 1 |
| Human Toxicity | 1 |
| Aquatic Toxicity | 1 |
| Corrosive Effect | 1 |
| Reactivity | 1 |
| Other Chemical | 1 |
| Water | 1 |
| Self Reaction | 1 |

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	1

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
- 13.2 Molecular Weight: 126
- 13.3 Boiling Point at 1 atm: 147.5°C (307.5°F)
- 13.4 Freezing Point: -141.5°C (-202.7°F)
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 0.834 at 20°C liquid
- 13.8 Liquid Surface Tension: 22.1 dynes/cm at 20°C, 29.4 at 25°C
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: 4.75
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: 41.5 Btu/lb = 12.1 cal/g = 124.4 J/g
- 13.13 Heat of Combustion: 14,171 Btu/lb = 4,046 cal/g = 16,928 J/g
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

(continued on pages 1 and 2)

NOTES

IPL

ISOPHTHALIC ACID

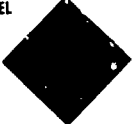
Common Synonyms benzene 1,3-dicarboxylic acid m-Phthalic acid		Solid	White	Slight unpleasant odor
		Sinks in water		
Avoid contact with solid and dust. Keep people away. Stop discharge if possible. Shut off ignition sources. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		Combustible Dust cloud may explode if ignited in an enclosed area. Extinguish with water, dry chemicals, foam, or carbon dioxide.		
Exposure		CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID Irritating to skin. Deives. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. If SWALLOWED and victim is UNCONSCIOUS OR HAS LOST CONSCIOUSNESS, do nothing, except keep victim warm.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and water officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Method, Handbook, CG 446-4) Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Benzene 1,3-dicarboxylic acid m-Phthalic acid. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: $C_8H_6O_4$ (COOH). 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: White. 4.3 Odor: Slightly acid.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: If without adequate ventilation, use respirator with dust filter, goggles, and gloves. 5.2 Symptoms Following Exposure: May cause slight to moderate irritation of eyes, skin, and mucous membranes on prolonged contact. Ingestion may cause gastrointestinal irritation. 5.3 Treatment for Exposure: INHALATION: remove victim to uncontaminated area; get medical attention if complications arise. INGESTION: get medical attention if complications arise. EYES: flush with large amounts of water for 15 min; get prompt medical attention. SKIN: wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade I LD ₅₀ 12.2 g/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, dry powder, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used. 6.5 Special Hazards of Combustion Products 6.6 Behavior in Fire: Dust forms explosive mixture in air 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Amoco Chemicals Corp. 130 East Randolph Drive Chicago, Ill. 60601 2 Arco Chemical Co. 260 South Broad St. Philadelphia, Pa. 19101 3 Eastman Organic Chemicals Rochester, N. Y. 14650
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 82-94% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Inerted 10.4 Venting: Safety relief
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 166 13.3 Boiling Point at 1 atm: Not pertinent (sublimes) 13.4 Freezing Point: 63.2°F = 14.5°C = 618°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.54 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -8,340 Btu/lb = -4,620 cal/g = -194 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
Continued on pages 5 and 6	
NOTES	

(Continued on pages 5 and 6)

IPR

ISOPRENE

Common Synonyms 2-Methyl-1,3-butadiene isoprenyl isoprenyl isoprenyl	Physical State Watery liquid Color Colorless Odor Mild odor Flammability Flammable Boiling Point 93.5°F
Fire	Flammable Flashback along vapor trail may occur Containers may explode in fire Vapor may explode if ignited in an enclosed area Wear self-contained breathing apparatus Combustion from behind barrier is possible Extinguish with chemical dry powder or foam Water may be ineffective in fire Use exposed containers with water
Exposure	Call for Medical Aid Vapor Irritating to eyes, nose and throat May be irritating Physically exhausted person may have difficulty breathing If breathing is difficult, give oxygen Liquid Irritating to skin and eyes Remove clothing and flush with water Push affected area with water If in eyes, flush with water and flush with water
Water Pollution	Harmful to Aquatic Life in Very Low Concentrations May be dangerous if it enters water intakes Severe local health and wildlife effects Notify police and fire water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning - high flammability Restrict access Evacuate area	2 LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: beta-Methylvinyl 2 Methyl-1,3-butadiene 32 Coast Guard Compatibility Classification Olefin 33 Chemical Formula: $CH_2=C(CH_3)CH=CH_2$ 34 IMCO/United Nations Numerical Designation 3.1/1218	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Mild aromatic
5. HEALTH HAZARDS 51 Personal Protective Equipment: Vapor proof goggles, self-contained breathing apparatus, leather or rubber safety shoes, rubber gloves 52 Symptoms Following Exposure: Vapor produces no effects other than slight irritation of the eyes and upper respiratory tract. Liquid may irritate eyes, like gasoline 53 Treatment for Exposure: INHALE: Remove victim promptly from irritating or asphyxiating atmosphere. If symptoms of asphyxiation persist, administer artificial respiration and oxygen. Treat symptomatically thereafter. CALL PHYSICIAN. EYES: Flush with water for at least 15 min. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Data not available 57 Late Toxicity: None 58 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 59 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin. 510 Odor Threshold: 0.005 ppm	

6 FIRE HAZARDS 61 Flash Point -65°F C.C. 62 Flammable Limits in Air: 2% - 9% 63 Fire Extinguishing Agents: Dry chemical foam or carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective 65 Special Hazards of Combustion Products: Toxic vapors are generated when heated 66 Behavior in Fire: May polymerize in containers and explode 67 Ignition Temperature: 428°F 68 Electrical Hazard: Class I, Group C 69 Burning Rate: 8.6 mm/min	8 WATER POLLUTION 81 Aquatic Toxicity: 75 ppm/96 hr/100% mortality/fresh water 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Polymerization is accelerated by heat and by oxygen, even by the presence of rusty iron. Iron surfaces should be treated with a suitable reducing agent, such as sodium nitrite, before they are placed into isoprene service. 76 Inhibitor of Polymerization: Tertiary butyl catechol (0.06%) Di- <i>n</i> -butylamine, phenyl beta-naphthylamine and phenyl alpha-naphthylamine are also used. IPR must be inhibited when transported interstate.	9 SELECTED MANUFACTURERS 1 B. I. Goodrich Co. B. I. Goodrich Chemical Co. Division 6100 Oak Tree Blvd. Cleveland, Ohio 44131 2 Goodyear Tire & Rubber Co. Chemical Division Beaumont, Texas 77704 3 Shell Chemical Co. Petrochemical Division Houston, Texas 77001																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A T U A W-2	10. SHIPPING INFORMATION 101 Grades or Purity: Research grade 99.99% polymerization grade 99.8% 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Pressure vacuum																																				
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable liquid 122 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>4</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>0</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect</td> <td>1</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>2</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>1</td> </tr> </tbody> </table> 123 NFPA Hazard Classifications <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	0	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	4	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: 68.12 133 Boiling Point at 1 atm: 93.5°F = 34.2°C = 307.2°K 134 Freezing Point: -230.2°F = -14.0°C = 127.3°K 135 Critical Temperature: 412°F = 211.1°C = 484.3°K 136 Critical Pressure: 540 psia = 37.4 atm = 3.75 MN/m ² 137 Specific Gravity: 0.681 at 20°C (liquid) 138 Liquid Surface Tension: 1.9 dynes/cm = 0.0189 N/m at 20°C 139 Liquid-Water Interfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20°C 1310 Vapor (Gas) Specific Gravity: 2.3 1311 Ratio of Specific Heats of Vapor (Gas): 1.091 1312 Latent Heat of Vaporization: 150 Btu/lb = 85 cal/g = 3.6 x 10 ⁴ J/kg 1313 Heat of Combustion: -1,848 Btu/lb = -10,471 cal/g = -438.40 x 10 ³ J/kg 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: -499 Btu/lb = -277 cal/g = -11.6 x 10 ⁴ J/kg
Category	Rating																																				
Fire	4																																				
Health																																					
Vapor Irritant	1																																				
Liquid or Solid Irritant	1																																				
Poisons	1																																				
Water Pollution																																					
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Aquatic Toxicity	1																																				
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Health Hazard (Blue)	2																																				
Flammability (Red)	4																																				
Reactivity (Yellow)	2																																				
NOTES (Continued on pages 5 and 6)																																					

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IAC

ISOPROPYL ACETATE

Common Synonyms Acetic acid isopropyl ester Isopropyl acetate		Waters liquid	Colorless	Pleasant fruity odor
		Floats and mixes slowly with water. Flammable. Irritating vapor is produced.		
Stop discharge if possible. Keep people away. Shut off ignitions sources and call fire department. Spray upward and use water spray to knock down vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, foam or alcohol. Water may be ineffective on fire. Cool exposed containers with water.			
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped give artificial respiration. If breathing is difficult give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing. Flush affected area with plenty of water. IF IN EYES hold eyelids open and flush with plenty of water. IF SWALLOWED do not induce vomiting. If conscious, flush with water or milk.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify local water treatment plant.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning - high flammability. Evacuate area. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetic acid isopropyl ester Isopropyl acetate 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: CH ₃ COOCH(CH ₃) ₂ 3.4 IMCO United Nations Numerical Designation: 32, 220		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pleasant, fruity, nonresidual		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor respirator or supplied mask, chemical splash goggles or face splash shield. 5.2 Symptoms Following Exposure: Vapors cause eye and respiratory irritation. High concentrations can be asphyxiating. Liquid irritates eyes but causes no serious injury. May cause dermatitis in some cases. 5.3 Treatment for Exposure: INHALATION: If victim is overexposed to vapors, remove from exposure immediately, call a physician for breathing treatment or stopped, start resuscitation and administer oxygen. EYES: Flush with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 250 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 (Dangerous to life) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight irritation of the eye, respiratory system at present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause smothering and reddening of the skin. 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: 37°F (3°C) (60°F (15°C)) 6.2 Flammable Limits in Air: 3.5% - 8.0% 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 840°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 265.5 days (theoretical) 8.4 Food Chain Concentration Potential: None.																													
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Eastman Kodak Co. Tennessee Eastman Co. Division Kingsport, Tenn. 37662 2. Exxon Chemical Co. Houston, Texas 77001 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017.																													
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A-P-Q-T-U-V-W		10. SHIPPING INFORMATION 10.1 Grades or Purity: 95.99+% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arrester) or pressure vacuum.																													
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>3</td></tr><tr><td>Health</td><td></td></tr><tr><td> Vapor Irritant</td><td>1</td></tr><tr><td> Liquid or Solid Irritant</td><td>1</td></tr><tr><td> Poisons</td><td>2</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td> Human Toxicity</td><td>1</td></tr><tr><td> Aquatic Toxicity</td><td></td></tr><tr><td> Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td> Other chemicals</td><td>1</td></tr><tr><td> Water</td><td>0</td></tr><tr><td> Self Reaction</td><td>0</td></tr></table>		Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity		Aesthetic Effect	2	Reactivity		Other chemicals	1	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 102.13 13.3 Boiling Point at 1 atm: 191.3°F = 88.5°C = 361°K 13.4 Freezing Point: -92.7°F = -69.3°C = 203.9°K 13.5 Critical Temperature: 409.1°F = 265°C = 538°K 13.6 Critical Pressure: 529 psia = 36 atm = 3.65 MN/m ² 13.7 Specific Gravity: 0.874 at 20°C (liquid) 13.8 Liquid Surface Tension: 26 dynes/cm = 0.026 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: 3.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.074 13.12 Latent Heat of Vaporization: 150 Btu/lb = 34 cal/g = 3.4 × 10 ³ J/kg 13.13 Heat of Combustion: 9420 Btu/lb = 5230 cal/g = 219 × 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.	
Category	Rating																														
Fire	3																														
Health																															
Vapor Irritant	1																														
Liquid or Solid Irritant	1																														
Poisons	2																														
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Aesthetic Effect	2																														
Reactivity																															
Other chemicals	1																														
Water	0																														
Self Reaction	0																														
12.3 NFPA Hazard Classifications. <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>3</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0	<i>C. continued on pages 1 and 2</i>																					
Category	Classification																														
Health Hazard (Blue)	1																														
Flammability (Red)	3																														
Reactivity (Yellow)	0																														

NOTES

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IPA

ISOPROPYL ALCOHOL

Common Synonyms Isopropanol 2-Propanol Dimethylcarbinol sec-Propyl alcohol Rubbing alcohol		Waters liquid Colorless Unpleasant alcohol odor like rubbing alcohol
Fire		Flammable Flammable-irritating vapor is produced
Exposure		FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. CAUTION: With dry chemical, alcohol, and carbon dioxide. Water may be ineffective. Do not expose containers with water.
Water Pollution		CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to eyes. Harmful if swallowed. IF SWALLOWED, DO NOT induce vomiting. Flush with plenty of water. IF SWALLOWED and victim is UNCONSCIOUS, have victim drink water or milk.
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-6. Issue warning: High Flammability. Disperse and flush.		2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Dimethylcarbinol, 2-Propanol Isopropanol, sec-Propyl alcohol Petrolol, Rubbing alcohol 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: CH ₃ CHOHCH ₃ 3.4 IMCO United Nations Numerical Designation: 3.2, 1219		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like ethyl alcohol, but a somewhat unpleasant character in a mild alcoholic odor.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor respirator (dependent on chemical), goggles, face splash shield. 5.2 Symptoms Following Exposure: Vapor causes mild irritation of eyes and upper respiratory tract. High concentrations may be irritating. Liquid irritates eyes and may cause temporary harmless to skin. Ingested causes drunkenness and vomiting. 5.3 Treatment for Exposure: INHALATION: If victim is overcome by vapors, remove from exposure immediately with a physician if breathing irregular or has stopped. Start respiration and administer oxygen. EYES: Flush with water for at least 15-30 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 400 ppm 5.5 Short-Term Inhalation Limits: 400 ppm for 10 min. 5.6 Toxicity by Ingestion: Grade I LD ₅₀ 5.0 g/kg (approx. 1.0 g/kg) 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes slight irritating character to respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically non-toxic to the skin. 5.10 Odor Threshold: 90 mg/m ³		

6 FIRE HAZARDS 6.1 Flash Point: 60-100 °C (140-212 °F) 6.2 Flammable Limits in Air: 2.3-12% 6.3 Fire Extinguishing Agents: Alcohol, foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 290 °C 6.8 Electrical Hazard: Class I Group D. 6.9 Burning Rate: 2.4 mm/min.		8 WATER POLLUTION 8.1 Aquatic Toxicity: 960-1,000 ppm 24 hr. death to fish in fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 133-150 days. 8.4 Food Chain Concentration Potential: None.																												
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9 SELECTED MANUFACTURERS 1. ARCO Chemical Co. 260 South Broad St. Philadelphia, Pa. 19101 2. Shell Chemical Co. Industrial Chemical Division Houston, Tex. 77001 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																												
10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.95% Anhydrous 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame catches and pressure vacuum).																														
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3. APQRN		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 60.10 13.3 Boiling Point at 1 atm: 82.5 °C (180.5 °F) $180.5 \text{ °F} = 82.5 \text{ °C} = 355.5 \text{ K}$ 13.4 Freezing Point: -89.5 °C (-129.1 °F) $-129.1 \text{ °F} = -89.5 \text{ °C} = 183.7 \text{ K}$ 13.5 Critical Temperature: 455.4 °C (845.7 °F) $845.7 \text{ °F} = 455.4 \text{ °C} = 808 \text{ K}$ 13.6 Critical Pressure: 49.0 atm (70.8 atm) $70.8 \text{ atm} = 49.0 \text{ atm} = 4.9 \text{ MN/m}^2$ 13.7 Specific Gravity: 0.785 at 20 °C (liquid) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 3.4 13.11 Ratio of Specific Heats of Vapor (Gas): 1.05 13.12 Latent Heat of Vaporization: 28.0 Btu/lb (65.4 kJ/kg) $65.4 \text{ kJ/kg} = 28.0 \text{ Btu/lb} = 0.1 \text{ kJ/g}$ 13.13 Heat of Combustion: 12.7 Btu/lb (29.8 kJ/kg) $29.8 \text{ kJ/kg} = 12.7 \text{ Btu/lb} = 0.1 \text{ kJ/g}$ 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 1.0 Btu/lb (2.3 kJ/kg) $2.3 \text{ kJ/kg} = 1.0 \text{ Btu/lb} = 0.001 \text{ kJ/g}$ 13.16 Heat of Polymerization: Not pertinent.																												
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>3</td></tr><tr><td>Health</td><td>1</td></tr><tr><td>Vapor Poison</td><td>1</td></tr><tr><td>Liquid/Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>2</td></tr><tr><td>Water Pollution</td><td>2</td></tr><tr><td>Human Toxicity</td><td>2</td></tr><tr><td>Aquatic Toxicity</td><td>2</td></tr><tr><td>Acute Effect</td><td>2</td></tr><tr><td>Reactivity</td><td>3</td></tr><tr><td>Other Chemicals</td><td>3</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table>		Category	Rating	Fire	3	Health	1	Vapor Poison	1	Liquid/Solid Irritant	1	Poisons	2	Water Pollution	2	Human Toxicity	2	Aquatic Toxicity	2	Acute Effect	2	Reactivity	3	Other Chemicals	3	Water	0	Self Reaction	0	
Category	Rating																													
Fire	3																													
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Water	0																													
Self Reaction	0																													
12.3 NFPA Hazard Classifications <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>3</td></tr><tr><td>Flammability (Red)</td><td>3</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	3	Reactivity (Yellow)	0																					
Category	Classification																													
Health Hazard (Blue)	3																													
Flammability (Red)	3																													
Reactivity (Yellow)	0																													
NOTES																														

REVISED 1978

IPP

ISOPROPYLAMINE

Common Synonyms 2-Aminopropane Monoisopropylamine	Liquid Colorless Strong ammonia odor Floats and mixes with water Flammable; irritating vapor is produced Boiling point is 91°F
Stop discharge if possible. Keep people away. Notify fire department. Notify police. Use water spray to knock down vapor. Avoid contact with liquid and vapor. Isolate and remove contaminated material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Wear goggles and self-protective breathing apparatus Extinguish with dry chemical, CO ₂ , or water spray Water may be ineffective in fire Do not expose to high temperatures with water
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing, difficult breathing or loss of consciousness If eyes are affected, flush with plenty of water If breathing has stopped, remove and start artificial respiration If breathing is difficult, give oxygen LIQUID Will burn skin and eyes If swallowed will cause nausea Remove contaminated clothing Flush affected areas with plenty of water IF SWALLOWED: Do not induce vomiting. Drink plenty of water IF SWALLOWED: Do not induce vomiting. Drink plenty of water IF SWALLOWED: Do not induce vomiting. Drink plenty of water
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Notify local health and pollution control agencies Notify police and fire department
1 RESPONSE TO DISCHARGE See Response Manual Handbook, CG 446-4 Issue warning of high flammability Notify fire department Notify police Evacuate area Dispose and flush	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Aminopropane Monoisopropylamine, Iso-Propylamine 3.2 Coast Guard Compatibility Classification: Data not available 3.3 Chemical Formula: (CH ₃) ₂ CHNH ₂ 3.4 IMCO/United Nations Numerical Designation: 1.1, 1.2	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Strong ammonia-like pungent Irritating, typical amine
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, eye shield, rubber gloves and apron, chemical face shield or safety goggles 5.2 Symptoms Following Exposure: Inhalation causes nose and throat irritation, severe coughing and chest pain. Irritation of air passages can cause laryngeal edema and loss of consciousness. Ingestion causes nausea, vomiting and severe irritation of mouth and stomach. Contact with eyes causes severe irritation and possible edema of the cornea. Contact with skin causes severe irritation. 5.3 Treatment for Exposure: INHALATION: removes victim to fresh air if he is not breathing, give artificial respiration if breathing is difficult, give oxygen, call a physician. INGESTION: call a physician immediately, encourage the drinking of large quantities of water, followed by dilute vinegar, lemon juice, or other weak acids. Keep patient warm. EYES: flush with water for 15 min. Holding eyelids apart and physical aid as soon as possible, preferably an eye specialist. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating, such that personnel will not usually tolerate moderate or high concentrations. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns. In short exposure may cause second degree burns on long exposure. 5.10 Odor Threshold: 5 ppm	

6 FIRE HAZARDS

- 6.1 Flash Point: -18°F (0°C)
 6.2 Flammable Limits in Air: 2.3% - 12%
 6.3 Fire Extinguishing Agents: Dry chemical, alcohol, foam, carbon dioxide
 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire
 6.6 Behavior in Fire: Burning isopropylamine is difficult to control because of the ease of reignition of the vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Containers may explode.
 6.7 Ignition Temperature: 756°F
 6.8 Electrical Hazard: Data not available
 6.9 Burning Rate: 63 mm/min

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
 7.2 Reactivity with Common Materials
 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
 7.5 Polymerization: Not pertinent
 7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: 40 - 80 ppm, 24 hr. creek chub, fathead minnow, bluegill, rainbow trout
 8.2 Waterfowl Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD): Data not available
 8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

1. Air Products and Chemicals, Inc.
 U.S. Highway 90
 P.O. Box 1140
 Philadelphia, Pa. 19102
 2. Penwalt Corporation
 Three Parkway
 Philadelphia, Pa. 19102
 3. Virginia Chemicals, Inc.
 3340 W. Norfolk Rd.
 Portsmouth, Va. 23704

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Technical 99.0%
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Open (flame arrester)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3
 V P Q R S

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable liquid
 12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|-------------------------|--------|
| Fire | 4 |
| Health | |
| Vapor Irritant | 4 |
| Liquid - Solid Irritant | 4 |
| Poisons | 4 |
| W - Pollution | |
| Human Toxicity | 2 |
| Aquatic Toxicity | 4 |
| Aesthetic Effect | 2 |
| Reactivity | |
| Other Chemicals | 4 |
| Water | 4 |
| Self Reaction | 0 |
- 12.3 NFPA Hazard Classifications
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 4 |
| Flammability (Red) | 4 |
| Reactivity (Yellow) | 0 |

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 59.1
 13.3 Boiling Point at 1 atm: 91.3°F = 32.4°C = 305.6°K
 13.4 Freezing Point: -130°F = -95°C = 178°K
 13.5 Critical Temperature: 396°F = 202°C = 475°K
 13.6 Critical Pressure: 740 psia = 50 atm = 5.1 MN/m²
 13.7 Specific Gravity (relative to water at 20°C): 0.68
 13.8 Liquid Surface Tension: 16.5 dynes/cm = 0.0165 N/m at 20°C
 13.9 Liquid-Water Interfacial Tension: Not pertinent
 13.10 Vapor (Gas) Specific Gravity: 2.04
 13.11 Ratio of Specific Heats of Vapor (Gas):
 13.12 Latent Heat of Vaporization: 193 Btu/lb = 10³ cal/g = 4.4 x 10³ J/kg
 13.13 Heat of Combustion: -16,940 Btu/lb = -9,420 cal/g = -394 x 10³ J/kg
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

(continued on page 104)

NOTES

IPE

ISOPROPYL ETHER

Common Synonyms		Liquid	Colorless	Sweet odor
Diisopropyl ether Diisopropyl oxide 2 Isopropoxypropane		Floats and mixes slowly with water. Flammable, irritating vapor is produced.		
Shut off ignition sources. Call fire department. Stop discharge if possible. Keep people away. Stay upwind. Use water spray to "knock down" vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.			
Exposure	Call for medical aid. VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, or nausea. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, flush eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Issue warning: high flammability. Restrict access. Evacuate area. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Diisopropyl ether Diisopropyl oxide 2 Isopropoxypropane 3.2 Coast Guard Compatibility Classification: Ethers (21) 3.3 Chemical Formula: (CH ₃) ₂ CHOCH(CH ₃) ₂ 3.4 IMCO/United Nations Numerical Designation: 311159		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sweet, slightly sharp character with pungent, ethereal, like camphor and ethyl ether.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air pack or organic canister mask, rubber gloves, goggles. 5.2 Symptoms Following Exposure: Inhalation causes anesthesia, nausea, headache, dizziness, and irritation of the eyes and nose. Contact of liquid with eyes causes only minor injury. Repeated contact with skin will remove natural oils and may cause dermatitis. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air and obtain medical attention immediately. Keep him warm and at rest and give artificial respiration if breathing stops; maintain an open airway. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting; seek medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 250 ppm (tentative). 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade I oral LD ₅₀ = 5.470 mg/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS

6.1 **Flash Point:** -18°F (0°C) -18°F (0°C)
 6.2 **Flammable Limits in Air:** 1.4% - 9%
 6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
 6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
 6.5 **Special Hazards of Combustion Products:** Not pertinent
 6.6 **Behavior in Fire:** Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Containers may explode when heated
 6.7 **Ignition Temperature:** 830°F
 6.8 **Electrical Hazard:** Data not available
 6.9 **Burning Rate:** 5.0 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:** No reaction
 7.3 **Stability During Transport:** Unstable peroxides may form on long standing in contact with air; these may explode spontaneously or when heated
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterflow Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Shell Chemical Company
 Industrial Chemicals Division
 P. O. Box 2461
 Houston, Texas 77001
 2. Exxon Chemical Company
 P. O. Box 2150
 Houston, Texas 77001
 3. Union Carbide Corporation
 Chemicals and Plastics Division
 270 Park Avenue
 New York, N. Y. 10017

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 94+%. May contain 0.01% hydroquinone or other inhibitor to prevent peroxide formation
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Pressure/vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3.)

A P Q T L V W

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
 12.2 **NAS Hazard Rating for Bulk Water Transportation**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetics Effect	2
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	1

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
 13.2 **Molecular Weight:** 102.2
 13.3 **Boiling Point at 1 atm:** 56°F = 62°C = 342°K.
 13.4 **Freezing Point:** -123°F = -86°C = 187°K.
 13.5 **Critical Temperature:** 440.4°F = 226.9°C = 500.1°K.
 13.6 **Critical Pressure:** 418 psia = 28.4 atm = 2.88 MN/m²
 13.7 **Specific Gravity:** 0.724 at 20°C (liquid)
 13.8 **Liquid Surface Tension:** 17.1 dynes/cm = 0.0171 N/m at 25°C
 13.9 **Liquid-Water Interfacial Tension:** 17.1 dynes/cm = 0.0171 N/m at 25°C
 13.10 **Vapor (Gas) Specific Gravity:** 3.5
 13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0590
 13.12 **Latent Heat of Vaporization:** 131 Btu/lb = 73.4 cal/g = 3.1×10^3 J/kg
 13.13 **Heat of Combustion:** 12,680 Btu/lb = 9,300 cal/g = 393×10^3 J/kg
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** Not pertinent
 13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 3 and 4.)

NOTES

IPM

ISOPROPYL MERCAPTAN

Common Synonyms 2 Propanethiol Propane-2 thiol	Liquid White Strong Skunk Odor Floats and mixes with water. Flammable, irritating vapor is produced.
Shut off ignition sources until fire department. Stop discharge if possible. Keep people away. Avoid contact with liquid and vapor. Stay upwind. Use water spray or knock down vapor. Do not eat, drink, or use tobacco. Notify local health and fire departments.	
Fire	FLAMMABLE: Irritating gases may be produced when heated. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinct with water. Do not use carbon dioxide or foam. Water may be ineffective. Do not apply water directly to water.
Exposure	ALF TER MEDICAL AID: VAPOR: Irritating to eyes, nose and throat. If inhaled will cause difficult breathing or loss of consciousness. If inhaled, get person to fresh air. If not breathing, give artificial respiration. If swallowed, give plenty of water. LIQUID: Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush eyes with water for 15 minutes. If SWALLOWED, give plenty of water. Do not induce vomiting. If SWALLOWED, give plenty of water. Do not induce vomiting. If SWALLOWED, give plenty of water. Do not induce vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and fire departments. Notify local health and fire departments.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability air contaminant: water contaminant Restrict access Evacuate area Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2 Propanethiol Propane-2 thiol 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: (C ₃ H ₇ CHSH) 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Powerful skunk
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes loss of sense of smell, muscular weakness, convulsions, respiratory paralysis. Ingestion causes nausea and vomiting. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, start artificial respiration and give oxygen if required; observe for signs of pulmonary edema; get medical attention. INGESTION: give large amount of water and induce vomiting. EYES or SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 1.7 g/kg (approx). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: 0.25 ppm.	

6. FIRE HAZARDS 6.1 Flash Point: -10°F (-11°C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Irritating sulfur dioxide gas is formed in fire. 6.6 Behavior in Fire: Vapor is heavier than air and may travel to a source of ignition and flashback. Containers may explode. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Pennwalt Corporation Three Parkway Philadelphia, Pa. 19102 2. Phillips Petroleum Co. Special Products Div. Chemical Dept. Bartlesville, Okla. 74004 3. Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 98.0+%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not requirement. 10.4 Venting: Pressure vacuum.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P O R S	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 76.2 13.3 Boiling Point at 1 atm: 126.6°F = 52.5°C = 125.8°K 13.4 Freezing Point: -102.8°F = -130.5°C = 142.7°K 13.5 Critical Temperature: Data not available. 13.6 Critical Pressure: Data not available. 13.7 Specific Gravity: 0.814 at 20°C (liquid) 13.8 Liquid Surface Tension: 22.0 dynes/cm = 0.022 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 2.6 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0964 at 15.6°C 13.12 Latent Heat of Vaporization: 165 Btu/lb = 92.1 cal/g = 383 J/g 13.13 Heat of Combustion: 4,420 Btu/lb = 2,200 cal/g = 9,200 J/g 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

(continued on pages 5 and 6)

IPC

ISOPROPYL PERCARBONATE

Common Synonyms Peroxydicarbonate acid diisopropyl ester Diisopropyl peroxycarbonate Diisopropyl peroxydicarbonate Isopropyl peroxydicarbonate Peroxydicarbonate acid bis(1-methylethyl) ester	Solid (Packed in Dry Ice) White Sharp Unpleasant Odor Sinks in water. Freezing point is 48°F
Stop discharge if possible. Keep people away. Shut off ignition sources. Call fire department. Avoid contact with food and clothing. Do not eat from containers that have been used. Do not use water on fire. Do not use dry chemicals, carbon dioxide, or foam on fire.	
Fire	COMBUSTIBLE May cause fire on contact with combustibles. Will increase the intensity of a fire. Containers may explode in fire. DO NOT USE DRY CHEMICALS, CARBON DIOXIDE, OR FOAM ON FIRE Flood discharge area with water. Do not use water on exposed containers with water.
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If inhaled, stop breathing and move to fresh air. If inhaled, breathe fresh air. If inhaled, move to fresh air. SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing. Wash affected area with plenty of water. If in eyes, flush with plenty of water. If swallowed, do not induce vomiting. If swallowed, drink plenty of water. If swallowed, do not induce vomiting. If swallowed, drink plenty of water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-4. Is up warning light. Flammability. Strong material. Restrict access. Should be removed. Chemical and physical treatment.	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Diisopropyl peroxycarbonate, Diisopropyl peroxydicarbonate, Peroxydicarbonate acid bis(1-methylethyl) ester, Peroxydicarbonate acid diisopropyl ester. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: C ₁₂ H ₂₀ O ₆ 3.4 IMCO/United Nations Numerical Designation: Not listed.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. Containers packed in Dry Ice. 4.2 Color: White. 4.3 Odor: Discreetable to green.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves and shoe. Hard hat. Helmet. Small size. Plastic apron. Respirator depending on when used. 5.2 Symptoms Following Exposure: Irritation, severe eye irritation. Not prolonged exposure may cause eye edema. Contact with eyes may cause irritation. Skin irritation may occur on contact. 5.3 Treatment for Exposure: INHALATION: Move to fresh air. Administer first aid. If necessary, call for medical aid. EYES: Flush with plenty of water. If necessary, call for medical aid. SKIN: Wash with plenty of water. If necessary, call for medical aid. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 Poisoning agent. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS

- 6.1 Flash Point: No pertinent combustible solids.
- 6.2 Flammable Limits in Air: No pertinent.
- 6.3 Fire Extinguishing Agents: Water.
- 6.4 Fire Extinguishing Agents Not to be Used: All extinguishing agents may be ineffective.
- 6.5 Special Hazards of Combustion Products: Flammable and toxic gases formed in fires include acetone, isopropyl alcohol, acetaldehyde, and ethane.
- 6.6 Behavior in Fire: Under heat and accelerative decomposition and may self-ignite. Confined fire may lead to detonation. Fire is very difficult to extinguish cause water not needed.
- 6.7 Ignition Temperature: Data not available.
- 6.8 Electrical Hazard: No pertinent.
- 6.9 Burning Rate: No pertinent.

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
- 7.2 Reactivity with Common Materials: May decompose with formation of oxygen when in contact with metals.
- 7.3 Stability During Transport: Unstable above 101°F with formation of oxygen gas.
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
- 7.5 Polymerization: Not pertinent.
- 7.6 Inhibitor of Polymerization: Not pertinent.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
- 8.2 Waterfowl Toxicity: Data not available.
- 8.3 Biological Oxygen Demand (BOD): Data not available.
- 8.4 Food Chain Concentration Potential: None.

9 SELECTED MANUFACTURERS

- PPG Industries, Inc.
Chemical Division
One Gateway Center
Pittsburgh, Pa. 15222
- Pennwalt Corp., Toledo, Ohio
1740 Military Road
Belle, N.Y. 14010

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Technical.
- 10.2 Storage Temperature: Below 100°F.
- 10.3 Inert Atmosphere: Not required.
- 10.4 Venting: Pressure regulated.

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 444-3.
II

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Organic Peroxide.
- 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed.
- 12.3 NFPA Hazard Classifications: Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid.
- 13.2 Molecular Weight: 202.2.
- 13.3 Boiling Point at 1 atm: No pertinent decomposition.
- 13.4 Freezing Point: 48°F (9°C).
- 13.5 Critical Temperature: No pertinent.
- 13.6 Critical Pressure: No pertinent.
- 13.7 Specific Gravity: 1.05 at 15°C.
- 13.8 Liquid Surface Tension: No pertinent.
- 13.9 Liquid-Water Interfacial Tension: No pertinent.
- 13.10 Vapor (Gas) Specific Gravity: No pertinent.
- 13.11 Ratio of Specific Heats of Vapor (Gas): No pertinent.
- 13.12 Latent Heat of Vaporization: No pertinent.
- 13.13 Heat of Combustion: 18,400 Btu/lb (42,000 kJ/kg).
- 13.14 Heat of Decomposition: 1,700 Btu/lb (3,800 kJ/kg).
- 13.15 Heat of Solution: No pertinent.
- 13.16 Heat of Polymerization: No pertinent.

NOTES

IVA		ISOVALERALDEHYDE	
Common Synonyms 1 Methylbutylaldehyde Isovaleryl aldehyde Isovaleryl 3 Methylbutanal		Liquid Colorless Weak suffocating odor Floats on water. Flammable; irritating vapor is produced.	
Fire		6 FIRE HAZARDS 6.1 Flash Point: 16°C (61°F) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water (may be ineffective) 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent	
Exposure		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None 9. SELECTED MANUFACTURERS 1 Aldrich Chemical Co., Inc. 540 West N. Park Avenue Milwaukee, Wis. 53233 2 Eastern Chemical Division 240 Marcus Boulevard Hauppauge, L.I., N.Y. 11787 3 Pfaff and Bauer, Inc. 2604 Northern Boulevard Flushing, N.Y. 11354	
Water Pollution		7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	
RESPONSE TO DISCHARGE See Material Safety Data Sheet, CG 444.4 1. Evaporates rapidly to air 2. May be absorbed by water 3. May be absorbed by soil 4. May be absorbed by vegetation 5. May be absorbed by aquatic life 6. May be absorbed by animals		10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame containers	
3 CHEMICAL DESIGNATIONS Synonyms: Isovaleryl aldehyde, isovalerylaldehyde, 3-methylbutanal, 3-methylbutyraldehyde Coast Guard Compatibility Classification: Aldehyde Chemical Formula: C ₅ H ₁₀ O IMCO/United Nations Numerical Designation: 3014		11 HAZARD ASSESSMENT CODE See Material Safety Data Sheet, CG 444.4 A1111111	
5 HEALTH HAZARDS Personal Protective Equipment: Respirator, gloves, eye protection, protective clothing Symptoms Following Exposure: Irritation of eyes, nose and throat. Vapor may cause headache, nausea, vomiting or difficult breathing. May cause drowsiness and dizziness. May cause irritation of skin and eyes. Treatment for Exposure: INHALATION: Remove from exposure area. If breathing is difficult, administer oxygen. If unconscious, administer artificial respiration. EYES: Flush with water. If irritation persists, consult a physician. SKIN: Wash with soap and water. If irritation persists, consult a physician. INGESTION: Induce vomiting. If unconscious, administer artificial respiration.		12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not rated 12.3 NFPA Hazard Classifications: Not rated	
2 LABEL 		13 PHYSICAL AND CHEMICAL PROPERTIES 1. Physical State at 15°C and 1 atm: Liquid 2. Molecular Weight: 86 3. Boiling Point at 1 atm: 46°C (115°F) 4. Freezing Point: -105°C (-157°F) 5. Critical Temperature: Not pertinent 6. Critical Pressure: Not pertinent 7. Specific Gravity: 0.81 at 15°C 8. Liquid Surface Tension: 23.5 at 20°C 9. Liquid-Water Interfacial Tension: 15.5 at 20°C 10. Vapor (Gas) Specific Gravity: 3.5 11. Ratio of Specific Heats of Vapor (Gas): 1.1 12. Latent Heat of Vaporization: 35.5 at 20°C 13. Heat of Combustion: -2840 kcal/mole 14. Heat of Decomposition: Not pertinent 15. Heat of Solution: Not pertinent 16. Heat of Polymerization: Not pertinent	
4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weakly suffocating		14 TOXICITY 14.1 Acute Toxicity: Not rated 14.2 Chronic Toxicity: Not rated 14.3 Reproductive Toxicity: Not rated 14.4 Developmental Toxicity: Not rated 14.5 Carcinogenicity: Not rated 14.6 Mutagenicity: Not rated 14.7 Immunotoxicity: Not rated 14.8 Neurotoxicity: Not rated 14.9 Hematotoxicity: Not rated 14.10 Hepatotoxicity: Not rated 14.11 Nephrotoxicity: Not rated 14.12 Cardiac Toxicity: Not rated 14.13 Respiratory Toxicity: Not rated 14.14 Gastrointestinal Toxicity: Not rated 14.15 Dermatological Toxicity: Not rated 14.16 Ocular Toxicity: Not rated 14.17 Systemic Toxicity: Not rated 14.18 Local Toxicity: Not rated 14.19 Irritation: Not rated 14.20 Corrosion: Not rated	

JPO

JET FUELS: JP-1

Common Synonyms Jet Fuel Fuel Oil No. 1	Waters: liquid Colorless Fuel oil odor Floats on water
See discharge if possible Call fire department Avoid breathing vapors Do not use for anything other than its intended purpose	
Fire	Combustible Flammable in air Water may be used Do not use for anything other than its intended purpose
Exposure	ALL FORMS MEDICAL AID DQ110 Irritating to skin and eyes Harmful if swallowed Do not use for anything other than its intended purpose
Water Pollution	Dangerous to aquatic life at high concentrations Floating to shoreline May be dangerous if it enters water intakes Do not use for anything other than its intended purpose
1 RESPONSE TO DISCHARGE See Response to Discharge, page 100, 101	2 LABELS See Labels, page 100, 101
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: None 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: C ₁₂ H ₂₆ 3.4 IMCO United Nations Numerical Designation: 101	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Fuel oil
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: None 5.2 Symptoms Following Exposure: None 5.3 Treatment for Exposure: ASPIRATION: If inhaled, call doctor. INGESTION: If swallowed, call doctor. SKIN: If on skin, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): None 5.5 Short-Term Inhalation Limits: 2400 mg/m ³ for 60 min 5.6 Toxicity by Ingestion: None 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: None	

6 FIRE HAZARDS 6.1 Flash Point: 100°F 6.2 Flammable Limits in Air: 1.1-7.6% 6.3 Fire Extinguishing Agents: Foam 6.4 Fire Extinguishing Agents Not to be Used: None 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: None 6.7 Ignition Temperature: 441°F 6.8 Electrical Hazard: None 6.9 Burning Rate: None	8 WATER POLLUTION 8.1 Aquatic Toxicity: 2000 ppm 24 hr LC50 in fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: None 7.5 Polymerization: None 7.6 Inhibitor of Polymerization: None	9 SELECTED MANUFACTURERS Exxon Co. 60 Rockefeller Plaza New York, N.Y. 10020 Shell Oil Co. Shell Plaza Houston, Tex. 77002 Sun Oil Co. 240 Radnor Rd. N. Darrow, Pa. 19055
11 HAZARD ASSESSMENT CODE See Hazard Assessment, page 100, 101 A11	10 SHIPPING INFORMATION 10.1 Grades or Purity: 100% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: None 10.4 Venting: None
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: 1910.106 12.2 NAS Hazard Rating for Bulk Water Transportation: Category Rating 12.3 EPA Hazard Classifications: Category Classification Hazardous Volatile Ignitable Flammable Corrosive Toxic Reactive OHS: 100 WSC: 100 S: 100	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 170 13.3 Boiling Point at 1 atm: 170°C 13.4 Freezing Point: -41°C 13.5 Critical Temperature: 305°C 13.6 Critical Pressure: 36 atm 13.7 Specific Gravity: 0.78 13.8 Liquid Surface Tension: 28 dyne/cm 13.9 Liquid-Water Interfacial Tension: 20 dyne/cm 13.10 Vapor (Gas) Specific Gravity: 3.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1 13.12 Latent Heat of Vaporization: 350 cal/g 13.13 Heat of Combustion: 13,000 cal/g 13.14 Heat of Decomposition: None 13.15 Heat of Solution: None 13.16 Heat of Polymerization: None
NOTES	

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JPT

JET FUELS: JP-3

Common Synonyms		Waters liquid	Colorless	Fuel oil odor
		Floats on water. Irritating, combustible vapor may be produced.		
Fire		Combustible		
Exposure		VAPOR Irritating to eyes, nose and throat. If inhaled, will cause coughing, dizziness, headache, or difficult breathing. LIQUID Irritating to skin and eyes. Harmful if swallowed. INGESTION Harmful. May cause vomiting and diarrhea. SKIN Irritating. May cause redness and itching. EYES Irritating. May cause redness and tearing. NOSE AND THROAT Irritating. May cause coughing and difficulty breathing.		
Water Pollution		Dangerous to aquatic life in high concentrations. Floating to shoreline. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE		2. LABELS		
See Response Methods Handbook, CG 444-2		See Hazard Labels Required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: None known.		4.1 Physical State (as shipped): Liquid		
3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures		4.2 Color: Colorless		
3.3 Chemical Formula: $C_{12}H_{26}$		4.3 Odor: Fuel oil odor		
3.4 IMCO United Nations Numerical Designation: 1.2				
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Protective gloves, goggles or face shield.				
5.2 Symptoms Following Exposure: Vapor: Irritation to eyes, nose and throat. Liquid: Irritation to skin and eyes. Ingestion: Vomiting and diarrhea. Inhalation: Coughing and difficulty breathing.				
5.3 Treatment for Exposure: ASPIRATION: If liquid is aspirated, do not induce vomiting. INHALATION: Move to fresh air. If breathing is difficult, give oxygen. EYES: Wash with water. SKIN: Wash with soap and water.				
5.4 Toxicity by Inhalation (Threshold Limit Value): None given.				
5.5 Short-Term Inhalation Limits: 2500 mg/m ³ for 60 min.				
5.6 Toxicity by Ingestion: Lethal (LD50) 1.5 g/kg.				
5.7 Acute Toxicity: Data not available.				
5.8 Vapor (Gas) Irritant Characteristics: Vapor: Irritating to eyes, nose and throat. Liquid: Irritating to skin and eyes.				
5.9 Liquid or Solid Irritant Characteristics: Minimum Hazard: If poured on skin, it will cause irritation and reddening of the skin.				
5.10 Odor Threshold: 1 ppm.				

6 FIRE HAZARDS		8 WATER POLLUTION																													
6.1 Flash Point: 100°F		8.1 Aquatic Toxicity: None given. 24-hr. LC50: 11.0 g/L water.																													
6.2 Flammable Limits in Air: Data not available.		8.2 Waterlow Toxicity: Data not available.																													
6.3 Fire Extinguishing Agents: Use dry chemical or carbon dioxide.		8.3 Biological Oxygen Demand (BOD): None given.																													
6.4 Fire Extinguishing Agents Not to be Used: None given.		8.4 Food Chain Concentration Potential: None given.																													
6.5 Special Hazards of Combustion Products: None given.																															
6.6 Behavior in Fire: None given.																															
6.7 Ignition Temperature: Data not available.																															
6.8 Electrical Hazard: None given.																															
6.9 Burning Rate: 4 in/min.																															
7 CHEMICAL REACTIVITY		9 SELECTED MANUFACTURERS																													
7.1 Reactivity with Water: None given.		Exxon 6000 Rockaway Plaza New York, N.Y. 10020																													
7.2 Reactivity with Common Materials: None given.		Shell 6000 Rockaway Plaza Houston, Texas 77060																													
7.3 Stability During Transport: Stable.		Amoco 2400 Radcliff Rd. St. Louis, Mo. 63116																													
7.4 Neutralizing Agents for Acids and Caustics: None given.																															
7.5 Polymerization: None given.																															
7.6 Inhibitor of Polymerization: None given.																															
10 SHIPPING INFORMATION																															
10.1 Grades or Purity: 100%																															
10.2 Storage Temperature: Ambient																															
10.3 Inert Atmosphere: Not required.																															
10.4 Venting: Operating as required.																															
11 HAZARD ASSESSMENT CODE		13 PHYSICAL AND CHEMICAL PROPERTIES																													
See Page 2 of Assessment Handbook, CG 444-2		13.1 Physical State at 15°C and 1 atm: Liquid																													
ATL		13.2 Molecular Weight: 170.3																													
		13.3 Boiling Point at 1 atm: 190°C																													
		13.4 Freezing Point: -95°C																													
		13.5 Critical Temperature: 305°C																													
		13.6 Critical Pressure: 3.5 MPa																													
		13.7 Specific Gravity: 0.81 g/cm ³																													
		13.8 Liquid Surface Tension: Data not available.																													
		13.9 Liquid-Water Interfacial Tension: Data not available.																													
		13.10 Vapor (Gas) Specific Gravity: 3.5																													
		13.11 Ratio of Specific Heats of Vapor (Gas): 1.1																													
		13.12 Latent Heat of Vaporization: 400 kJ/kg																													
		13.13 Heat of Combustion: 44,000 kJ/kg																													
		13.14 Heat of Decomposition: 44,000 kJ/kg																													
		13.15 Heat of Solution: None given.																													
		13.16 Heat of Polymerization: None given.																													
12 HAZARD CLASSIFICATIONS																															
12.1 Code of Federal Regulations: Combustible Liquid																															
12.2 NAS Hazard Rating for Bulk Water Transportation:																															
		<table><tr><th>Category</th><th>Rating</th></tr><tr><td>Flammable</td><td>1</td></tr><tr><td>Highly Flammable</td><td>2</td></tr><tr><td>Vapor Flammable</td><td>3</td></tr><tr><td>Liquid Flammable</td><td>4</td></tr><tr><td>Poison</td><td>5</td></tr><tr><td>Water Pollutant</td><td>6</td></tr><tr><td>Human Toxic</td><td>7</td></tr><tr><td>Aquatic Toxic</td><td>8</td></tr><tr><td>Acute Toxic</td><td>9</td></tr><tr><td>Reactive</td><td>10</td></tr><tr><td>Other Chemical</td><td>11</td></tr><tr><td>Water</td><td>12</td></tr><tr><td>Not Reactive</td><td>13</td></tr></table>		Category	Rating	Flammable	1	Highly Flammable	2	Vapor Flammable	3	Liquid Flammable	4	Poison	5	Water Pollutant	6	Human Toxic	7	Aquatic Toxic	8	Acute Toxic	9	Reactive	10	Other Chemical	11	Water	12	Not Reactive	13
Category	Rating																														
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Reactive	10																														
Other Chemical	11																														
Water	12																														
Not Reactive	13																														
12.3 NFPA Hazard Classifications:																															
		<table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health</td><td>2</td></tr><tr><td>Flammability</td><td>2</td></tr><tr><td>Reactivity</td><td>1</td></tr></table>		Category	Classification	Health	2	Flammability	2	Reactivity	1																				
Category	Classification																														
Health	2																														
Flammability	2																														
Reactivity	1																														
NOTES																															

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JPF

JET FUELS: JP-4

Common Synonyms		Waters: liquid	Colorless	Fuel oil odor
		Fluores on water		
Major Hazards: 1. Irritant to skin and eyes. 2. May be dangerous if it enters water intakes. 3. May be dangerous if it enters water intakes. 4. May be dangerous if it enters water intakes. 5. May be dangerous if it enters water intakes.				
Fire		FLAMMABLE Extinguish with dry chemical, foam, or water. Water may be effective. Do not use water on burning liquid.		
Exposure		CAUTION: MEDICAL AID LIQUID Irritating to skin and eyes. Harmful if swallowed. Keep out of contact with skin and eyes. If on affected area, wash with plenty of water. If in eyes, flush with water and seek medical attention. If swallowed, do not induce vomiting. Do not drink alcohol or milk. DO NOT INDUCE VOMITING.		
Water Pollution		Dangerous to aquatic life in high concentrations. Floating to shoreline. May be dangerous if it enters water intakes. N/A: No data available. N/A: No data available.		
1 RESPONSE TO DISCHARGE Type Response: Miscellaneous Hazardous (C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, AA, AB, AC, AD, AE, AF, AG, AH, AI, AJ, AK, AL, AM, AN, AO, AP, AQ, AR, AS, AT, AU, AV, AW, AX, AY, AZ, BA, BB, BC, BD, BE, BF, BG, BH, BI, BJ, BK, BL, BM, BN, BO, BP, BQ, BR, BS, BT, BU, BV, BW, BX, BY, BZ, CA, CB, CC, CD, CE, CF, CG, CH, CI, CJ, CK, CL, CM, CN, CO, CP, CQ, CR, CS, CT, CU, CV, CW, CX, CY, CZ, DA, DB, DC, DD, DE, DF, DG, DH, DI, DJ, DK, DL, DM, DN, DO, DP, DQ, DR, DS, DT, DU, DV, DW, DX, DY, DZ, EA, EB, EC, ED, EE, EF, EG, EH, EI, EJ, EK, EL, EM, EN, EO, EP, EQ, ER, ES, ET, EU, EV, EW, EX, EY, EZ, FA, FB, FC, FD, FE, FF, FG, FH, FI, FJ, FK, FL, FM, FN, FO, FP, FQ, FR, FS, FT, FU, FV, FW, FX, FY, FZ, GA, GB, GC, GD, GE, GF, GG, GH, GI, GJ, GK, GL, GM, GN, GO, GP, GQ, GR, GS, GT, GU, GV, GW, GX, GY, GZ, HA, HB, HC, HD, HE, HF, HG, HH, HI, HJ, HK, HL, HM, HN, HO, HP, HQ, HR, HS, HT, HU, HV, HW, HX, HY, HZ, IA, IB, IC, ID, IE, IF, IG, IH, II, IJ, IK, IL, IM, IN, IO, IP, IQ, IR, IS, IT, IU, IV, IW, IX, IY, IZ, JA, JB, JC, JD, JE, JF, JG, JH, JI, JJ, JK, JL, JM, JN, JO, JP, JQ, JR, JS, JT, JU, JV, JW, JX, JY, JZ, KA, KB, KC, KD, KE, KF, KG, KH, KI, KJ, KK, KL, KM, KN, KO, KP, KQ, KR, KS, KT, KU, KV, KW, KX, KY, KZ, LA, LB, LC, LD, LE, LF, LG, LH, LI, LJ, LK, LL, LM, LN, LO, LP, LQ, LR, LS, LT, LU, LV, LW, LX, LY, LZ, MA, MB, MC, MD, ME, MF, MG, MH, MI, MJ, MK, ML, MM, MN, MO, MP, MQ, MR, MS, MT, MU, MV, MW, MX, MY, MZ, NA, NB, NC, ND, NE, NF, NG, NH, NI, NJ, NK, NL, NM, NO, NP, NQ, NR, NS, NT, NU, NV, NW, NX, NY, NZ, OA, OB, OC, OD, OE, OF, OG, OH, OI, OJ, OK, OL, OM, ON, OO, OP, OQ, OR, OS, OT, OU, OV, OW, OX, OY, OZ, PA, PB, PC, PD, PE, PF, PG, PH, PI, PJ, PK, PL, PM, PN, PO, PP, PQ, PR, PS, PT, PU, PV, PW, PX, PY, PZ, QA, QB, QC, QD, QE, QF, QG, QH, QI, QJ, QK, QL, QM, QN, QO, QP, QQ, QR, QS, QT, QU, QV, QW, QX, QY, QZ, RA, RB, RC, RD, RE, RF, RG, RH, RI, RJ, RK, RL, RM, RN, RO, RP, RQ, RR, RS, RT, RU, RV, RW, RX, RY, RZ, SA, SB, SC, SD, SE, SF, SG, SH, SI, SJ, SK, SL, SM, SN, SO, SP, SQ, SR, SS, ST, SU, SV, SW, SX, SY, SZ, TA, TB, TC, TD, TE, TF, TG, TH, TI, TJ, TK, TL, TM, TN, TO, TP, TQ, TR, TS, TT, TU, TV, TW, TX, TY, TZ, UA, UB, UC, UD, UE, UF, UG, UH, UI, UJ, UK, UL, UM, UN, UO, UP, UQ, UR, US, UT, UU, UV, UW, UX, UY, UZ, VA, VB, VC, VD, VE, VF, VG, VH, VI, VJ, VK, VL, VM, VN, VO, VP, VQ, VR, VS, VT, VU, VV, VW, VX, VY, VZ, WA, WB, WC, WD, WE, WF, WG, WH, WI, WJ, WK, WL, WM, WN, WO, WP, WQ, WR, WS, WT, WU, WV, WW, WX, WY, WZ, XA, XB, XC, XD, XE, XF, XG, XH, XI, XJ, XK, XL, XM, XN, XO, XP, XQ, XR, XS, XT, XU, XV, XW, XX, XY, XZ, YA, YB, YC, YD, YE, YF, YG, YH, YI, YJ, YK, YL, YM, YN, YO, YP, YQ, YR, YS, YT, YU, YV, YW, YX, YY, YZ, ZA, ZB, ZC, ZD, ZE, ZF, ZG, ZH, ZI, ZJ, ZK, ZL, ZM, ZN, ZO, ZP, ZQ, ZR, ZS, ZT, ZU, ZV, ZW, ZX, ZY, ZZ.				
2 LABEL				
3 CHEMICAL DESIGNATIONS		4 OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: N/A 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixture 3.3 Chemical Formula: C₁₂H₂₆ 3.4 IMCO United Nations Numerical Designation: 1992		4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light tan 4.3 Odor: Fuel oil		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Protective clothing and gloves. 5.2 Symptoms Following Exposure: Vapor causes eye, nose, throat and skin irritation. May cause dizziness and headache. May cause nausea and vomiting. 5.3 Treatment for Exposure: ASPIRATION: If inhaled, get fresh air. If severe, get medical attention. INGESTION: Do not induce vomiting. If swallowed, drink water. EYES: Wash with water. SKIN: Wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: 2500 mg/m³ for 60 min 5.6 Toxicity by Ingestion: 10,000 mg/kg 5.7 Late Toxicity: No data available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes eye, nose, throat and skin irritation. May cause dizziness and headache. May cause nausea and vomiting. 5.9 Liquid or Solid Irritant Characteristics: May cause skin irritation. May cause eye irritation. 5.10 Odor Threshold: 100 ppm				

6 FIRE HAZARDS		8 WATER POLLUTION																																			
6.1 Flash Point: 100°F (38°C) 6.2 Flammable Limits in Air: 1.1% - 7.6% 6.3 Fire Extinguishing Agents: Water, foam, dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: None. 6.5 Special Hazards of Combustion Products: None. 6.6 Behavior in Fire: None. 6.7 Ignition Temperature: 400°F (204°C) 6.8 Electrical Hazard: None. 6.9 Burning Rate: None.		8.1 Aquatic Toxicity: None. 8.2 Waterway Toxicity: None. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.																																			
7 CHEMICAL REACTIVITY		9 SELECTED MANUFACTURERS																																			
7.1 Reactivity with Water: None. 7.2 Reactivity with Common Materials: None. 7.3 Stability During Transport: None. 7.4 Neutralizing Agents for Acids and Corrosives: None. 7.5 Polymerization: None. 7.6 Inhibitor or Polymerization: None.		9.1 Manufacturers: None. 9.2 Distributors: None. 9.3 Suppliers: None. 9.4 Other: None.																																			
11 HAZARD ASSESSMENT CODE		10 SHIPPING INFORMATION																																			
11.1 Hazard Assessment Code: None.		10.1 Grades or Purity: None. 10.2 Storage Temperature: None. 10.3 Inert Atmosphere: None. 10.4 Venting: None.																																			
12 HAZARD CLASSIFICATIONS		13 PHYSICAL AND CHEMICAL PROPERTIES																																			
12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Flammable</td> <td>1</td> </tr> <tr> <td>Highly Flammable</td> <td>2</td> </tr> <tr> <td>Very Flammable</td> <td>3</td> </tr> <tr> <td>Extremely Flammable</td> <td>4</td> </tr> <tr> <td>Corrosive</td> <td>5</td> </tr> <tr> <td>Highly Corrosive</td> <td>6</td> </tr> <tr> <td>Very Corrosive</td> <td>7</td> </tr> <tr> <td>Extremely Corrosive</td> <td>8</td> </tr> <tr> <td>Toxic</td> <td>9</td> </tr> <tr> <td>Highly Toxic</td> <td>10</td> </tr> <tr> <td>Very Toxic</td> <td>11</td> </tr> <tr> <td>Extremely Toxic</td> <td>12</td> </tr> <tr> <td>Reactive</td> <td>13</td> </tr> <tr> <td>Highly Reactive</td> <td>14</td> </tr> <tr> <td>Very Reactive</td> <td>15</td> </tr> <tr> <td>Extremely Reactive</td> <td>16</td> </tr> </tbody> </table>		Category	Rating	Flammable	1	Highly Flammable	2	Very Flammable	3	Extremely Flammable	4	Corrosive	5	Highly Corrosive	6	Very Corrosive	7	Extremely Corrosive	8	Toxic	9	Highly Toxic	10	Very Toxic	11	Extremely Toxic	12	Reactive	13	Highly Reactive	14	Very Reactive	15	Extremely Reactive	16	13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 170.3 13.3 Boiling Point at 1 atm: 190°C 13.4 Freezing Point: -95°C 13.5 Critical Temperature: 300°C 13.6 Critical Pressure: 30 atm 13.7 Specific Gravity: 0.8 13.8 Liquid Surface Tension: 25 dyne/cm 13.9 Liquid-Water Interfacial Tension: 15 dyne/cm 13.10 Vapor (Gas) Specific Gravity: 3.5 13.11 Rate of Specific Heats of Vapor (Gas): 1000 cal/g 13.12 Latent Heat of Vaporization: 1000 cal/g 13.13 Heat of Combustion: 10000 cal/g 13.14 Heat of Decomposition: None 13.15 Heat of Solution: None 13.16 Heat of Polymerization: None	
Category	Rating																																				
Flammable	1																																				
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Very Flammable	3																																				
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12.3 NFPA Hazard Classifications:		NOTES																																			
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Category	Classification																																				
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Flammability	2																																				
Reactivity	0																																				

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[illegible]

[illegible]

6 FIRE HAZARDS 6.1 Flash Point: 142 F (61 C) 6.2 Flammable Limits in Air: 1.1 - 7.5 6.3 Fire Extinguishing Agents: Foam, Dry Chemical, Water (Not Recommended) 6.4 Fire Extinguishing Agents Not to be Used: Water (Not Recommended) 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: None 6.7 Ignition Temperature: 444 F 6.8 Electrical Hazard: None 6.9 Burning Rate: None	8 WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None																						
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: None 7.2 Reactivity with Common Materials: None 7.3 Stability During Transport: None 7.4 Neutralizing Agents for Acids and Caustics: None 7.5 Polymerization: None 7.6 Inhibitor of Polymerization: None	9 SELECTED MANUFACTURERS Acme Products Co. 1234 N. Main St. New York, N.Y. 10001 Tel. (212) 555-1234 Houston, Tex. 77001 Tel. (713) 555-5678 St. Louis, Mo. 63101 Tel. (314) 555-9012																						
11 HAZARD ASSESSMENT CODE A 1 1	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical Grade, 99.5% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not Required 10.4 Venting: Open flame approved																						
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: 29 CFR 1910.106 (Flammable Liquid) 12.2 HAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Category</th> <th style="width: 60%;">Rating</th> </tr> </thead> <tbody> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Environment</td> <td>1</td> </tr> <tr> <td>Physical</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> <tr> <td>Special</td> <td>1</td> </tr> <tr> <td>Overall</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 40%;">Category</th> <th style="width: 60%;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Flammability</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> </tbody> </table>	Category	Rating	Health	1	Environment	1	Physical	2	Reactivity	1	Special	1	Overall	1	Category	Classification	Health	1	Flammability	2	Reactivity	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 78.11 13.3 Boiling Point at 1 atm: 68.7°C (158°F) 13.4 Freezing Point: -107.9°C (-162°F) 13.5 Critical Temperature: 327.8°C (622°F) 13.6 Critical Pressure: 33.5 atm 13.7 Specific Gravity: 0.7893 (at 15°C) 13.8 Liquid Surface Tension: 21.7 dyne/cm (at 20°C) 13.9 Liquid-Water Interfacial Tension: 18.3 dyne/cm (at 20°C) 13.10 Vapor (Gas) Specific Gravity: 2.016 (at 15°C) 13.11 Ratio of Specific Heats of Vapor (Gas): 1.09 13.12 Latent Heat of Vaporization: 35.5 kJ/mol (at 68.7°C) 13.13 Heat of Combustion: -47.7 kJ/mol (at 25°C) 13.14 Heat of Decomposition: None 13.15 Heat of Solution: None 13.16 Heat of Polymerization: None
Category	Rating																						
Health	1																						
Environment	1																						
Physical	2																						
Reactivity	1																						
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Category	Classification																						
Health	1																						
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Reactivity	1																						

NOTES

LTA

LACTIC ACID

Common Synonyms 2-Hydroxypropanoic acid Racemic lactic acid Milk acid Alpha-Hydroxypropionic acid		Thick Liquid	Colorless to Yellow	Weak Unpleasant, Odor
Mixes and Mixes with water				
Avoid contact with liquid and vapors. Keep people away. Stop discharging, if possible. Notify and remove discharge if material. Notify local health and pollution control agencies.				
Fire		Combustible Extinguish with water. Do not use chemicals. Do not use foam.		
Exposure		CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If eyes feel irritation, blink and flush with plenty of water. If breathing is difficult, leave area and breathe fresh air. If breathing is difficult, use oxygen. LIQUID Will burn skin and eyes. If swallowed will cause nausea. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Flush eyes for 10 minutes and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. If Nausea, vomit and drink water. If SWALLOWED and not nauseated: COOL OR HAVE COOL DRINKS OR FLUIDS. IF SWALLOWED and not nauseated: COOL OR HAVE COOL DRINKS OR FLUIDS.		
Water Pollution		Dangerous to aquatic life in high concentration. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush.		2 LABELS No hazard label required by Code or Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Hydroxypropanoic acid alpha-Hydroxypropionic acid, Milk acid, Racemic lactic acid. 3.2 Coast Guard Compatibility Classification Not listed. 3.3 Chemical Formula CH ₃ CHOHCOOH H ₂ O 3.4 IMCO/United Nations Numerical Designation: Not listed.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Syrupy liquid. 4.2 Color: Yellow to colorless. 4.3 Odor: None or weak acidic.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, goggles, self-contained breathing apparatus where high concentrations of mist are present. 5.2 Symptoms Following Exposure: Inhalation of mist causes coughing and irritation of mucous membranes. Ingestion, even of diluted preparations, has a corrosive effect on the esophagus and stomach. Contact with concentrated solutions can cause severe burns of skin or eye. 5.3 Treatment for Exposure: INHALATION: Move to fresh air. INGESTION: Give large amount of water. EYES: Flush with water for at least 15 minutes. SKIN: Flush with water. Wash well with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 1 oral LD ₅₀ = 1,800 mg/kg (equivalent). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: 4.0 X 10 ⁻⁴ ppm.				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent (not flammable or burns with difficulty) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: < 80 ppm/24 hr/goldfish, no effect, fresh water 684 ppm/6 hr, fish killed, fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 72% 5 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Slowly corrodes most metals 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Dilute with water, mix with sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Clinton Corn Processing Co. P. O. Box 340 Clinton, Iowa 52732 2. Mallinckrodt Chemical Works 223 Westside Avenue P. O. Box 394 Jersey City, N. J. 07307 3. Monsanto Company 800 North Lindbergh Blvd. St. Louis, Mo. 63166
	10 SHIPPING INFORMATION 10.1 Grades or Purity: USP Reagent Technical 88% Food processing 50% MF. The balance is water in all cases 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 70°C and 1 atm: Liquid 13.2 Molecular Weight: 90 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.21 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: $-6,520$ Btu/lb $= -3,620$ cal/g $= -152 \times 10^3$ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classification: Not listed	(Continued on pages 5 and 6)
NOTES	

LS

LATEX, LIQUID SYNTHETIC

Common Synonyms: Plastic latex Synthetic rubber latex	Liquid White Mixes with water
1. If possible, check if possible. 2. Do not inhale dusts or fumes. 3. Do not get on skin and pollute clothing.	
Fire	Not flammable Combustible solid is produced when heated
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to eyes IF IN EYES: Flush eyes with plenty of water
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Not particularly soluble in water Not particularly toxic to aquatic life
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41 Disperse and flush (if not coagulated) Should be removed (if coagulated) Chemical and physical treatment	2 LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Plastic latex synthetic rubber latex 3.2 Coast Guard Compatibility Classification Miscellaneous water solutions 3.3 Chemical Formula: Not pertinent 3.4 IMCO-United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Milky 4.3 Odor: Each type has a characteristic odor
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical goggles or face shield 5.2 Symptoms Following Exposure: Irritation of eyes 5.3 Treatment for Exposure: Flush eyes with water for at least 15 min 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: Contact with eyes causes irritation 5.10 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable unless coagulated 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products If the latex dries out and then burns, hydrochloric acid, hydrogen cyanide, and styrene gases may be evolved. All are irritating and poisonous. 6.6 Behavior in Fire: Heat causes coagulation, the latex forms sticky plastic lumps which may burn. 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not flammable	8 WATER POLLUTION 8.1 Aquatic Toxicity Data not available 8.2 Waterfowl Toxicity Data not available 8.3 Biological Oxygen Demand (BOD) 1-5 days 8.4 Food Chain Concentration Potential None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Coagulated by heat and acids to gummy flammable material 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: not pertinent	9 SELECTED MANUFACTURERS 1. Borg Warner Corp. Marathon Division Washington, W. Va. 26184 2. W. R. Grace & Co. Doway and Anus Chemical Division Cambridge, Mass. 02140 Rohm and Haas Co. Independence Mall West Philadelphia, Pa. 19105
HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-1 A P	10 SHIPPING INFORMATION 10.1 Grades or Purity: All commercial latexes are shipped in a variety of concentrations in water depending on the particular polymer involved and the intended use of the latex. Some are particularly hazardous except they do not coagulate to gummy flammable material. 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Not listed 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.057 at 25°C (liquid) (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas) Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

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LPO

LAUROYL PEROXIDE

Common Synonyms		Solid	White	Faint soapy odor
Dilauroyl peroxide Dodecanoil peroxide		Fluents on water		
Call fire department Keep people away Wipe up and remove discharged material Notify local health and pollution control agencies				
Fire	Combustible May cause fire on contact with combustibles Containers may explode in fire May explode if exposed to heat or flames Control fires from behind barrier Flood discharge area with water Cool exposed containers with water			
Exposure	Call for medical aid SCLD Irritating to skin and eyes. Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: oxidizing material water contaminant Medical containment Should be removed Chemical and physical treatment		2 LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Dilauroyl peroxide Dodecanoil peroxide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $(C_{11}H_{21}O)_2$ & (OO) 3.4 IMCO/United Nations Numerical Designation: 2.1534		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Faint pungent, bland, soapy		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles 5.2 Symptoms Following Exposure: Contact with liquid irritates eyes and skin. Ingestion causes irritation of mouth and stomach 5.3 Treatment for Exposure: EYES: wash with plenty of water for 15 min. and get medical attention. SKIN: wash with plenty of soap and water. INGESTION: administer emetics to induce vomiting and call a physician 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Weak carcinogen in mice 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: Not pertinent oxidizing combustible solids	8.1	Aquatic Toxicity: Data not available
6.2	Flammable Limits in Air: Not pertinent	8.2	Waterfowl Toxicity: Data not available
6.3	Fire Extinguishing Agents: Water, dry chemical, foam, or carbon dioxide	8.3	Biological Oxygen Demand (BOD): Data not available
6.4	Fire Extinguishing Agents Not to be Used: Not pertinent	8.4	Food Chain Concentration Potential: Not pertinent
6.5	Special Hazards of Combustion Products: Not pertinent		
6.6	Behavior in Fire: Can increase the severity of a fire. Becomes sensitive to shock when hot. Containers may explode in a fire. May ignite or explode spontaneously if mixed with flammable materials		
6.7	Ignition Temperature: Not pertinent	9 SELECTED MANUFACTURERS	
6.8	Electrical Hazard: Not pertinent	1.	Pennwalt Corporation Liquid Division 1740 Military Road Buffalo, N.Y. 14240
6.9	Burning Rate: Not pertinent	2.	Witco Chemical Corporation L.S. Peroxygen Division 850 Merton Avenue Richmond, Calif. 94804
		3.	Arco Chemical Division Dart Industries, Inc. 885 Garden Street Hiera, Ohio 44035
7 CHEMICAL REACTIVITY			
7.1	Reactivity with Water: No reaction		
7.2	Reactivity with Common Materials: May ignite or explode spontaneously when mixed with combustible materials		
7.3	Stability During Transport: Stable if not overheated		
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent		
7.5	Polymerization: Not pertinent		
7.6	Inhibitor of Polymerization: Not pertinent		
		10 SHIPPING INFORMATION	
		10.1	Grades or Purity: 97-98% dried with water
		10.2	Storage Temperature: <50 °F
		10.3	Inert Atmosphere: Not required
		10.4	Venting: Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) H Z		13 PHYSICAL AND CHEMICAL PROPERTIES	
		13.1	Physical State at 15°C and 1 atm: Solid
		13.2	Molecular Weight: 399
		13.3	Boiling Point at 1 atm: Decomposes
		13.4	Freezing Point: 129.1 ± 0.4 °C (267.2 °F)
		13.5	Critical Temperature: Not pertinent
		13.6	Critical Pressure: Not pertinent
		13.7	Specific Gravity: 0.91 at 20 °C (solid)
		13.8	Liquid Surface Tension: Not pertinent
		13.9	Liquid-Water Interfacial Tension: Not pertinent
		13.10	Vapor (Gas) Specific Gravity: Not pertinent
		13.11	% of Specific Heats of Vapor (Gas): Not pertinent
		13.12	Latent Heat of Vaporization: Not pertinent
		13.13	Heat of Combustion (solid): -16,500 Btu/lb = -9,100 cal/g = -3.0 X 10 ⁴ J/kg
		13.14	Heat of Decomposition: Data not available
		13.15	Heat of Solution: Not pertinent
		13.16	Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS			
12.1	Code of Federal Regulations: Organic Peroxide		
12.2	NAS Hazard Rating for Bulk Water Transportation: Not listed		
12.3	HFP Hazard Classifications:		
	Classification		
	Health Hazard (Blue)	3	
	Flammability (Red)	2	
	Reactivity (Yellow)	3	
	Overall	6XX	
		(Continued on page 2 and 3)	
NOTES			

LRM

LAURYL MERCAPTAN

Common Synonyms 1. Dodecanethiol (n-dodecyl mercaptan)	Only liquid Colorless Mild skunk odor Floats on water. Freezing point is 19°F
Waxes, esters, and other derivatives Sulfur compounds, e.g., thiophene, thiophene Alkylthio compounds, e.g., alkylthio Alkylthio compounds, e.g., alkylthio	
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE. Waxes, esters, and other derivatives Sulfur compounds, e.g., thiophene, thiophene Alkylthio compounds, e.g., alkylthio Alkylthio compounds, e.g., alkylthio
Exposure	CAUTION MEDICAL AID LIQUID OR SOLID Irritating to skin and eyes. If swallowed, will cause nausea. Remove or tamponade from eyes and skin. Flush affected areas with plenty of water. IF IN EYES, flush with plenty of water. IF SWALLOWED, do not induce vomiting. Give plenty of water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Not a significant water pollutant.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment. Should be removed. Chemical and physical treatment.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dodecanethiol Dodecyl mercaptan 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: C ₁₂ H ₂₆ SH ₂ 3.4 IMCO United Nations Numerical Designation: Not listed.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild skunk
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Respirator when mist is present; rubber gloves; chemical goggles; rubber shoes and apron. 5.2 Symptoms Following Exposure: Liquid is irritating to skin, eyes, and mucous membranes. Ingestion may cause nausea. Repeated exposure can cause dermatitis and may produce a sensitizing effect. 5.3 Treatment for Exposure: Get medical attention for all eye exposures and for all serious skin exposures. INHALATION: Inhale fresh air repeatedly with cold water. Treatment is symptomatic. INGESTION: Dilute by drinking water. If vomiting occurs, drink more water. Do not induce vomiting. EYES: Flush thoroughly with water. Ventilation by electrolysis is helpful in removing fumes. Especially around eyes and eyelids. SKIN: Remove contaminated clothing. Flush skin with water. Wash exposed area with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Causes decline in kidney and liver function in rats. 5.8 Vapor (Gas) Irritant Characteristics: Irritating concentration of vapor unlikely, but mist can cause irritation of eyes and upper respiratory tract. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause staining and reddening of the skin. 5.10 Odor Threshold: 4 mg/m ³	

6. FIRE HAZARDS 6.1 Flash Point: 26°F (0°C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause foaming. 6.5 Special Hazards of Combustion Products: Poisonous and irritating gases (e.g., sulfur dioxide) are generated in fires. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Occidental Petroleum Corp. Hooker Chemical Corp. Stamford, Conn. 06905 2. Phillips Petroleum Co. Bartlesville, Okla. 74004 3. Unifrol Inc. Unifrol Chemical Co. Division Naugatuck, Conn. 06470								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A 1-1	10. SHIPPING INFORMATION 10.1 Grades or Purity: 95% minimum. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arrester).								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table data-bbox="883 1489 1130 1565"> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td></td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)		Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 202. 13.3 Boiling Point at 1 atm: Very high. 13.4 Freezing Point: 19.4°F = -7.0°C = 269.2°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.85 at 15°C (liquid). 13.8 Liquid Surface Tension: (at 30 dynes/cm = 0.03 N/m at 20°C) 13.9 Liquid-Water Interfacial Tension: (at 30 dynes/cm = 0.03 N/m at 20°C) 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: (at 110 Btu/lb = 60 cal/g = 2.5 X 10 ³ J/kg) 13.13 Heat of Combustion: (at 110 Btu/lb = 60 cal/g = 2.5 X 10 ³ J/kg) = 10,000 cal/g = 422 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)									
Reactivity (Yellow)	0								
NOTES (Continued on pages 5 and 6)									

REVISED 1978

LAC

LEAD ACETATE

Common Synonyms Lead acetate trihydrate Neutral lead acetate Normal lead acetate		Solid	White	Odorless
Sinks and mixes with water				
Avoid contact with solid. Do not get on clothes. If on clothes, wash thoroughly with soap and water. Do not breathe dust.				
Fire		NOT FLAMMABLE		
		CALL FOR MEDICAL AID DUST POISONOUS IF INHALED If inhaled will cause dizziness or loss of consciousness. If inhaled, avoid further exposure and get plenty of water. If breathing is difficult, use oxygen. SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Rinse skin thoroughly with plenty of water. Flush eyes with plenty of water. IF IN EYES , flush with plenty of water. IF SWALLOWED , do not induce vomiting. Give plenty of water to drink. If swallowed, do not induce vomiting. Give plenty of water to drink.		
Exposure		If swallowed, do not induce vomiting. Give plenty of water to drink.		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE See Response Methods Manual, CG 446-41 Issue warning: water contaminant. Restrict access. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Lead acetate trihydrate Neutral lead acetate Normal lead acetate Sodium Lead Acetate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $Pb(CH_3COO)_2 \cdot 3H_2O$ 3.4 IMCO/United Nations Numerical Designation: 9.1616		4 OBSERVABLE CHARACTERISTIC 4.1 Physical State (as shipped): Solid 4.2 Color: White (commercial grades are frequently brown or grey lumps) 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask and protective gloves. 5.2 Symptoms Following Exposure: Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders: colic, constipation, etc. weakness which may go on to paralysis chiefly of the extensor muscles of the wrists and less often of the ankles is noticeable. In the most serious cases, ingestion of a large amount causes irritation of the alimentary tract: pain, leg cramps, muscle weakness, paralysis, depression, coma, and death may follow in 1 or 2 days. Contact with eyes causes irritation. 5.3 Treatment for Exposure: Remove at once all causes of lead intoxication from further exposure until the blood level is reduced to a safe value. Immediately place the individual under medical care. INDUCTIONS: give gastric lavage using 1% solution of sodium or magnesium sulfate. Leave 15-30 gm magnesium sulfate in 6-8 oz of water in the stomach as antidote and cathartic. egg white, milk, and tannin are useful demulcents. calcium sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES or SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.2 mg/m ³ (as lead) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2.4 D.D.O.S. 5g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating acid fumes may be formed in fires 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 90 ppm: 16-188 days catfish blood cell injury tap water 748 mg (as Pb) 4 days minnow 11% salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Fish and terrestrial animals are capable of concentrating lead
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. E.I. du Pont and Chemical Corp. 347 Madison Ave. New York, N.Y. 10017 2. Mallinckrodt Chemical Works 223 Westside Ave. P.O. Box 364 Jersey City, N.J. 07303 3. Allied Chemical Corp. Specialty Chemicals Div. P.O. Box 1087R Mottstown, N.J. 07090
	10 SHIPPING INFORMATION 10.1 Grades or Purity: N+ Reagent Techn. at 97% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not pertinent 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 379.1 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.88 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transport: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

LAR

LEAD ARSENATE

Common Synonyms Lead arsenate acid Plumbous arsenate	Solid White Odorless Sinks in water
AVOID CONTACT WITH SOLID: Keep people away. Not to be handled if possible. Is irritant and toxic to fish and other aquatic life. Not to be handled and pollution is not to be made.	
Fire	Not flammable
 Exposure	CALL FOR MEDICAL AID SOLID POISONOUS IF SWALLOWED If SWALLOWED and conscious: Flush mouth with water and spit out. Do not swallow. If unconscious: SWALLOWED and unconscious: DO NOT INDUCE VOMITING. If swallowed: Keep person lying down.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intake. Not to be used in water bodies. Not to be used in water bodies.
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4. See also: 1. Poisonous material. Should be removed. Chemical and physical properties.	2. LABEL  POISON
3. CHEMICAL DESIGNATIONS 31 Synonyms: Lead arsenate acid Plumbous arsenate 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: PbHAsO ₄ 34 UNCO United Nations Numerical Designation: 6.1 (Toxic)	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: White 43 Odor: None
5. HEALTH HAZARDS 51 Personal Protective Equipment: Dust respirator, protective clothing to prevent contact with skin and eyes. 52 Symptoms Following Exposure: Inhalation or ingestion causes dizziness, headache, nausea, vomiting, diarrhea, and abdominal pain. Subacute doses cause weakness, loss of weight, and emaciation. Blood and urine concentrations of lead rise. 53 Treatment for Exposure: As specific medical treatment is used for exposure to this chemical, call a physician immediately. Give victim a tablespoon of salt in glass of water and repeat until vomit is clear. Then give two tablespoons of emetic salt in milk if magenta with water and plenty of fluids and water. Have victim lie down and keep quiet. 54 Toxicity by Inhalation (Threshold Limit Value): Indeterminate. 55 Short-Term Inhalation Limits: Not pertinent. 56 Toxicity by Ingestion: Grade 4 (1.0) but with strong irritability. 57 Late Toxicity: Local poisoning. 58 Vapor (Gas) Irritant Characteristics: Not pertinent. 59 Liquid or Solid Irritant Characteristics: Not pertinent. 60 Water Threshold: Not pertinent.	

6. FIRE HAZARDS 61 Flash Point: Not flammable. 62 Flammable Limits in Air: Not flammable. 63 Fire Extinguishing Agents: Not pertinent. 64 Fire Extinguishing Agents Not to be Used: Not pertinent. 65 Special Hazards of Combustion Products: Not pertinent. 66 Behavior in Fire: Not pertinent. 67 Ignition Temperature: Not flammable. 68 Electrical Hazard: Not pertinent. 69 Burning Rate: Not flammable.	8. WATER POLLUTION 81 Aquatic Toxicity: 14 ppm 48 h. Bluegill, Fathead minnow. 82 Waterfowl Toxicity: Dose not known. 83 Biological Oxygen Demand (BOD): None. 84 Food Chain Concentration Potential: Data not available.								
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: No reaction. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Not pertinent. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Chempac Chemical Co., Inc. 260 Madison Ave. New York, N.Y. 10017 2 Chas. F. Chenier & Co. Ortho Division 940 Herdley St. Richmond, Calif. 94804 4 MC Corp. Niagara Chemical Division Middleport, N.Y. 14105								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-5. II	10. SHIPPING INFORMATION 101 Grades or Purity: 94% 102 Storage Temperature: Ambient. 103 Inert Atmosphere: No requirement. 104 Venting: Open.								
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Poisonous liquid or solid, Class B. 122 HAS Hazard Rating for Bulk Water Transportation: Not listed. 123 NFPA Hazard Classifications: <table data-bbox="865 1455 1100 1541"> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>1</td></tr> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	0	Reactivity (Yellow)	1	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid. 132 Molecular Weight: 347.17. 133 Boiling Point at 1 atm: Decomposes. 134 Freezing Point: Not pertinent. 135 Critical Temperature: Not pertinent. 136 Critical Pressure: Not pertinent. 137 Specific Gravity: 5.19 (15°C/4°C). 138 Liquid Surface Tension: Not pertinent. 139 Liquid-Water Interfacial Tension: Not pertinent. 1310 Vapor (Gas) Specific Gravity: Not pertinent. 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 1312 Latent Heat of Vaporization: Not pertinent. 1313 Heat of Combustion: Not pertinent. 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: Not pertinent. 1316 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	0								
Reactivity (Yellow)	1								
NOTES <i>continued on page 1404</i>									

LFB

LEAD FLUOROBORATE

Common Synonyms Lead fluoroborate Lead fluoroborate solution		Liquid	Colorless	Odorless
Sinks and mixes with water				
AVOID CONTACT WITH EYES AND VAPOR. KEEP EYES AWAY. Wear goggles and suit continuous flow respirator. Notify the largest possible number of people. Notify the nearest fire department. Notify the nearest hospital.				
Fire		Not flammable. Irritating gases may be produced when heated. Wear goggles and suit continuous flow respirator.		
 Exposure		CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED. If inhaled will cause dizziness or loss of consciousness. Place victim in fresh air. Give plenty of water. If in eyes, hold eyes open and flush with plenty of water. If SWALLOWED: Do not induce vomiting. Give plenty of water. If SWALLOWED: Do not induce vomiting. Give plenty of water. LIQUID Will burn skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. Remove victim from area. Give plenty of water. IF IN EYES: Hold eyes open and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Give plenty of water. If swallowed, do not induce vomiting. Give plenty of water. IF SWALLOWED: Do not induce vomiting. Give plenty of water.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify the nearest water authority. Notify the nearest hospital.		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4. Issue warning. Water contains hazard. Restrict access. Disperse and flush.		2 LABELS No hazard label required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Lead fluoroborate. Lead fluoroborate solution. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: $Pb(BF_4)_2 \cdot H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Faint.		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, face shield, rubber apron. 5.2 Symptoms Following Exposure: Early symptoms of lead intoxication via inhalation or ingestion are most commonly gastrointestinal disorders, i.e., constipation, i.e., weakness, which may progress to paralysis, chiefly of the extensor muscles. If the wrists and less often of the ankles, is noticeable in the most serious cases. Ingestion of a large amount causes local irritation of the alimentary tract, pain, leg cramps, muscle weakness, paresthesias, depression, coma, and death may follow in 1 to 2 days. Contact with eyes or skin may cause burns and irritation. 5.3 Treatment for Exposure: Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe level. Immediately place the individual under medical care. INDUCTIONS give gastric lavage using 1% solution of sodium or magnesium sulfate. Leave 15-30 min. Magnesium sulfate in 6-8 oz. of water in the stomach as antidote and cathartic. Egg white, milk, and tannin are useful demulcents. Stropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES: Flush with copious quantities of water for 15 min. SKIN: Wash area with soap and water to remove acid burn. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.2 mg/m (as lead). 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating hydrogen fluoride gas may form in fire 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: May be toxic 8.3 Biological Oxygen Demand (BOD): Not listed 8.4 Food Chain Concentration Potential: Bioaccumulative								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Solution is acidic and will corrode most metals 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. P. O. Box 1087R Morristown, N. J. 07960 2. The Harshaw Chemical Co. 1945 E. 97th St. Cleveland, Ohio 44106 3. Pfaltz and Bauer, Inc. 475 Fairfield Ave. Stamford, Conn. 06902								
	10 SHIPPING INFORMATION 10.1 Grades or Purities: 90-92% solution in water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open								
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3. A P	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Mixture 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.75 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><td>Category</td><td>Classification</td></tr><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>0</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	0	Reactivity (Yellow)	0	
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	0								
Reactivity (Yellow)	0								
NOTES									

LFR

LEAD FLUORIDE

Common Synonyms Lead difluoride Plumbous fluoride	Solid White Odorless Sinks in water
AVOID CONTACT WITH SOLID AND DO NOT KEEF FLOET AWAY When handling this material, avoid contact with skin and eyes. If contact occurs, wash immediately with plenty of water. If swallowed, do not induce vomiting. Seek medical attention if necessary.	
Fire	Not flammable
 Exposure	CAUTION: POISONOUS IF INHALED If inhaled will cause dizziness or loss of consciousness. If inhaled, move to fresh air and breathe deeply of water. If inhaled, seek medical attention if necessary. SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. If swallowed, do not induce vomiting. Seek medical attention if necessary. Reproductive Effects: Lead is a known reproductive toxicant. It may cause miscarriages, stillbirths, and other complications. Avoid contact with pregnant women and children. Environmental Effects: Lead is a toxic substance. It may cause harm to aquatic life and the environment. Avoid contact with water and soil.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4. Issue warning - water contaminant. Restrict access. Should be removed. Chemical and physical treatment.	2. LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Lead difluoride, Plumbous fluoride. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: PbF ₂ . 3.4 IMCO/United Nations Numerical Designation: Not listed.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: White. 4.3 Odor: None.
5 HEALTH HAZARDS <i>Dust and fumes of all but the most insoluble lead compounds are readily absorbed on inhalation and, to a lesser degree, after ingestion.</i> 5.1 Personal Protective Equipment: Respirator for heavy dust exposure, safety goggles. 5.2 Symptoms Following Exposure: Not irritant to skin or mucous membranes; protect against chronic poisoning. Early symptoms of lead intoxication: a combination of ingestion are most common: gastrointestinal disorders, constipation, etc., weakness, which may go on to paralysis, chills, of the extensor muscles of the wrists and less often the ankles, is noticeable in the most serious cases. Ingestion of a large amount causes local irritation of the alimentary tract, pain, leg cramps, muscle weakness, paresthesias, depression, coma, and death may follow in 2-3 days. Contact with eyes causes irritation. 5.3 Treatment for Exposure: Remove at once all cases of lead intoxication from further exposure until the blood level is reduced to a safe value. Immediately place the individual under medical care. IN CASE OF INGESTION: give gastric lavage using 1% solution of sodium or magnesium sulfate. Leave 15-30 gm magnesium sulfate in 6-8 oz. of water in the stomach as ant-dote and cathartic. Egg white, milk, and tannic acid are useful demulcents. Atropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. IF ON SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.15 mg/m³ as lead. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade I LD50 5.2 g/kg. 5.7 Late Toxicity: Data not available.	

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable.
6.2 **Flammable Limits in Air:** Not flammable.
6.3 **Fire Extinguishing Agents:** Not pertinent.
6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
6.5 **Special Hazards of Combustion Products:**
6.6 **Behavior in Fire:**
6.7 **Ignition Temperature:** Not pertinent.
6.8 **Electrical Hazard:** Not pertinent.
6.9 **Burning Rate:** Not pertinent.

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 7.4 mg/l (as Pb) 4 days minimum, 11 m soft water.
8.2 **Waterway Toxicity:** May be toxic.
8.3 **Biological Oxygen Demand (BOD):** None.
8.4 **Food Chain Concentration Potential:** Bioconcentrative.

9. SELECTED MANUFACTURERS

1. Ozark Mahoning Co.
1870 South Boulder
Tulsa, OK 74119
2. American Hoechst Corp.
Chemicals and Plastics Div.
Rt. 202, 206 North
Somerville, N.J. 08876
3. Gallard Schlesinger Chemical Mfg. Co.
94 Mineola Ave.
Carle Place, N.Y. 11514

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction.
7.2 **Reactivity with Common Materials:**
7.3 **Stability During Transport:** Stable.
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
7.5 **Polymerization:** Not pertinent.
7.6 **Inhibitor of Polymerization:** Not pertinent.

10 SHIPPING INFORMATION

- 10.1 **Grades or Purity:** Technical C.P. Optical grade.
10.2 **Storage Temperature:** Ambient.
10.3 **Inert Atmosphere:** No requirement.
10.4 **Venting:** Open.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446.3)
II

12 HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed.
12.2 **HAS Hazard Rating for Bulk Water Transportation:** Not listed.
12.3 **NFPA Hazard Classifications:** Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid.
13.2 **Molecular Weight:** 245.19.
13.3 **Boiling Point at 1 atm:** Not pertinent.
13.4 **Freezing Point:** Not pertinent.
13.5 **Critical Temperature:** Not pertinent.
13.6 **Critical Pressure:** Not pertinent.
13.7 **Specific Gravity:** 8.24 at 20°C (solid).
13.8 **Liquid Surface Tension:** Not pertinent.
13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
13.12 **Latent Heat of Vaporization:** Not pertinent.
13.13 **Heat of Combustion:** Not pertinent.
13.14 **Heat of Decomposition:** Not pertinent.
13.15 **Heat of Solution:** Not pertinent.
13.16 **Heat of Polymerization:** Not pertinent.

5 HEALTH HAZARDS (Cont'd)

- 5.8 **Vapor (Gas) Irritant Characteristics:** Data not available.
5.9 **Liquid or Solid Irritant Characteristics:** Data not available.
5.10 **Odor Threshold:** Data not available.

LID

LEAD IODIDE

Common Synonyms		Solid	Bright Yellow	Odorless
Sinks in water				
AVOID CONTACT WITH SKIN AND EYES. KEEP OFF OF FACE AND HAIR. WASH IMMEDIATELY WITH WATER. IF SWALLOWED, DO NOT INDUCE VOMITING. IF SWALLOWED, DRINK WATER OR MILK AND CALL A PHYSICIAN.				
Fire		Not flammable		
		CALL FOR MEDICAL AID DUST POISONOUS IF INHALED If inhaled will cause dizziness or loss of consciousness. If swallowed will cause nausea, vomiting or loss of consciousness. SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness. EYES If eyes are contacted, flush with water for 15 minutes. IF SWALLOWED Do not induce vomiting. Drink water or milk and call a physician.		
Exposure				
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant Restrict access Should be removed (Chemical and physical treatment)		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: <chem>PbI2</chem> 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Bright yellow 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask and protective gloves 5.2 Symptoms Following Exposure: Early symptoms of lead intoxication via inhalation are weakness, are most commonly gastrointestinal disorders (colic, constipation, etc.), weakness which is progression to paralysis, chiefly of the extensor muscles of the wrists and less often the ankles; is noticeable in the most serious cases. Ingestion of a large amount causes local irritation of the alimentary tract. Pain, leg cramps, muscle weakness, paresthesias, depression, coma and death may follow in four to seven days. Contact with eyes causes irritation. 5.3 Treatment for Exposure: Remove at once all cases of lead intoxication from further exposure. If the blood level is reduced to a safe value, immediately place the individual under medical care. <chem>PbI2</chem> <chem>NaHSO4</chem> give gastric lavage using 1% solution of sodium or magnesium sulfate. Leave 15-30 mg magnesium sulfate in 6-8 oz. of water in the stomach as antidote and cathartic. Give white milk and tannin are useful demulcents. Atropine sulfate and other antispasmodics may relieve abdominal pain, but morphine may be necessary. EYES or SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m (as lead) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: May be toxic. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: Bioaccumulative.
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. RNY Corporation 680 Sawmill River Road Andover, N.Y. 10901. 2. Ventur Corp. P.O. Box 150 Beverly, Mass. 01915. 3. Mansfield Chemical Works 51 Lewis Ave. 01540.
	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.99% - 99.99%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 461.04. 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 6.16 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	
NOTES	

5 FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Combustible, moderately flammable when exposed to fire. Smelling material of fire in a room with pipes in water 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Wastewater Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Insoluble, does not decompose in contact with water 7.2 Reactivity with Common Materials: May corrode glass when moist 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: This compound reacts with dilute acid to form a salt and water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Alphachem Chemical Co. P.O. Box 100 Beverly, California 90701 Alphachem Chemical Co. P.O. Box 100 Beverly, California 90701 Alphachem Chemical Co. P.O. Box 100 Beverly, California 90701
11 HAZARD ASSESSMENT CODE See HAZARD ASSESSMENT HANDBOOK, CG 440-3, RP	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial, 98% min 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not pertinent 10.4 Venting: Open
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Hazardous material 12.2 NFPA Hazard Rating for Bulk Water Transportation: Notified 12.3 NFPA Hazard Classifications: Notified	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 44.05 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 43.1°C = 109.6°F ± 0.5°C 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.21 at 20°C 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent

NOTES

LEAD THIOCYANATE

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating sulfur dioxide gas may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: May be toxic 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Bioaccumulating								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Fielding Chemicals Co. P.O. Box 71 Jersey City, N.J. 07303 2. Gaffar Subisener Chemical Mfg. Co. 334 Minola Ave. Clark Place, N.Y. 11514 3. Eastman Organic Chemicals Rochester, N.Y. 14640								
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-31 11	10 SHIPPING INFORMATION 10.1 Grades or Purity: Practical Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not pertinent 10.4 Venting: Open								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Class B 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Category</th> <th style="text-align: left; border-bottom: 1px solid black;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>1</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 121.4 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.92 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Grs): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	1								
Reactivity (Yellow)	1								

LAL

LINEAR ALCOHOLS

Common Synonyms Undecanol Tridecanol Tetradecanol Pentadecanol		Liquid Floats on water	Colorless	Mild alcohol odor
Not declared flammable Can be asphyxiant May irritate with frequent Exposure to low concentrations No known health and safety hazards				
Fire	Combustible Flammable liquid and vapor Can be exposed to fire with water			
Exposure	CAUTION: MILD ALCOHOL LIQUID Irritating to skin Will burn eyes Harmful if absorbed in large quantities May irritate with frequent exposure May be asphyxiant if inhaled in large quantities CONCENTRATIONS			
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes No data available on biodegradability No data on persistence in water			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Undecanol, Tetradecanol, tridecanol, Pentadecanol (it could be any of the above or mixtures thereof) 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: $C_{12}H_{26}O$, $C_{14}H_{30}O$ 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Eye protection 5.2 Symptoms Following Exposure: Direct contact can produce eye irritation. Low concentrations may 5.3 Treatment for Exposure: Wash eyes with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade I LD ₅₀ 4.5 g/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to skin 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: 101 F (38 C) (100) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water (in foam may cause fracture) 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 20 days 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Alco Corp. Industrial Chemical Division 4000 S.W. 10th Hialeah, Fla. 33012 Shell Chemical Industrial Chemicals Division Houston, Tex. 77001 Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No reaction 10.4 Venting: Overpressure relief
11 HAZARD ASSESSMENT CODE See Hazard Assesment Handbook, CG 446-3 ATL	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid (colorless) 13.2 Molecular Weight: 226.4 13.3 Boiling Point at 1 atm: 254.1 (100) 13.4 Freezing Point: 24.8 (7.6) 13.5 Critical Temperature: Not listed 13.6 Critical Pressure: Not listed 13.7 Specific Gravity: 0.82 (20) 13.8 Liquid Surface Tension: 28.5 (20) 13.9 Liquid-Water Interfacial Tension: 18.5 (20) 13.10 Vapor (Gas) Specific Gravity: Not listed 13.11 Ratio of Specific Heats of Vapor (Gas): Not listed 13.12 Latent Heat of Vaporization: Not listed 13.13 Heat of Combustion: 13,100 (20) Btu/lb 13,100 (20) kJ/kg 13.14 Heat of Decomposition: Not listed 13.15 Heat of Solution: Not listed 13.16 Heat of Polymerization: Not listed
12 HAZARD CLASSIFICATIONS 12 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

LNG

LIQUEFIED NATURAL GAS

Common Synonyms LNG		Liquefied gas	Colorless	Odorless or weak skunk odor
		Fluents and boils on water. Flammable vapor cloud is produced.		
Fire FLAMMABLE Flashback at the vapor trail may occur. May explode if ignited in a confined area.				
Exposure ASPIRATOR Not irritating to eyes, nose or throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. LAUGHING GAS Will cause frostbite.				
Water Pollution Not harmful to aquatic life.				
1 RESPONSE TO DISCHARGE (See Response Methods Handbook - 100-1)		2 LABEL 		
3 CHEMICAL DESIGNATIONS 1. Synonyms: LNG 2. Coast Guard Compatibility Classification: Para-ffin 3. Chemical Formula: CH ₄ , C ₂ H ₆ , etc. 4. IMCO United Nations Numerical Designation: 1977		4 OBSERVABLE CHARACTERISTICS 1. Physical State (as shipped): Liquid 2. Color: Colorless 3. Odor: M		
5 HEALTH HAZARDS 1. Personal Protective Equipment: None 2. Symptoms Following Exposure: Dizziness, headache, nausea, vomiting, loss of consciousness. 3. Treatment for Exposure: Move to fresh air. If inhaled, give oxygen. If unconscious, do not give anything by mouth. If swallowed, do not induce vomiting. If on skin, wash with water. 4. Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5. Short-Term Inhalation Limits: 100 ppm 6. Toxicity by Ingestion: None 7. Late Toxicity: None 8. Vapor (Gas) Irritant Characteristics: None 9. Liquid or Solid Irritant Characteristics: None 10. Odor Threshold: 10 ppm				

6 FIRE HAZARDS

- 6.1 Flash Point: -176°C (flammable gas)
6.2 Flammable Limits in Air: 5-15%
6.3 Fire Extinguishing Agents: Water, foam, dry chemical, CO₂, etc.
6.4 Fire Extinguishing Agent's Not to be Used: None
6.5 Special Hazards of Combustion Products: None
6.6 Behavior in Fire: Burns rapidly.
6.7 Ignition Temperature: 500°C
6.8 Electrical Hazard: None
6.9 Burning Rate: Rapid

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: None
8.2 Waterfowl Toxicity: None
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1. Air Liquide
2. Air Products
3. Air Separation
4. Airco
5. Airco
6. Airco
7. Airco
8. Airco
9. Airco
10. Airco

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: None
7.2 Reactivity with Common Materials: None
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: None
7.5 Polymerization: None
7.6 Inhibitor of Polymerization: None

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: 99.9%
10.2 Storage Temperature: -162°C
10.3 Inert Atmosphere: None
10.4 Venting: None

11 HAZARD ASSESSMENT CODE

11.1 Hazard Assessment Code: 1977

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Gas
13.2 Molecular Weight: 16
13.3 Boiling Point at 1 atm: -162°C

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: 1977
12.2 NAS Hazard Rating for Bulk Water Transportation: None

Category Rating

1. Highly Flammable
2. Flammable
3. Combustible
4. Non-Flammable
5. Non-Flammable
6. Non-Flammable
7. Non-Flammable
8. Non-Flammable
9. Non-Flammable
10. Non-Flammable

14 Freezing Point

14.1 Freezing Point: -162°C

15 Critical Temperature

15.1 Critical Temperature: -82°C

16 Critical Pressure

16.1 Critical Pressure: 3.3 MPa

Specific Gravity

17.1 Specific Gravity: 0.42

18 Liquid Surface Tension

18.1 Liquid Surface Tension: 15.0 dyne/cm

19 Liquid-Water Interfacial Tension

19.1 Liquid-Water Interfacial Tension: 15.0 dyne/cm

20 Vapor (Gas) Specific Gravity

20.1 Vapor (Gas) Specific Gravity: 0.42

21 Ratio of Specific Heats of Vapor (Gas)

21.1 Ratio of Specific Heats of Vapor (Gas): 1.3

22 Latent Heat of Vaporization

22.1 Latent Heat of Vaporization: 510 kJ/kg

23 Heat of Combustion

23.1 Heat of Combustion: 50 MJ/kg

24 Heat of Decomposition

24.1 Heat of Decomposition: None

25 Heat of Solution

25.1 Heat of Solution: None

26 Heat of Polymerization

26.1 Heat of Polymerization: None

NOTES

LPG

LIQUEFIED PETROLEUM GAS

Common Synonyms Propane, butane, propylene, Petroleum LPG	Liquefied compressed gas. Colorless. Weak odor may have skunk odor added. Floats and boils on water. Flammable vapor cloud is produced.
	Step discharge if possible. Keep people away. Shut fire extinguishers and other equipment off. Stay upwind and use water spray to knock down flames. Do not use water directly on the liquid. Do not use water directly on the liquid. Do not use water directly on the liquid.
Fire	FLAMMABLE Flashback along vapor trail may occur. Containers may explode in fire. May explode if ignited in an enclosed area. Step discharge if possible. Do not use water directly on the liquid.
Exposure	VAPOR Not irritating to eyes, nose and throat. If inhaled, will cause dizziness, difficult breathing or loss of consciousness. CALL FOR MEDICAL AID LIQUID Will cause frostbite. May cause frostbite. If breathing has stopped, give artificial respiration. Do not use mouth-to-mouth respiration. Flush affected areas with water for 15 min. DO NOT RUB AFFECTED AREAS
Water Pollution	Not harmful to aquatic life.
1 RESPONSE TO DISCHARGE See Response Manual Handbook, 2-446-4. Emergency Response Manual Response Manual Response Manual	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Butane, Propane, Propylene, Petroleum, LPG. 3.2 Coast Guard Compatibility Classification: Paraffin or olefin. 3.3 Chemical Formula: C ₃ H ₈ , C ₄ H ₁₀ , C ₃ H ₆ . 3.4 IMCG United Nations Numerical Designation: 1958.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied compressed gas. 4.2 Color: Colorless. 4.3 Odor: Mild odor, skunk-like, added for detection.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Not required for the liquid, but eye protection is recommended for the vapor. 5.2 Symptoms Following Exposure: Dizziness, headache, nausea, vomiting, loss of consciousness. 5.3 Treatment for Exposure: Remove from exposure. If breathing is difficult, give artificial respiration. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1000 ppm. 5.5 Short-Term Inhalation Limits: 1000 ppm. 5.6 Toxicity by Ingestion: None. 5.7 Late Toxicity: None. 5.8 Vapor (gas) Irritant Characteristics: Vapor is non-irritant to eyes, nose and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable irritant characteristics. 5.10 Odor Threshold: 1000 ppm.	

6 FIRE HAZARDS

- 6.1 Flash Point: Propane: -119°C (-182°F); Butane: -60°C (-76°F).
- 6.2 Flammable Limits in Air: Propane: 2.1% - 9.5%; Butane: 1.8% - 8.4%.
- 6.3 Fire Extinguishing Agents: All water, foam, dry chemical, carbon dioxide, and water-soluble alcohol. Do not use water directly on the liquid.
- 6.4 Fire Extinguishing Agents Not to be Used: Water (directly on the liquid).
- 6.5 Special Hazards of Combustion Products: None known.
- 6.6 Behavior in Fire: Containers may explode. Fire may spread rapidly. Do not use water directly on the liquid.

(Continued on page 4)

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: None.
- 7.2 Reactivity with Common Materials: None.
- 7.3 Stability During Transport: Stable.
- 7.4 Neutralizing Agents for Acids and Caustics: None.
- 7.5 Polymerization: None.
- 7.6 Inhibitor of Polymerization: None.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: None.
- 8.2 Waterfowl Toxicity: None.
- 8.3 Biological Oxygen Demand (BOD): None.
- 8.4 Food Chain Concentration Potential: None.

9 SELECTED MANUFACTURERS

- Liquid Co.
Houston, Tex. 77001
Phillips Petroleum Co.
Bartlesville, Okla. 74003
Sunoco Co.
St. Davids, Pa. 19080

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Various grades, mostly propane. In some cases, propylene may be included. The proportion may be indicated on the label.
- 10.2 Storage Temperature: Ambient.
- 10.3 Inert Atmosphere: No requirement.
- 10.4 Venting: Safety relief.

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Manual, 2-446-4.
ABCDEF

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Liquefied compressed gas.
- 12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|------------------|--------|
| Flammable | 4 |
| Corrosive | 0 |
| Reactive | 0 |
| Health Hazard | 0 |
| Water Pollution | 0 |
| Acute Toxicity | 0 |
| Chronic Toxicity | 0 |
| Reactivity | 0 |
| Other Chemical | 0 |
| Water | 0 |
| Soil | 0 |
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 4 |
| Reactivity (Yellow) | 0 |

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Gas.
- 13.2 Molecular Weight: 44.
- 13.3 Boiling Point at 1 atm: -42.1°C (-43.4°F).
- 13.4 Freezing Point: -182.5°C (-276.5°F).
- 13.5 Critical Temperature: -42.1°C (-43.4°F).
- 13.6 Critical Pressure: 41.65 psia = 41.94 atm = 4.249 MN/m².
- 13.7 Specific Gravity (gas): 1.52 (air = 1.0).
- 13.8 Liquid Surface Tension: 18.1 dyne/cm = 0.0181 N/m.
- 13.9 Liquid-Water Interfacial Tension: 1.5 dyne/cm = 0.015 N/m.
- 13.10 Vapor (Gas) Specific Gravity: 1.52.
- 13.11 Ratio of Specific Heats of Vapor (Gas): 1.16.
- 13.12 Latent Heat of Vaporization: 82.2 Btu/lb = 191.5 kJ/kg = 42.2 x 10³ J/kg.
- 13.13 Heat of Combustion: 49.72 Btu/lb = 114.7 kJ/kg = 49.72 x 10³ J/kg.
- 13.14 Heat of Decomposition: None.
- 13.15 Heat of Solution: None.
- 13.16 Heat of Polymerization: None.

(Continued on page 4)

6 FIRE HAZARDS (Cont'd)

- 6.7 Ignition Temperature: Propane: 536°C (1000°F); Butane: 477°F.
- 6.8 Electrical Hazard: Class I, Group D.
- 6.9 Burning Rate: 8.2 mm/sec.

REVISED 1978

LTH

LITHARGE

Common Synonyms Lead monoxide Lead oxide yellow Plumbous oxide Lead Protoxide		Solid Sinks in water	Gray or yellow green or red brown	Odorless
Keep people away Isolate and remove dispersed material Notify local health and pollution control agencies				
Fire		Not flammable		
Exposure		Solid or dust Irritating to eyes Harmful if inhaled May be toxic to fish and plants Does not readily oxidize and does not react with water SWALLOWED and swallowed CONSUMPTION may irritate stomach and intestines and cause vomiting SWALLOWED and swallowed CONSUMPTION may irritate stomach and intestines and cause vomiting except for persons with iron deficiency		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Lead monoxide, Lead oxide yellow, Lead protoxide, Massicot, Plumbous oxide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: PbO 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow to red; low-metal content oxides yellow to green to brown; high metal content oxides gray to brown 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: or metal fume respirator, gloves, goggles 5.2 Symptoms Following Exposure: Generally symptoms of lead poisoning (delayed); inhalation or ingestion causes abdominal pain (lead colic), metallic taste, mouth loss of weight, pain in muscles, and muscular weakness. Dust may irritate eyes 5.3 Treatment for Exposure: Consult physician after ingestion or exposure to high concentrations of dust. INGESTION: call physician at once, as first aid induce vomiting and give milk and magnesium sulfate if possible 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m ³ 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Impairs development of human fetal connective tissue cells 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: $> 50,000$ ppm/96 hr: mosquito fish, 11% turbid water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: Data not available.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acid and Causals: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. NI Industries, Inc. Pigment and Chemicals Division 425 University Avenue Westwood, Mass. 02090 2. J. I. Baker Chemical Co. Phillipsburg, N. J. 08665 3. Eagle Picher Industries, Inc. Chemicals and Fibers Division American Building Cincinnati, Ohio 45202
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Low metal content oxides contain 98 to 99.8%. High metal or battery grades contain 93 to 95%. Reagent purified. Most grades available in several particle sizes. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 223.2. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 9.5 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	<i>Continued on pages 5 and 6</i>
NOTES	

(continued on pages 5 and 6)

LAH

LITHIUM ALUMINUM HYDRIDE

Common Synonyms LAH	Solid powder White to gray Odorless Reacts violently with water. Flammable gas is produced.
Avoid contact with skin and dust. Wear protective clothing including gloves. Stop, inhale if possible. Keep people away. Shut off gas flow source if available. Evacuate area if gas is detected. Notify local health and safety agency.	
Fire	FLAMMABLE Flammable gas is released on contact with water, metal, or acids. Heat released on contact with water. DO NOT USE WATER. DRY CHEMICALS, CARBON DIOXIDE, OR FOAM. Extinguish with powdered metal or powdered graphite.
Exposure	CALL FOR MEDICAL AID SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Call doctor immediately.
Water Pollution	Effects of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and welfare officials. Notify operators of any water intakes.
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4. Isolate. Warn. High fire and toxicity. Restrict access. Disperse and flush with water.	2 LABELS  
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: LAH 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: LiAlH ₄ 3.4 IMCO United Nations Numerical Designation: 4.2 (140)	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White to gray 4.3 Odor: None
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubberized gloves, full face shield. 5.2 Symptoms Following Exposure: Contact with skin causes severe irritation. 5.3 Treatment for Exposure: Flush the skin thoroughly with water for at least 15 minutes. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not applicable. 5.5 Short-Term Inhalation Limits: Not applicable. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Not applicable. 5.9 Liquid or Solid Irritant Characteristics: Moderate irritant. 5.10 Odor Threshold: Not applicable.	

6. FIRE HAZARDS

- 6.1 Flash Point: Solid
 6.2 Flammable Limits in Air: Not pertinent
 6.3 Fire Extinguishing Agents: Powdered graphite, powdered salt, or powdered limestone.
 6.4 Fire Extinguishing Agents Not to be Used: Do NOT use water and acids with or divide on dry chemical.
 6.5 Special Hazards of Combustion Products: Data not available.
 6.6 Behavior in Fire: Decomposes at 257°F to form hydrogen gas. The heat generated may cause further fire and explosion.
 6.7 Ignition Temperature: Data not available.
 6.8 Electrical Hazard: Class I, Group B.
 6.9 Burning Rate: Not pertinent.

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Reacts violently with water as a solid, or when dissolved in ether. The hydrogen evolved by the reaction with water is a non-flammable gas and necessitates adequate ventilation.
 7.2 Reactivity with Common Materials: Can burn in heated or moist air.
 7.3 Stability During Transport: Normally stable, unstable at high temperatures.
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): Data not available.
 8.4 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

1. Richmont Smelting & Refining Works, Inc.
 500 Belmont Ave.
 Brooklyn, N.Y. 11220
 2. Leeds Mineral Co.
 Route 100
 Exton, PA 19341
 3. Vee-Pon Corp.
 Chemical Division
 Beverly, Mass. 01915

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: 99.99%
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: Dry air
 10.4 Venting: Steel container if well ventilated area.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446.4)
 RKC

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable solid.
 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed.
 12.3 NFPA Hazard Classifications
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 2 |
| Reactivity (Yellow) | W |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
 13.2 Molecular Weight: 37.94
 13.3 Boiling Point at 1 atm: Decomposes
 13.4 Freezing Point: Not applicable
 13.5 Critical Temperature: Not applicable
 13.6 Critical Pressure: Not applicable
 13.7 Specific Gravity: 0.97 (at 15°C and 1 atm)
 13.8 Liquid Surface Tension: Not applicable
 13.9 Liquid-Water Interfacial Tension: Not applicable
 13.10 Vapor (Gas) Specific Gravity: Not applicable
 13.11 Ratio of Specific Heats of Vapor (Gas): Not applicable
 13.12 Latent Heat of Vaporization: Not applicable
 13.13 Heat of Combustion: Not applicable
 13.14 Heat of Decomposition: Not applicable
 13.15 Heat of Solution: Not applicable
 13.16 Heat of Polymerization: Not applicable

NOTES

LHD

LITHIUM HYDRIDE

Common Synonyms	Solid Crystals are gray or blue; powder is white. Odorless. Reacts violently with water. Flammable gas is produced.
AVOID CONTACT WITH SOLID AND DUST. KEEP IT OFF! AWAY Wear dust respirator and full face shield. Remove contaminated gloves. Never discharge to sink. Isolate area and keep out of traffic. Notify local health officer for decontamination.	
Fire	Combustible. Irritating flammable gas may be produced when heated. Extinguish with dry graphite or sand or DRY ICE POWDER. DO NOT USE WATER TO WASH CARBON DIOXIDE OR OTHER CHEMICALS ON FIRE OR ADJACENT AREAS.
 Exposure	ALL FORMS OF LITHIUM DUST POISONOUS IF INHALED If inhaled will cause coughing or difficult breathing. If inhaled, remove person to fresh air. Wash face with water. If in eyes, flush with water. If in mouth, do not swallow. Spit out and rinse mouth with water. If SWALLOWED, do not induce vomiting. If UNCONSCIOUS, having CONVULSIONS, do not give anything by mouth. SOLID Will burn skin and eyes. If swallowed will cause nausea or loss of consciousness. Remove contaminated clothing and shoes. Flush skin with copious amounts of water. IF IN EYES, flush with copious amounts of water. IF SWALLOWED, do not induce vomiting. If UNCONSCIOUS, having CONVULSIONS, do not give anything by mouth.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not recommended for wildlife refuges. Notify local health officer if water is leaked.
1 RESPONSE TO DISCHARGE See Response Methods Handbook CG 446-4. Issue warning: High flame, highly toxic smoke. Risk of explosion. Decontaminate and flush with water.	2 LABELS  
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: LiH 3.4 IMCO/United Nations Numerical Designation: 4.1, 1414	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Gray-blue crystalline, may have gray and material ranges from black to white to gray. 4.3 Odor: None.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or full shield; rubber gloves; full face shield; respirator; full body protective suit. 5.2 Symptoms Following Exposure: Irritation of the eyes, nose, throat, and lungs; coughing and wheezing; chest tightness; and shortness of breath. Symptoms of irritation of the eyes, nose, throat, and lungs; coughing and wheezing; chest tightness; and shortness of breath. 5.3 Treatment for Exposure: If inhaled, hydrate the eyes with eye drops or irrigation. If in eyes, flush with copious amounts of water. If in mouth, do not swallow. Spit out and rinse mouth with water. If SWALLOWED, do not induce vomiting. If UNCONSCIOUS, having CONVULSIONS, do not give anything by mouth. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.05 mg/m³. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS

- 6.1 Flash Point: Not applicable.
Non-flammable solid.
- 6.2 Flammable Limits in Air: Not applicable.
- 6.3 Fire Extinguishing Agents: Dry graphite or sand or DRY ICE POWDER.
Graphite or lithium chloride.
- 6.4 Fire Extinguishing Agents Not to be Used: Never use water. Do not use alcohol, hydrocarbon, or dry chemical extinguishers.
- 6.5 Special Hazards of Combustion Products: Irritating and flammable gas may be produced.
- 6.6 Behavior in Fire: Melts and decomposes when heated. Produces flammable hydrogen gas. Reacts violently with water to produce flammable gas which may explode.
- 6.7 Ignition Temperature: Not applicable.
- 6.8 Electrical Hazard: Not applicable.
- 6.9 Burning Rate: Not applicable.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
- 8.2 Waterfowl Toxicity: Data not available.
- 8.3 Biological Oxygen Demand (BOD): Data not available.
- 8.4 Food Chain Concentration Potential: Data not available.

9 SELECTED MANUFACTURERS

Lithium Corporation, Inc.
P.O. Box 100
Beverly Hills, CA 90212

Ventron Corp.
P.O. Box 100
Beverly Hills, CA 90212

Pharmaceuticals, Inc.
2550 13th Ave.
Stanford, CA 94302

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Reacts violently with water to form flammable hydrogen gas and a strong caustic solution. Reaction may occur especially with powder.
- 7.2 Reactivity with Common Materials: Melts and decomposes when heated. Produces flammable hydrogen gas.
- 7.3 Stability During Transport: Stable if sealed and moisture excluded.
- 7.4 Neutralizing Agents for Acids and Caustics: Residues should be washed with water, then rinsed with dilute acetic acid.
- 7.5 Polymerization: Not pertinent.
- 7.6 Inhibitor of Polymerization: Not pertinent.

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Commercial grade.
- 10.2 Storage Temperature: Ambient.
- 10.3 Inert Atmosphere: Required.
- 10.4 Venting: Not required.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)
RP

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not applicable.
- 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed.
- 12.3 NFPA Hazard Classifications
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 4 |
| Reactivity (Yellow) | 2 |
| | W |

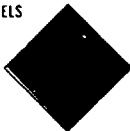
13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid.
- 13.2 Molecular Weight: 7.95.
- 13.3 Boiling Point at 1 atm: Not applicable (decomposes).
- 13.4 Freezing Point: Not applicable.
- 13.5 Critical Temperature: Not applicable.
- 13.6 Critical Pressure: Not applicable.
- 13.7 Specific Gravity: 0.78 at 20°C (solid).
- 13.8 Liquid Surface Tension: Not applicable.
- 13.9 Liquid-Water Interfacial Tension: Not applicable.
- 13.10 Vapor (Gas) Specific Gravity: Not applicable.
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not applicable.
- 13.12 Latent Heat of Vaporization: Not applicable.
- 13.13 Heat of Combustion: Data not available.
- 13.14 Heat of Decomposition: Data not available.
- 13.15 Heat of Solution: Not applicable.
- 13.16 Heat of Polymerization: Not applicable.

NOTES

LTM

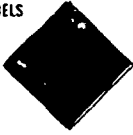
LITHIUM, METALLIC

Common Synonyms		Salt solid	White to light silver	Odorless
		Reacts violently with water Flammable gas is produced		
AVOID CONTACT WITH SOLID. KEEP PEOPLE AWAY. Wear gloves, avoid blowing dust, avoid eye contact. Call fire department. Remove and remove discharged material. Notify local health and safety authorities.				
Fire		Combustible. Irritating gases may be produced when heated. Wear goggles and self-contained breathing apparatus. Extinguish with dry graphite powder or other inert powder. DO NOT USE WATER, FOAM, DRY CHEMICALS OR CARBON DIOXIDE ON FIRE. DO NOT USE WATER ON LITHIUM ADJACENT LINES.		
Exposure		CALL FOR MEDICAL AID. SOLID: Will burn skin and eyes. Harmful if swallowed. Reactions: irritation of skin, eyes and nose. Flue, irritation, tears with phosgene, fluorine. IF EYES: Flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Have victim drink water or milk. IF SWALLOWED: Do not induce vomiting if unconscious or having convulsions. Notify physician.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local water pollution agency. Notify petroleum cleanup authorities.		
1 RESPONSE TO DISCHARGE EPA 101, 102, 103, 104, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000.		2 LABELS  		
3 CHEMICAL DESIGNATIONS Synonyms: N Coast Guard Compatibility Classification: N Chemical Formula: IMCO/United Nations Numerical Designation:		4 OBSERVABLE CHARACTERISTICS Physical State (as shipped): Color: Odor:		
5 HEALTH HAZARDS Personal Protective Equipment: Symptoms Following Exposure: Treatment for Exposure: Toxicity by Inhalation (Threshold Limit Value): Short Term Inhalation Limits: Toxicity by Ingestion: Late Toxicity: Vapor (Gas) Irritant Characteristics: Liquid or Solid Irritant Characteristics: Odor Threshold:				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Graphite, lithium chloride. 6.4 Fire Extinguishing Agents Not to be Used: Water, sand, halogenated hydrocarbons, carbon dioxide, soda acid or dry chemical. 6.5 Special Hazards of Combustion Products: Strong alkali fumes are formed in fire. 6.6 Behavior in Fire: Molten lithium is quite easily ignited and is often difficult to extinguish. Hot or burning lithium will react with all cases except those of the helium group. It also reacts violently with organic, wood, asphalt, sand, wax, oil, and most materials except the exception that does not apply to the alkali metals. Hydrogen explosion is possible.		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Not applicable. 8.4 Food Chain Concentration Potential: Not applicable.									
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently to form flammable hydrogen gas and strong caustic solution. Reaction usually occurs. 7.2 Reactivity with Common Materials: May ignite combustible materials if they are dry. 7.3 Stability During Transport: Stable. Fire and moisture are excluded. 7.4 Reactivity with Acids and Caustics: Residues should be flushed with water. Do not mix with dilute acids. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9 SELECTED MANUFACTURERS 1. E. I. du Pont de Nemours & Co. Route 100 Ext. 914 2. Lithium Corporation of America Box 100 Bessemer City, N.C. 28016 3. Vencor Corp. P.O. Box 59 Beverly, Mass. 01915									
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Method on CG-44C-3) RK		10 SHIPPING INFORMATION 10.1 Grades or Purity: Pure 99.99% 10.2 Storage Temperature: As above. 10.3 Inert Atmosphere: Inert. 10.4 Venting: Safe.									
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable solid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> </tbody> </table>		Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	2	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 6.941 13.3 Boiling Point at 1 atm: Not pertinent. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.534 (20°C solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: 15,470 Btu/lb. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 31,500 Btu/lb. 13.16 Heat of Polymerization: Not pertinent.	
Category	Classification										
Health Hazard (Blue)	1										
Flammability (Red)	2										
Reactivity (Yellow)	2										
6 FIRE HAZARD: (Cont'd) 6.7 Ignition Temperature: Not applicable. 6.8 Electrical Hazard: Not applicable. 6.9 Burning Rate: Not applicable.											

MGX

MAGNESIUM

Common Synonyms	Silver Sinks in water	Silvery Odorless		
Call fire department. Upon discharge, powder keeps in place. In life and fire, use fire extinguisher, as usual. No local heat and pollution - if it is dry.				
Fire	FLAMMABLE Extinguish with dry graphite, soda ash, or other inert powder. DO NOT USE WATER TO EXTINGUISH DRY CHEMICALS OR VAPORIZING LIQUID ON FIRE.			
Exposure	Call fire department. SOLID Irritating to eyes. Harmful if swallowed. If IN EYES, hold eye open and flush with plenty of water. If SWALLOWED, do not induce vomiting. Call doctor. Drink water.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if enters water intakes. No effect on fish and wildlife if eaten. No serious operation of nearby water intakes.			
1 RESPONSE TO DISCHARGE (See Response Manual Handbook, CG 446-4) Issue warning - high flammability. Should not be moved. Chemical and physical treatment.				
2 LABELS  				
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: Mg. 3.4 IMCO/United Nations Numerical Designation: Pellet: 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, 1410, 1411, 1412, 1413, 1414, 1415, 1416, 1417, 1418, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, 1430, 1431, 1432, 1433, 1434, 1435, 1436, 1437, 1438, 1439, 1440, 1441, 1442, 1443, 1444, 1445, 1446, 1447, 1448, 1449, 1450, 1451, 1452, 1453, 1454, 1455, 1456, 1457, 1458, 1459, 1460, 1461, 1462, 1463, 1464, 1465, 1466, 1467, 1468, 1469, 1470, 1471, 1472, 1473, 1474, 1475, 1476, 1477, 1478, 1479, 1480, 1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488, 1489, 1490, 1491, 1492, 1493, 1494, 1495, 1496, 1497, 1498, 1499, 1500, 1501, 1502, 1503, 1504, 1505, 1506, 1507, 1508, 1509, 1510, 1511, 1512, 1513, 1514, 1515, 1516, 1517, 1518, 1519, 1520, 1521, 1522, 1523, 1524, 1525, 1526, 1527, 1528, 1529, 1530, 1531, 1532, 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3193, 3194, 3195, 3196, 3197, 3198, 3199, 3200, 3201, 3202, 3203, 3204, 3205, 3206, 3207, 3208, 3209, 3210, 3211, 3212, 3213, 3214, 3215, 3216, 3217, 3218, 3219, 3220, 3221, 3222, 3223, 3224, 3225, 3226, 3227, 3228, 3229, 3230, 3231, 3232, 3233, 3234, 3235, 3236, 3237, 3238, 3239, 3240, 3241, 3242, 3243, 3244, 3245, 3246, 3247, 3248, 3249, 3250, 3251, 3252, 3253, 3254, 3255, 3256, 3257, 3258, 3259, 3260, 3261, 3262, 3263, 3264, 3265, 3266, 3267, 3268, 3269, 3270, 3271, 3272, 3273, 3274, 3275, 3276, 3277, 3278, 3279, 3280, 3281, 3282, 3283, 3284, 3285, 3286, 3287, 3288, 3289, 3290, 3291, 3292, 3293, 3294, 3295, 3296, 3297, 3298, 3299, 3300, 3301, 3302, 3303, 3304, 3305, 3306, 3307, 3308, 3309, 3310, 3311, 3312, 3313, 3314, 3315, 3316, 3317, 3318, 3319, 3320, 3321, 3322, 3323,				

MPC

MAGNESIUM PERCHLORATE

Common Synonyms Anhydrous Dendritic Magnesium perchlorate anhydrous Magnesium perchlorate hexahydrate	Solid White Odorless Sinks and mixes with water
Avoid contact with skin and eyes. Keep away from heat and flame. Do not breathe dust. Do not get on clothes.	
Fire	Not flammable May cause fire on contact with combustibles Will increase the intensity of a fire Do not use water
Exposure	CAUTION FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause difficult breathing If eyes are irritated, flush with plenty of water If breathing is difficult, get fresh air or use a respirator If breathing is difficult, get fresh air SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness Remove contaminated clothing and shoes Flush affected areas with plenty of water If EYES are irritated, flush with plenty of water If SWALLOWED, drink water or milk. Do not induce vomiting. If unconscious, do not give anything by mouth. If SWALLOWED, do not induce vomiting. Do not have any food or drink. (CONCLUSIONS OF THE INVESTIGATION)
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and welfare officials Notify police and fire department
1 RESPONSE TO DISCHARGE See Response Methods Handbook CG 446.4 Toxic warning oxidizing material Restrict access Dispose and flush	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Anhydrous Dendritic Magnesium perchlorate anhydrous Magnesium perchlorate hexahydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: Mg(ClO ₄) ₂ 3.4 IMCO/United Nations Numerical Designation: 5.1 1474	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: U.S. Bureau of Mines approved respirator, chemical safety goggles, face shield 5.2 Symptoms Following Exposure: Inhalation of dust irritates mucous membranes. Ingestion of large amounts may be fatal. Immediate symptoms include abdominal pain, nausea and vomiting, diarrhea, pallor, blueness, shortness of breath, unconsciousness. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, get medical attention if irritation persists. INGESTION: give large amount of water, induce vomiting, call a physician. EYES: flush with copious quantities of water for at least 15 min., call physician. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable but may cause or increase the intensity of a fire 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: Can form explosive mixture with combustible material or finely powdered metals. Increases the intensity of fires. 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Dissolves with liberation of heat. May cause spattering. 7.2 Reactivity with Common Materials: Contact with wood, paper, oils, grease or finely divided metals may cause fires and explosions. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Hooker Chemical Corporation Industrial Chemicals Division Niagara Falls, N.Y. 14302 2. Kerr-McGee Chemical Corp. Kerr-McGee Center Oklahoma City, OK 73102 3. D. F. Goldsmith Chemical & Metal Corp. 509 Pinner Ave. Evanston, Ill. 60202								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook CG 446.3 NS	10. SHIPPING INFORMATION 10.1 Grades or Purity: Pure anhydrous 65% basis, 100% of hexahydrate in water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Safety relief 13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 223.2 13.3 Boiling Point at 1 atm: Decomposes above 300°C 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.21 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Data not available 13.15 Heat of Solution: 260 Btu/lb = 140 cal/g = 6.0 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>		Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	0	Reactivity (Yellow)	0
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	0								
Reactivity (Yellow)	0								
NOTES									

(Continued on pages 5 and 6)

MLT

MALATHION

Common Synonyms Cythion Insecticide		Liquid	Yellow to dark brown	Skunk-like odor
Sinks in water. Freezing point is 37° F.				
AVOID CONTACT WITH EYES. If contact occurs, flush eyes with water for 15 minutes. If swallowed, do not induce vomiting. Seek medical attention.				
Fire		Combustible POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED Containers may explode in fire If fire occurs, use dry chemical, carbon dioxide, or water spray foam to extinguish. Do not use water stream directly on container.		
Exposure		LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to eyes If in eyes, flush with water for 15 minutes. If swallowed, do not induce vomiting. Seek medical attention. If skin is exposed, remove contaminated clothing and wash exposed areas thoroughly with water. Remove contaminated clothing under a shower. Administer atropine, 2 mg (1/30 gr) intramuscularly or intravenously as soon as any local or systemic signs or symptoms of an intoxication are noted. Repeat the administration of atropine every 3-8 min. until signs of atropinization (mydriasis, dry mouth, rapid pulse, hot and dry skin) occur, initiate treatment in children with 1 mg of atropine. Watch respiration and remove bronchial secretions if they appear to be obstructing the airway, intubate if necessary. Give 2 PAM (Pralidoxime, Protopam), 2.5 g in 100 ml of sterile water or in 5% dextrose and water intravenously slowly in 15-30 min. If sufficient fluid is not available, give 1 gm of 2 PAM in 1 ml of distilled water by deep intramuscular injection. Repeat this every half hour if respiration weakens or if muscle fasciculation or convulsions recur.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Do not discharge into waterways.		
1. RESPONSE TO DISCHARGE (See Response to Malathion Handbook, CG 446-1)		2. LABEL		
Issue warning: poison + alter contaminant Restrict access Should be removed + chemical and physical treatment.				
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS		
31 Synonyms: CYTHION Insecticide S (1,2-Bis (ethoxy-carbonyl) ethyl) C O dimethyl phosphorodithioate		41 Physical State (as shipped): Liquid		
32 Coast Guard Compatibility Classification: Not applicable		42 Color: Yellow to dark brown		
33 Chemical Formula: C ₁₀ H ₁₆ O ₆ P ₂ S ₂		43 Odor: Characteristic skunk-like mercaptan		
34 IMCO/United Nations Numerical Designation: 6.1/1893				
5. HEALTH HAZARDS				
51 Personal Protective Equipment: Wear self-contained breathing apparatus (or respirator for organophosphoric pesticides) and rubber clothing while fighting fires of malathion with chlorinated bleach solution. All clothing contaminated by fumes and vapors must be decontaminated.				
52 Symptoms Following Exposure: Exposure to fumes from a fire or to liquid causes headache, blurred vision, constricted pupils of the eyes, weakness, nausea, cramps, diarrhea and tightness in the chest. Muscle twitch and convulsions may follow. The symptoms may develop over a period of 8 hours.				
53 Treatment for Exposure: Speed is essential. INSPIRATION: in the nonbreathing victim immediately institute artificial respiration using the mouth-to-mouth, the mouth-to-nose or the mouth-to-oropharyngeal method. Call physician. INTENTION: administer milk, water or salt water and induce vomiting repeatedly. SKIN OR EYE CONTACT: flood and wash exposed skin areas thoroughly with water. Remove contaminated clothing under a shower. Administer atropine, 2 mg (1/30 gr) intramuscularly or intravenously as soon as any local or systemic signs or symptoms of an intoxication are noted. Repeat the administration of atropine every 3-8 min. until signs of atropinization (mydriasis, dry mouth, rapid pulse, hot and dry skin) occur, initiate treatment in children with 1 mg of atropine. Watch respiration and remove bronchial secretions if they appear to be obstructing the airway, intubate if necessary. Give 2 PAM (Pralidoxime, Protopam), 2.5 g in 100 ml of sterile water or in 5% dextrose and water intravenously slowly in 15-30 min. If sufficient fluid is not available, give 1 gm of 2 PAM in 1 ml of distilled water by deep intramuscular injection. Repeat this every half hour if respiration weakens or if muscle fasciculation or convulsions recur.				

6. FIRE HAZARDS

- 61 Flash Point: > 325°F
62 Flammable Limits in Air:
Data not available
63 Fire Extinguishing Agents: Dry chemical, carbon dioxide, water spray foam
64 Fire Extinguishing Agents Not to be Used:
Not pertinent
65 Special Hazards of Combustion Products:
Vapors and fumes from fires are hazardous. They include sulfur dioxide and phosphoric acid
66 Behavior in Fire: Gives off hazardous fumes. Area surrounding fire should be diked to prevent water runoff
67 Ignition Temperature: Data not available
68 Electrical Hazard: Not pertinent
69 Burning Rate: Data not available

8. WATER POLLUTION

- 81 Aquatic Toxicity:
0.09 ppm/96 hr/bluegill/TL₅₀/fresh water
0.033-0.083 ppm/96 hr/marine crustaceans
LC₅₀
82 Waterway Toxicity: LD₅₀=1485 mg/Lg
83 Biological Oxygen Demand (BOD)
Data not available
84 Food Chain Concentration Potential
None

9. SELECTED MANUFACTURERS

American Cyanamid Co
Agricultural Division
P.O. Box 400
Princeton, N.J. 08540

7. CHEMICAL REACTIVITY

- 71 Reactivity with Water: None
72 Reactivity with Common Materials:
No hazardous reaction
73 Stability During Transport: Not pertinent
74 Neutralizing Agents for Acids and Caustics:
Liquid bleach solution for decontamination
75 Polymerization: Not pertinent
76 Inhibitor of Polymerization:
Not pertinent

10. SHIPPING INFORMATION

- 101 Grades or Purity: CYTHION
Insecticide, Malathion ULV Concentrate
Insecticide. Many powders, dusts and spray solutions are sold under a variety of trade names
102 Storage Temperature: Below 120°F
Decomposition (non hazardous) occurs at higher temperatures
103 Inert Atmosphere: Data not available
104 Venting: Data not available

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
A-X-Y

12. HAZARD CLASSIFICATIONS

- 121 Code of Federal Regulations:
Poisonous liquid or solid, Class B
122 NAB Hazard Rating for Bulk Water Transportation: Not listed
123 NFPA Hazard Classifications: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 131 Physical State at 15°C and 1 atm: Liquid
132 Molecular Weight: 330.36
133 Boiling Point at 1 atm: Very high
134 Freezing Point: 37°F = 2.9°C = 276°K
135 Critical Temperature: Not pertinent
136 Critical Pressure: Not pertinent
137 Specific Gravity: 1.234 at 25°C (liquid)
138 Liquid Surface Tension: 37.1 dynes/cm = 0.0371 N/m at 24°C
139 Liquid-Water Interfacial Tension: 19 dynes/cm = 0.019 N/m at 24°C
1310 Vapor (Gas) Specific Gravity:
Not pertinent
1311 Ratio of Specific Heats of Vapor (Gas):
Not pertinent
1312 Latent Heat of Vaporization:
Not pertinent
1313 Heat of Combustion: Data not available
1314 Heat of Decomposition: Not pertinent
1315 Heat of Solution: Not pertinent
1316 Heat of Polymerization: Not pertinent

(continued on pages 5 and 6)

5. HEALTH HAZARDS (Cont'd.)

- 54 Toxicity by Inhalation (Threshold Limit Value): 10 mg/m³
55 Short-Term Inhalation Limits: Data not available
56 Toxicity by Ingestion: Grade 2.1 LD₅₀ 5 to 5 g/kg (rat)
57 Late Toxicity: Data not available
58 Vapor (Gas) Irritant Characteristics: None likely
59 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin
510 Odor Threshold: Data not available

REVISED 1978

MLI

MALEIC ACID

Common Synonyms: cis-Butenedioic acid cis-1,2-Ethylene dicarboxylic acid Maleic acid Maleic acid Tetraic acid		Solid White Odorless
Avoid contact with skin or eyes. Wash immediately with plenty of water. If inhaled, move to fresh air. If swallowed, drink plenty of water. Do not induce vomiting.		Sinks and mixes with water
Fire		Combustible
Exposure		ACUTE MEDICAL SIGNS DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. Harmful if swallowed. Remove clothing if contaminated. If on skin, flush with water. If in eyes, flush with water for 15 minutes. If swallowed, drink plenty of water. If swallowed, do not induce vomiting.
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE See Response Manual Handbook, CG 446.41. Disperse and Flush.		2. LABELS No hazard label required by Codes of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: cis-Butenedioic acid cis-1,2-Ethylene dicarboxylic acid Maleic acid, Maleic acid, Tetraic acid 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{HOOC}-\text{CH}=\text{CH}-\text{COOH}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION: Remove to fresh air. EYES: Immediately flush with plenty of water for 15 minutes. Get medical attention for eye irritation. SKIN: Wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 oral LD₅₀ = 100 mg/kg rats 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Irritating smoke containing malic anhydride may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May corrode metals when wet 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute solution of sodium bicarbonate or soda ash 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: 240 ppm 24-48 hr. mosquitofish, H₉₆, fresh water 5 ppm 96 hr. fathead minnow, H₉₆, fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 18% 5 days 8.4 Food Chain Concentration Potential: None
9 SELECTED MANUFACTURERS 1. All-J Chemical Co. Specialty Chemicals Dept. P.O. Box 1067R Morristown, N.J. 07960 2. Mallinckrodt Chemical Works 223 Westside Ave. P.O. Box 184 Jersey City, N.J. 07303 3. Eastman Organic Chemicals Rochester, N.Y. 14609		10 SHIPPING INFORMATION 10.1 Grade or Purity: Reagent Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE See HAZARD Assessment Handbook, CG 446.2 NS		12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed
13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 116.1 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 265°F = 130°C = 265°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.49 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -5,000 Btu/lb = -2,260 cal/g = -117 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent		NOTES

MLA

MALEIC ANHYDRIDE

Common Synonyms Toxic: anhydride ex: Butenedioic anhydride	Molten, or solid crystals or tablets. Colorless. Choking odor. Sinks and mixes slowly with water.
As an irritant when used and liquid, heavy vapors arise. Wear goggles, self-contained breathing apparatus, and rubber clothing, including gloves. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Combustible. Dust cloud may be ignited by spark or flame. Wear goggles, self-contained breathing apparatus, and rubber clothing, including gloves. Extinguish with dry chemical or carbon dioxide. Water may be ineffective.
Exposure	SAFETY INFORMATION LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control agency. Notify operator of local water treatment plant.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4. Hyperic and flush.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: cis-Butenedioic anhydride; 2,3-Furandione; Toxic anhydride. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: (C ₄ H ₂ O ₃) _n . 3.4 IMCO United Nations Numerical Designation: 9.0.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or liquid. 4.2 Color: Colorless. 4.3 Odor: Astringent, choking.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved organic vapor and gas canister, chemical goggles, and face shield; rubber gloves and boots; coveralls or rubber apron. 5.2 Symptoms Following Exposure: Irritation causes coughing, sneezing, throat irritation, skin contact causes irritation and redness. Vapors cause severe eye irritation, photophobia and double vision may occur. 5.3 Treatment for Exposure: INHALATION: Give oxygen. EYE OR SKIN CONTACT: Flush with lot of water for at least 15 min. For eyes, call a physician. For contact with skin, remove contaminated clothing and treat as chemical and thermal burn. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.25 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2. LD ₅₀ 0.5 g/kg. 5.7 Letal Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smothering of the skin and first degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: 1.3 - 2.9 mg/m ³ .	

6. FIRE HAZARDS

- 6.1 **Flash Point:** (Liquid) 215°F (C = 240°F) O.C.
 6.2 **Flammable Limits in Air:** 1.4% - 7.1%
 6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide.
 6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing.
 6.5 **Special Hazards of Combustion Products:** No pertinent.
 6.6 **Behavior in Fire:** When heated above 400°F, in the presence of various materials, may generate heat and carbon dioxide. Will explode if confined.
 6.7 **Ignition Temperature:** 475°F.
 6.8 **Electrical Hazard:** Class I, Group D.
 6.9 **Burning Rate:** 1.4 mm/min.

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Hot water may cause frothing. Reacts with cold water slowly and non-hazardous.
 7.2 **Reactivity with Common Materials:** No reaction.
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Caustics:** Solid spills: Immediately be covered before any significant reaction with water occurs. Flush area of spill with water.
 7.5 **Polymerization:** Very unlikely at ordinary temperatures, even in the molten state.
 7.6 **Inhibitor of Polymerization:** None.

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 150 ppm/24 hr. sunlight, 11 hr. fresh water.
 8.2 **Waterford Toxicity:** Data not available.
 8.3 **Biological Oxygen Demand (BOD):** 40% 4 days.
 8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

1. Monsanto Co.
 Monsanto Industrial Chemicals Co.
 300 North Lindbergh Blvd.
 St. Louis, Mo. 63166.
 2. Petro-Tech Chemical Corp.
 5000 Park Place
 Houston, Tex. 77057.
 3. United States Steel Corp.
 U.S.S. Chemicals Division
 Neville Island, Pa. 15225.

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** Commercial 99%
 10.2 **Storage Temperature:** Ambient.
 10.3 **Inert Atmosphere:** No requirement.
 10.4 **Venting:** Open.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3).
 RR

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed.
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 1 |
| Health | |
| Vapor Irritant | 2 |
| Liquid or Solid Irritant | 2 |
| Poison | 1 |
| Water Pollution | |
| Human Toxicity | 2 |
| Aquatic Toxicity | 2 |
| Aesthetic Effect | 1 |
| Reactivity | |
| Other Chemicals | 1 |
| Water | 2 |
| Self Reaction | 0 |
- 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 3 |
| Flammability (Red) | 1 |
| Reactivity (Yellow) | 1 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid.
 13.2 **Molecular Weight:** 98.06.
 13.3 **Boiling Point at 1 atm:** 140°F = 200°C = 473°K.
 13.4 **Freezing Point:** 127°F = 53°C = 326°K.
 13.5 **Critical Temperature:** Not pertinent.
 13.6 **Critical Pressure:** Not pertinent.
 13.7 **Specific Gravity:** 1.43 at 15°C (solid).
 13.8 **Liquid Surface Tension:** Not pertinent.
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
 13.12 **Latent Heat of Vaporization:** Not pertinent.
 13.13 **Heat of Combustion:** -1916 Btu/lb = -159 cal/g = -238 kJ/kg.
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** -153 Btu/lb = -12.5 cal/g = -156 kJ/kg.
 13.16 **Heat of Polymerization:** Not pertinent.

(Continued on page 2 and 3)

NOTES

REVISED 1978

MLH

MALEIC HYDRAZIDE

Common Synonyms 1,2-Dihydro-3,6-pyridinedione Maleic acid hydrazide MH Malazide Regulus	Solid White Odorless Sinks in water
Call the department keeps people away Isolate and remove structure, if structure Not a health and pollution hazard	
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Extinguish with water. Do not use foam or dry chemical extinguishers.
Exposure	Inhalation: irritant DUST Irritating to eyes, nose and throat May be irritating to respiratory tract If in eyes: Flush with plenty of water If in mouth: Spit out and swallow If swallowed: Spit out and swallow SOLID Irritating to skin and eyes Harmful if swallowed Reproductive: Irritates skin and eyes If in eyes: Flush with plenty of water If in mouth: Spit out and swallow If swallowed: Spit out and swallow If swallowed: Spit out and swallow If swallowed: Spit out and swallow
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not a health and pollution hazard Not a health and pollution hazard
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant Should be removed Chemical and physical treatment	2. LABELS No label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,2-Dihydro-3,6-pyridinedione; 6-Hydroxy-1,2,4,5-tetrahydropyridine; Maleic acid hydrazide; Malazide; MH; Regulus 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $C_4H_4N_2O_2$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield; dust mask 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Contact with eyes or skin causes irritation. Ingestion has been observed to cause vomiting and diarrhea in test animals. 5.3 Treatment for Exposure: INHALATION: Move to fresh air. EYES: Flush with water for at least 15 min. SKIN: Flush with water; wash with soap and water. INGESTION: Get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Toxic - Irritated - Irritating - Irritant 5.7 Late Toxicity: Causes cancer in rats 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent	

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water dry chemical foam carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic nitrogen oxides are produced 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. The Anso Company Chemical Division 1 Stanton Street Marquette, Wis. 54449 2. Union Carbide Chemical Co. Spencer Street Nauratua, C. 00670 3. Chemical Formulators, Inc. Box 26 Natick, W. Va. 25441
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 97+ 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 112.1 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 101°C (214°F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.60 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: test 1 - 20.200 Btu/lb (44.800 cal/g) - 190 x 10 ³ J/g 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

(Continued on pages 4 and 5)

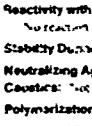
MAT

MERCURIC ACETATE

Common Synonyms	Solid White Mild vinegar like odor Sinks and mixes with water
AVOID CONTACT WITH SOLID AND USE KEEL PROPERLY Wear a respirator and eye protection. Avoid contact with water. Do not use in food or drink. Do not use in children's toys. Do not use in children's clothing.	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	HAZARD FOR MEDICAL USE DUST POISONOUS IF INHALED May cause irritation of the respiratory tract. May cause dermatitis. Ingestion causes pain, vomiting, ulceration of mouth and stomach, kidney failure, metal taste, pain, and rapid weakness. SOLID POISONOUS IF SWALLOWED If swallowed, do not induce vomiting. Do not eat or drink. Do not use laxatives. Do not use cathartics. Do not use enemas. Do not use any other treatment. Do not use any other treatment.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Do not use in or near water intakes Do not use in or near water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4)	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Not applicable 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $(\text{CH}_3\text{COO})_2\text{Hg}$ 3.4 IMCO/United Nations Numerical Designation: 6.1 (b)(2)	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Night air
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, dust mask, goggles 5.2 Symptoms Following Exposure: The general symptoms are those of acute poisoning developing rapidly after ingestion but more slowly after repeated exposure. Contact with eyes causes irritation and ulceration. Skin contact may cause dermatitis. Ingestion causes pain, vomiting, ulceration of mouth and stomach, kidney failure, metal taste, pain, and rapid weakness. 5.3 Treatment for Exposure: Have physician treat. Do not induce vomiting. Do not eat or drink. Do not use laxatives. Do not use cathartics. Do not use enemas. Do not use any other treatment. Do not use any other treatment. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m³ (as mercury) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 oral LD₅₀ 7 mg/kg 5.7 Eye Toxicity: Irritation, Necrosis and Adhesions, damage to cornea 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Smoke may contain toxic mercury or mercury oxide fumes 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 24 hr LC ₅₀ 100 µg/L (fresh water) 72 hr LC ₅₀ 100 µg/L (fresh water) * Time interval not specified 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Vantage Corporation Chemicals Division Congress Street Beverly, Mass 01915 2. National Chemical Works 1600 N. Second Street St. Louis, Mo 63103 3. Garland Schenck Chemical Manufacturing Co 544 Minnesota Ave Carle Place, N.Y. 11734
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NS	10 SHIPPING INFORMATION 10.1 Grades or Purity: Not applicable 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: None
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous Gas B 12.2 IAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classification: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 329.6 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 4.27 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

Continued on pages 4 and 5

Common Synonyms		Solid	White	Odorless
Mercury chloride, ammoniated Mercury ammonium chloride Mercury amide chloride Ammoniated mercury		Sinks in water		
AVOID ONLY WITH NO FLAMMABLES FLEE AWAY Wash exposed areas with water Inhaled and in contact with skin: Wash with water In contact with eyes: Flush with water				
Fire		Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED		
 Exposure		CAUTION: MEDICAL USE DUST POISONOUS IF INHALED May be dangerous if it enters water intakes May be dangerous if it enters water intakes SOLID POISONOUS IF SWALLOWED May be dangerous if it enters water intakes May be dangerous if it enters water intakes		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes May be dangerous if it enters water intakes		
1 RESPONSE TO DISCHARGE See Hazardous Materials Response Guide 111 Spill: Wash with water Contaminant: Wash with water Medical: Wash with water Should be removed Chemical and physical hazard		2 LABEL  POISON		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Alpha Ammonium chloride, Ammoniated mercury, Mercury chloride, ammoniated, Mercury ammonium chloride, Mercury (II) chloride, ammoniated 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: HgNH ₄ Cl 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, gloves, apron 5.2 Symptoms Following Exposure: The general symptoms of poisoning are: nausea, vomiting, diarrhea, abdominal pain, and a feeling of fullness. In severe cases, there may be a feeling of fullness, and a feeling of fullness. In severe cases, there may be a feeling of fullness, and a feeling of fullness. 5.3 Treatment for Exposure: Have person lie flat, face down, with head tilted back. Flush with water. If inhaled, call a physician or medical officer. If swallowed, call a physician or medical officer. If swallowed, call a physician or medical officer. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ (as dust) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Irritation of the skin and eyes. May cause skin irritation. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				
6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Smoke may contain toxic mercury compounds 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazards: Not pertinent 6.9 Burning Rate: Not pertinent				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent				
8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.12 ppm (24 hr LC50 for rainbow trout) 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Not pertinent 8.4 Food Chain Concentration Potential: Data not available				
9. SELECTED MANUFACTURERS Ventron Corporation Chemical Division Congress Street Beverly, Mass. 01915				
10. SHIPPING INFORMATION 10.1 Gross Weight or Purity: 1.5 lb. net 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open				
11. HAZARD ASSESSMENT CODE See Hazardous Materials Response Guide 111 11				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous (Class B) 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed				
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 252.1 13.3 Boiling Point at 1 atm: Not pertinent (sublimes at 100°C) 13.4 Freezing Point: Not pertinent (sublimes) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 5.4 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent				

(continued on pages 1 and 2)

NOTES

MCN

MERCURIC CYANIDE

Common Synonyms Cyanurina Mercury cyanide Mercury (II) cyanide	Solid (crystals or powder) White Sinks and mixes slowly with water
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear dust mask and gloves. Do not breathe dust. Do not ingest. If swallowed, do not induce vomiting. Get medical attention. Do not breathe dust or fumes.	
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
 Exposure	ALL FORMS OF AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing. If eyes are exposed, remove dust with water. If water is not available, use dry cloth to wipe eyes. If water is available, flush eyes with water for 15 minutes. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush contaminated skin with water. If EYES have been exposed, flush with water. If SWALLOWED, do not induce vomiting. Get medical attention. If SWALLOWED, induce vomiting only if instructed by medical personnel.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Do not discharge into water.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison water contaminant Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cyanurina, Mercury cyanide, Mercury (II) cyanide 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: Hg(CN) ₂ 3.4 IMCO/United Nations Numerical Designation: 6.1/1636	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Colorless or white 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Symptoms of both cyanide and mercury intoxication can occur. Acute poisoning has resulted from inhaling dust concentrations of 1.2-5.5 mg/m ³ of air. Symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Cyanide poisoning can cause anxiety, confusion, dizziness, and shortness of breath, with possible unconsciousness, convulsions, and paralysis. Breath may smell like bitter almonds. Ingestion causes necrosis, pain, vomiting, and severe purging, plus the above symptoms. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis. Systemic poisoning can occur by absorption through skin. 5.3 Treatment for Exposure: <i>As quickly call physician.</i> INHALATION: If victim has stopped breathing, start artificial respiration immediately, using amyl nitrite pearls; administer amyl nitrite by inhalation for 15-30 seconds of every minute while sodium nitrite solution is being prepared; discontinue amyl nitrite and immediately inject intravenously 10 ml of a 3% solution of sodium nitrite (nonsterile if necessary) over a period of 2-4 min., without removing needle; infuse intravenously 50 ml of a 25% aqueous solution of sodium thiosulfate; injection should take about 10 min. (concentrations of 5-50% may be used, but keep total dose approx. 12 gm). Oxygen therapy may be helpful in combination with the above. INGESTION: <i>alimentary absorption is very rapid; action during first 10-15 min. determines prognosis.</i> Give egg whites, milk, or activated charcoal and induce vomiting; treat for cyanide poisoning as above. If eyes or skin wash with water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.05 mg/m ³ (as mercury) 5.5 Short-Term Inhalation Limits: Data not available	

(Continued on page 4)

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Fumes from fire may contain toxic mercury and hydrogen cyanide 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.02 ppm/48 hr/daphnia magna; 11 mg/l/fresh water 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Possible bioaccumulation problem. Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Contact with any acidic material will form poisonous hydrogen cyanide gas, which may collect in enclosed spaces. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. J. I. Baker Chemical Co. Phillipsburg, N. J. 08865 2. Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902 3. Gallard Schlesinger Chemical Mfg. Co. 584 Mincola Ave. Cattle Place, N. Y. 11514
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) 55	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous solid, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 252.63 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 4.0 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
5. HEALTH HAZARDS (Cont'd.) 5.6 Toxicity by Ingestion: Grade 4, oral LD ₅₀ = 25 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: (None)	

(Continued on pages 4 and 5)

MID

MERCURIC IODIDE

Common Synonyms Mercuric iodide, red Mercury bisiodide		Solid	Red	Odorless
Sinks in water				
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear dust respirator and rubber overclothing (including gloves). Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED			
	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing. If in eyes, hold eye(s) open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
Exposure				
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Issue warning: poison water contaminant. Restrict access. Should be removed. Chemical and physical treatment.		2 LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Mercuric iodide, red Mercury bisiodide 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: HgI_2 3.4 IMCO/United Nations Numerical Designation: 616115		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Red 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves. 5.2 Symptoms Following Exposure: All forms of exposure to this compound are hazardous. Acute systemic mercurialism may be fatal within a few minutes; death by uremic poisoning is usually delayed 5-12 days. Acute poisoning has resulted from inhaling dust concentrations of 1.2-8.5 mg/m ³ of air; symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes necrosis, pain, vomiting, and severe purging. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, get medical attention. INGESTION: alimentary absorption is very rapid; action during first 10-15 min. determines prognosis. Give regurgitates, milk, or activated charcoal and induce vomiting; consult physician. EYES: flush with water for at least 15 min. SKIN: flush with water; wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.05 mg/m ³ (as mercury). 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 4, oral LD ₅₀ = 40 mg/kg (rats). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Odorless.				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Fumes from fire may contain toxic mercury vapor 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazards: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Mallinckrodt Chemical Works 223 Westside Ave P.O. Box 384 Jersey City, N.J. 07304 2. J.T. Baker Chemical Co. Phillipsburg, N.J. 08865 3. Gallard-Schlesinger Chemical Mfg. Co. 584 Mineola Ave Carle Place, N.Y. 11514
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent 99+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-3). II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 454.90 13.3 Boiling Point at 1 atm: 669°F = 354°C = 627°K. 13.4 Freezing Point: 495°F = 258°C = 510°K. 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 6.3 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heat of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous solid, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	(Continued on pages 5 and 6)
NOTES	

MNT

MERCURIC NITRATE

Common Synonyms Mercury pernitrate Mercury (II) nitrate Mercury nitrate monohydrate	Solid White Sharp odor Sinks in water
AVOID CONTACT WITH SOLID DUST. KEEP PEOPLE AWAY Wear dust respirator and full protective gear. If dust is on clothes, change it as possible. Isolate and remove its large quantities. Stop work with dust until the area is clean.	
Fire	Not flammable Will increase the intensity of a fire POISONOUS GASES MAY BE PRODUCED WHEN HEATED
 Exposure	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing. If eyes are irritated, pour salt water with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected area with plenty of water. If EYES are irritated, open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have vomit back with milk and have victim lie on his left side. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, DO NOT GIVE ANYTHING BY MOUTH.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3) Issue warning: poison water contaminant: oxidizing material Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Mercuric nitrate monohydrate, Mercury (II) nitrate, Mercury pernitrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{Hg}(\text{NO}_3)_2 \cdot \text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: 6.1/1625	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid Color: White, colorless 4.3 Odor: sharp odor of nitric acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Acute systemic poisoning may be fatal within a few minutes death by uremic poisoning is usually delayed 5-12 days. Acute poisoning has resulted from inhaling dust concentrations of 1.2-8.5 mg/m ³ of air. Symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes nervous pain, vomiting, and severe purging. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, get medical attention. INGESTION: alimentary absorption is very rapid, action during first 10-15 min. determines prognosis. Give egg whites, milk or activated charcoal and induce vomiting; consult physician. EYES or SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.05 mg/m ³ (as mercury) 5.5 Short-Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable, but may intensify fire 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: vapors from fire may contain toxic mercury and oxides of nitrogen 6.6 Behavior in Fire: May increase intensity of fire if in contact with burning material 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Wet-snow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Possible bioaccumulation problem. Many organisms can accumulate mercury from water. Bioconcentration up to 10,000 fold
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Dissolves then forms cloudy acid solution. The reaction is not hazardous. 7.2 Reactivity with Common Materials: Solution will corrode most metals. Solid in contact with wood or paper may cause fire. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush well with water, rinse with dilute solution of sodium bicarbonate or soda ash. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Mallinckrodt Chemical Works 221 Westside Ave. P. O. Box 394 Jersey City, N. J. 07303 2. J. T. Baker Chemical Co. Phillipsburg, N. J. 08865 3. Pfaltz and Bauer, Inc. 175 Fairfield Ave. Stamford, Conn. 06902
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	10. SHIPPING INFORMATION 10.1 Grade or Purity: Reagent 99.9% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous solid, Class B 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 342.6 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 4.3 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

(See insert on pages 5 and 6)

MSF

MERCURIC SULFIDE

Common Synonyms Mercuric sulfide black Lumps mineral Mercuric sulfide red Vermilion Artificial cinnabar Chinese red		Solid	Red or black	Odorless
Sinks in water				
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY Wear dust respirator and rubber overclothing (including gloves). Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Wear goggles and self-contained breathing apparatus. Extinguish with water, foam or sand. Other extinguishing agents may be ineffective on fire.			
	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, artificial respiration. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes. If swallowed will cause coughing, nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning: water contaminant. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Mercuric sulfide black (lumps mineral), Mercuric sulfide, red (vermilion, Artificial cinnabar, Chinese red). 3.2 Coast Guard's Compatibility Classification: Not listed. 3.3 Chemical Formula: HgS. 3.4 IMCO/United Nations Numerical Designation: 6.1/2024.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Red or black. 4.3 Odor: None.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves. 5.2 Symptoms Following Exposure: Acute poisoning can result from inhaling dust concentrations of 12.5 mg/m ³ in air. Symptoms include pain and tightness in chest, coughing, and difficulty in breathing. If ingested, toxicity depends on release of the Hg ²⁺ ion. Chronic mercury poisoning can cause kidney, mental, and nervous system disturbances. Dust irritates eyes and frequently causes allergic dermatitis. Absorption through skin can cause systemic poisoning. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, give artificial respiration if breathing has stopped. INGESTION: give egg whites, milk, or activated charcoal, induce vomiting, consult physician. EYES: flush with water. SKIN: wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.05 mg/m ³ as mercuric. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Central nervous system effects, tremors, psychological disturbances in humans. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Odorless.				

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, sand 6.4 Fire Extinguishing Agents Not to be Used: Other agents may be ineffective 6.5 Special Hazards of Combustion Products: Smoke from fire contains poisonous mercury vapor and irritating sulfur dioxide gas 6.6 Behavior in Fire: Changes color when hot. Decomposes at burning temperature. The black form may soften, and molten sulfur may flow out and burn 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterbody Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Many organisms can accumulate mercury from water. Bioconcentration up to 10,000 fold
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerizability: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Ventron Corp. P.O. Box 159 Beverly, Mass. 01915 2. Gallard-Schlesinger Chemical Mfg. Co. 564 Mincola Ave. Carle Place, N.Y. 11514 3. Merck & Co. Merck Chemical Division 121 East Lincoln Ave. Rahway, N.J. 07065
	10. SHIPPING INFORMATION 10.1 Grade or Purity: The black form may contain up to 40% free sulfur 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 232.7 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 8 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 1,700 Btu/lb (solid) or 10,000 Btu/lb (liquid) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATION 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NIHA Hazard Classification: Not listed	

(continued on pages 1 and 2)

NOTES

MRR

MERCUROUS CHLORIDE

Common Synonyms Calomel Methylmercuric chloride Mercury monochloride Mercury protochloride Mercury subchloride		Solid	White	Odorless
Sinks in water				
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear dust respirator. Stop discharge of product. Evacuate area and decontaminate area. Notify local health and pollution control agencies.				
Fire		Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED		
 Exposure		CALL FOR MEDICAL AID DUST POISONOUS IF INHALED If inhaled will cause coughing or difficult breathing. If eyes, nose, mouth, skin, and throat with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONVULSING, have victim drink water or milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING NO CONVULSIONS, do nothing except keep victim warm.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant. Restrict access. Show it be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Calomel; Mercurys monochloride; Mercury protochloride; Mercurys subchloride; Methylmercurys chloride. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: Hg ₂ Cl ₂ (or Hg ₂ Cl). 3.4 IMCO/United Nations Numerical Designation: 4.1/2024.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: White. 4.3 Odor: None.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves. 5.2 Symptoms Following Exposure: Acute poisoning can result from inhaling dust concentrations of 1.2 - 8.5 mg/m ³ in air. Symptoms include pain and tightness in chest, coughing, and difficulty in breathing. Compound is an irritant, cathartic, or purgative. "Calomel sickness," a benign reaction with fever and rash, appears after about 1 week; seldom causes systemic poisoning but may be fatal if retained to 100 - 400 mg/kg. Contact with eyes causes mild irritation. 5.3 Treatment for Exposure: INHALATION: remove to fresh air; give artificial respiration if breathing has stopped. INGESTION: give egg whites, milk, or activated charcoal; induce vomiting; consult physician. EYES: flush with water. SKIN: wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.05 mg/m (as mercury). 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Grade 3 oral LD ₅₀ = 210 mg/kg rats. 5.7 Late Toxicity: Central nervous system effects: tremors, psychological disturbances in humans. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Odorless.				

5. FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable.
 6.2 **Flammable Limits in Air:** Not flammable.
 6.3 **Fire Extinguishing Agents:** Not pertinent.
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
 6.5 **Special Hazards of Combustion Products:** Fumes from fire may contain toxic vapors of substance.
 6.6 **Behavior in Fire:** Vaporizes and escapes as a sublimate.
 6.7 **Ignition Temperature:** Not pertinent.
 6.8 **Electrical Hazard:** Not pertinent.
 6.9 **Burning Rate:** Not pertinent.

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available.
 8.2 **Waterfowl Toxicity:** Data not available.
 8.3 **Biological Oxygen Demand (BOD):** Data not available.
 8.4 **Food Chain Concentration Potential:** Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold.

9. SELECTED MANUFACTURERS

1. Mallockrodt Chemical Works
 223 Westside Ave.
 P.O. Box 384
 Jersey City, N.J. 07303
 2. Gallard Schlegler Chemical Mfg. Co.
 584 Mincola Ave.
 Clark Place, N.Y. 11114
 3. Pfaltz and Bauer, Inc.
 175 Fairfield Ave.
 Stamford, Conn. 06902

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction.
 7.2 **Reactivity with Common Materials:**
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Corrosives:** Not pertinent.
 7.5 **Polymerization:** Not pertinent.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** NF Technical 99.9% Reagent.
 10.2 **Storage Temperature:** Ambient.
 10.3 **Inert Atmosphere:** No requirement.
 10.4 **Venting:** Open.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 II

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid.
 13.2 **Molecular Weight:** 276.1.
 13.3 **Boiling Point at 1 atm:** Not pertinent.
 13.4 **Freezing Point:** Not pertinent.
 13.5 **Critical Temperature:** Not pertinent.
 13.6 **Critical Pressure:** Not pertinent.
 13.7 **Specific Gravity:** 7.14 at 20°C (solid).
 13.8 **Liquid Surface Tension:** Not pertinent.
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
 13.12 **Latent Heat of Vaporization:** Not pertinent.
 13.13 **Heat of Combustion:** Not pertinent.
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** Not pertinent.
 13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 5 and 6)

NOTES

MRN

MERCUROUS NITRATE

Common Synonyms Mercury protonate Mercurous nitrate monohydrate		Solid	White	Slight odor
Sinks in water				
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear dust respirator and rubber overclothing, including gloves. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agency.				
Fire		Not flammable Will increase the intensity of a fire POISONOUS GASES MAY BE PRODUCED WHEN HEATED		
 Exposure		ALL FOR MEDICAL AID DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes. If swallowed it will cause nausea and vomiting. Remove all contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk and have victim induce vomiting. If SWALLOWED and victim is UNCONSCIOUS, DO NOT INDUCE VOMITING. (CONVULSIONS) If nothing else, keep victim warm.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify personnel of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison, water containments: oxidizing material Restrict access Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Mercurous nitrate monohydrate; Mercury protonate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: HgNO ₃ · H ₂ O 3.4 IMCO/United Nations Numerical Designation: 6.1.1627		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Slight odor of nitric acid		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Acute systemic poisoning may be fatal within a few minutes; death by systemic poisoning is usually delayed 5-12 days. Acute poisoning has resulted from inhaling dust concentrations of 1.2-3.5 mg/m ³ of air. Symptoms include tightness and pain in chest, coughing, and difficulty in breathing. Ingestion causes necrosis, pain, vomiting, and severe purging. Contact with eyes causes ulceration of conjunctiva and cornea. Contact with skin causes irritation and possible dermatitis; systemic poisoning can occur by absorption through skin. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, get medical attention. INGESTION: give egg whites, milk, or activated charcoal; induce vomiting; consult physician. EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.05 mg/m (as mercury) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 oral LD ₅₀ = 297 mg/kg rats 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable, but may intensify fire 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Smoke from fire may contain toxic mercury vapor and oxides of nitrogen 6.6 Behavior in Fire: May increase intensity of fire 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Possible bioaccumulation problem. Many organisms can accumulate mercury from water. Bioconcentrative up to 10,000 fold
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Dissolves then forms cloudy acid solution. The reaction is not hazardous 7.2 Reactivity with Common Materials: Solution may corrode most metals. Solid in contact with wood or paper may cause fire 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water; rinse with dilute solution of sodium bicarbonate or soda ash 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 J. T. Baker Chemical Co. Phillipsburg, N. J. 08865 2 Gallard-Schlesinger Chemical Mfg. Co. 584 Mineola Ave. Carle Place, N. Y. 11514 3 Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent, Purified 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 280.6 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 4.78 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizer 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

(continued on pages 1 and 2)

Common Synonyms Quackalver	Liquid Sinks in water	Silver	Odorless
AVOID CONTACT WITH SKIN AND EYES. Wash immediately with soap and water. If swallowed, do not induce vomiting. Seek medical attention.			
Fire	Not flammable		
Exposure	LIQUID Effects of exposure may be delayed		
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-A) Should be removed Chemical and physical treatment		2. LABELS No Hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Quackalver 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: Hg 3.4 HMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Silver 4.3 Odor: None	
5. HEALTH HAZARDS			
5.1 Personal Protective Equipment: Avoid contact of liquid with skin. For vapor use chemical cartridge (Hopackite) respirator			
5.2 Symptoms Following Exposure: No immediate symptoms. As poisoning becomes established slight muscular tremor, loss of appetite, nausea, and diarrhea are observed. Poisoning of kidneys, and cardiovascular disturbances may occur			
5.3 Treatment for Exposure: Consult a doctor			
5.4 Toxicity by Inhalation (Threshold Limit Value): 0.05 mg/m³			
5.5 Short-Term Inhalation Limits: Data not available			
5.6 Toxicity by Ingestion: No immediate toxicity			
5.7 Late Toxicity: Development of mercury poisoning			
5.8 Vapor (Gas) Irritant Characteristics: None			
5.9 Liquid or Solid Irritant Characteristics: None			
5.10 Odor Threshold: Not pertinent			

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.5 l ppm/48 hr/carpagus aedium, TL m / fresh water 0.29 ppm/48 hr/marine fish, TL m / salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Mercury concentrates in liver and kidneys of ducks and geese to levels above FDA limit of 0.5 ppm. Muscle tissue usually well below the limit
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Belmont Smelting and Refining Works, Inc 330 Belmont Ave Brooklyn, N.Y. 11207 2 Engelhard Minerals and Chemical Corp Phillips Bros. Division 299 Park Ave New York, N.Y. 10017 3 NI Industries Goodwin Division 900 W. 18th St Chicago, Ill 60608
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CS-446-3) A-X	10. SHIPPING INFORMATION 10.1 Grade or Purity: Pure 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Ventilating: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: ORM B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 200.59 13.3 Boiling Point at 1 atm: 65.5°C = 147°F = 630°K 13.4 Freezing Point: -34.0°F = -34.9°C = 234.1°K 13.5 Critical Temperature: 264°F = 142°C = 171°K 13.6 Critical Pressure: 23,300 psia = 1587 atm = 160.5 MN/m² 13.7 Specific Gravity: 13.55 at 20°C (liquid) 13.8 Liquid Surface Tension: 470 dynes/cm = 0.470 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 175 dynes/cm = 0.175 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 7 and 8)

NOTES

MSO

MESITYL OXIDE

Common Synonyms 4-methyl-3-pent-2-one Isopropylidenacetone Methyl isobutyl ketone	Liquid Colorless to light yellow Strong peppermint or honey odor Floats and mixes with water. Flammable. Irritating vapor is produced.
Fire	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness or difficult breathing. LIQUID Irritating to skin and eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Through Function: CG 446-1. Issue warning: water contaminant. Restrict access. Dispense and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Isobutyl methyl ketone Isopropylideneacetone; Methyl isobutyl ketone; 4-Methyl-3-pentene-2-one 3.2 Corrosion Compatibility Classification: Ketone 3.3 Chemical Formula: $\text{CH}_3\text{COCH}(\text{CH}_3)_2$ 3.4 IMCO/United Nations Numerical Designation: 11-1229	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to slightly yellow 4.3 Odor: Strong, peppermint, honeylike
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air pack or organic canister mask, rubber gloves, goggles. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat, headache, dizziness, difficult breathing. Contact with liquid or concentrated vapor causes severe eye irritation. Liquid irritates skin. Ingestion causes irritation of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: move victim to fresh air and restore breathing, call physician. EYES: immerse eyes with plenty of water for at least 15 min. SKIN: wash with water. INGESTION: give large amount of water, call physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm 5.5 Short-Term Inhalation Limits: 1,000 ppm for 60 min 5.6 Toxicity by Ingestion: Lethal LD_{50} = 1,120 mg/kg rats 5.7 Lethal Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure; may cause second degree burns on long exposure. 5.10 Odor Threshold: 12 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 84°F O.C. 73°F C.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 652°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 4.2 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Union Carbide Corporation Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017 2 Shell Chemical Company Industrial Chemicals Division P.O. Box 2463 Houston, Texas 77001 3 Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14650																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook: CG 446-3) A-P-Q-T-U	10. SHIPPING INFORMATION 10.1 Grades or Purity: 97-98 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arresters)																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="974 1401 1205 1660"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>2</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxics</td> <td>2</td> </tr> <tr> <td>Aquatic Toxics</td> <td>3</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>2</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="974 1681 1205 1767"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	2	Liquid or Solid Irritant	2	Poisons	2	Water Pollution		Human Toxics	2	Aquatic Toxics	3	Aesthetic Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 98.2 13.3 Boiling Point at 1 atm: 106°F = 40°C = 303°K 13.4 Freezing Point: -51°F = -36°C = 227°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.853 at 20°C (aqueous) 13.8 Liquid Surface Tension: 22.9 dynes/cm = 0.0229 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.4 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 157 Btu/lb = 37 cal/g = 1.7×10^5 J/kg 13.13 Heat of Combustion: -14,800 Btu/lb = -3,000 cal/g = -1.0×10^7 J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	2																																				
Liquid or Solid Irritant	2																																				
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Flammability (Red)	1																																				
Reactivity (Yellow)	0																																				
NOTES (continued on pages 1 and 6)																																					

MCL

METHALLYL CHLORIDE

Common Synonyms 1-Chloro-2-methylpropene gamma-Chlorobutylene beta-Methylchloride beta-Methylchloride		Liquid Colorless to yellow Sharp penetrating odor
Boiling point: 37.1°C (99°F) Melting point: -104.3°C (-155.7°F) Vapor pressure: 100 mm Hg at 20°C Density: 0.89 g/cm³ at 20°C Specific gravity: 0.89 at 20°C Refractive index: 1.38 at 20°C		
Fire		FLAMMABLE Irritating gases may be produced when heated Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Flashback with dry, metallic surfaces may occur May be ineffective with water Exposure: Irritation with the eyes
Exposure		VAPOR Harmful if inhaled May irritate eyes, nose, and throat If breathed has a typical ether-like irritation If breathing difficulty occurs, stop exposure LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing as soon as possible Flush affected areas with water for 15 minutes If IN EYES, hold eyelids open and flush with plenty of water If SWALLOWED, do not induce vomiting unless told to do so by a physician If SWALLOWED, drink water to help dilute and swallow If SWALLOWED, do not induce vomiting unless told to do so by a physician
Water Pollution		Effect of low concentrations on aquatic life is unknown Feeding to shoreline May be dangerous if it enters water intakes No data on biodegradability No data on persistence in water
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Toxic warning - high flammability Restrict access Mechanical containment Should be removed Chemical and physical treatment		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: gamma-Chlorobutylene, 1-Chloro-2-methylpropene, beta-Methylchloride, beta-Methylchloride 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₄ H ₇ Cl 3.4 HBCO/United Nations Numerical Designation: 1.2 1901		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to straw 4.3 Odor: Pungent, penetrating
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic canister mask, goggles, rubber gloves 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Contact of vapor or liquid with eyes causes irritation. Liquid irritates skin. Exposure causes irritation of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air. If breathing stops, give artificial respiration and oxygen. Subsequent treatment is symptomatic and supportive. Flush with water for at least 15 min., get medical attention if exposure has been to liquid. No skin flush with water, get medical attention if skin is burned. INGESTION: induce vomiting and follow with gastric lavage, demulcents, and saline cathartics, get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: 12°F (10°C) 6.2 Flammable Limits in Air: 2.1% - 9.1% 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Irritating and toxic hydrogen chloride and phosgene vapors may be formed 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 4.4 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Foul Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. FMC Corporation Industrial Chemical Division 633 Third Avenue New York, N.Y. 10017 2. Progil, Inc. 409 Madison Ave. New York, N.Y. 10022 3. Aldrich Chemical Co. 940 West St. Paul Ave. Milwaukee, Wis. 53233
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T C V W	10. SHIPPING INFORMATION 10.1 Grades or Purities: 95+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure vacuum
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 90.55 13.3 Boiling Point at 1 atm: 37.1°C = 99.2°F = 310.3°K 13.4 Freezing Point: -104.3°C = -155.7°F = 169.2°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.89 at 20°C (liquid) 13.8 Liquid Surface Tension: (est.) 24 dynes/cm = 0.024 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (est.) 12 dynes/cm = 0.012 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: 1.12 13.11 Ratio of Specific Heats of Vapor (Gas): 1.089 13.12 Latent Heat of Vaporization: 160 Btu/lb = 39 cal/g = 1.7×10^5 J/kg 13.13 Heat of Combustion: (est.) -14,600 Btu/lb = -6,600 cal/g = -270×10^3 J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES (Continued on pages 5 and 6)	

MTH

METHANE

Common Synonyms Marsh gas Natural gas	Liquid or gas Colorless Weak odor Liquid floats and boils on water. Flammable visible vapor cloud is produced.
Fire	FLAMMABLE. Flashback along vapor trail may occur. May explode if ignited in an enclosed area.
Exposure	VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause dizziness, difficult breathing, and loss of consciousness. LIQUID Will cause frostbite.
Water Pollution	Not harmful to aquatic life.
1. RESPONSE TO DISCHARGE See Response Methods Manual, CG 404.4 Toxic warning: High Concentration Restrict access Evacuate area	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonym: Marsh gas 3.2 Coast Guard Compatibility Classification: Paraffin 3.3 Chemical Formula: CH ₄ 3.4 IMCO United Nations Numerical Designation: 2019	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Gas 4.2 Color: Colorless 4.3 Odor: Weak odor
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus for high concentrations; protective clothing if exposed to liquid. 5.2 Symptoms Following Exposure: High concentrations may cause dizziness and loss of consciousness, even at 1% concentration in air. 5.3 Treatment for Exposure: Remove to fresh air. Support respiration. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not persistent (methane is an asphyxiant, and limiting factor is available oxygen). 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Not pertinent. 5.7 Oral Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the nose and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin because of evaporative property. But may cause some frostbite. 5.10 Odor Threshold: 700 ppm.	

6 FIRE HAZARDS

- 6.1 Flash Point: Flammable gas
- 6.2 Flammable Limits in Air: 4.7% - 15.0%
- 6.3 Fire Extinguishing Agents: Suffocation of gas
- 6.4 Fire Extinguishing Agents Not to be Used: Water
- 6.5 Special Hazards of Combustion Products: None
- 6.6 Behavior in Fire: Not pertinent
- 6.7 Ignition Temperature: 1044°F
- 6.8 Electrical Hazard: Class I Group D
- 6.9 Burning Rate: 12 cm/min

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: None
- 8.2 Waterfowl Toxicity: None
- 8.3 Biological Oxygen Demand (BOD): None
- 8.4 Feed Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

- 1. Air Products and Chemicals, Inc.
Allentown, Pa. 18106
- 2. Phillips Petroleum Co.
Marionville, Mo. 64659
- 3. Upride Carbide Corp.
Lynde Division
270 Park Ave.
New York, N.Y. 10017

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials: No reaction
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10 SHIPPING INFORMATION

- 10.1 Grades or Purities: Research grade, pure grade
- 10.2 Storage Temperature: -200°F
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Manual, CG 404.4
 ABC DEFG

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable compressed gas
- 12.2 HAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Toxic	2
Health	
Vapor Hazard	1
Liquid or Solid Hazard	1
Poison	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	1
Non-Aquatic Toxicity	1
Reactivity	
Other Chemicals	1
Water	1
Self-Reaction	1

12.3 NFPA Hazard Classifications: 2.1, 1, 1

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Gas
- 13.2 Molecular Weight: 16.04
- 13.3 Boiling Point at 1 atm: -162.0°C (-260°F)
- 13.4 Freezing Point: -182.5°C (-266.5°F)
- 13.5 Critical Temperature: -130.6°C (-193.1°F)
- 13.6 Critical Pressure: 45.8 atm (4.64 MPa)
- 13.7 Specific Gravity: 0.423 at 15°C (liquid)
- 13.8 Liquid Surface Tension: 14.6 dynes/cm (0.014 N/m) at 15°C
- 13.9 Liquid-Water Interfacial Tension: 19.7 dynes/cm (0.0197 N/m) at 15°C
- 13.10 Vapor (Gas) Specific Gravity: 0.554
- 13.11 Ratio of Specific Heats of Vapor (Gas): 1.31
- 13.12 Latent Heat of Vaporization: 510.4 Btu/lb (-1.15 kcal/g) at 15°C
- 13.13 Heat of Combustion: -12.557 Btu/lb (-2.91 kcal/g) at 15°C
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

NOTES

REVISED 1978

MSA

METHANEARSONIC ACID, SODIUM SALTS

Common Synonyms: Dimethyl arsenate Monomethyl methanearsonate MSMA DSMA	Solid, or water solution (colours solid solution may be red or green) Odorous Solid may float or sink in water; solid and solution mix with water
Physical Properties: Molecular Weight: 146.04 (MSMA) Molecular Weight: 162.04 (DSMA) Density: 1.45 (MSMA) Density: 1.45 (DSMA)	Fire: Not flammable POISONOUS GASES ARE PRODUCED WHEN HEATED
Exposure: SOLID OR SOLUTION Irritating to skin and eyes. If swallowed, and cause nausea, vomiting, or loss of consciousness. Harmful if absorbed through the skin. Fumes irritate the respiratory tract. If INHALED, some irritation of the nose, throat and lungs may occur. If SWALLOWED, some irritation of the mouth and throat may occur. If SKIN CONTACT, some irritation may occur. If EYE CONTACT, some irritation may occur.	Water Pollution: Dangerous to aquatic life at high concentrations. May be dangerous if it enters water intakes. Not a health hazard to humans. Not a health hazard to animals.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: poison, water contamination. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dimethyl methanearsonate Dimethyl methyl arsenate DSMA Monomethyl methanearsonate Monomethyl methyl arsenate MSMA 3.2 Coast Guard Compatibility Classification: Not applicable	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or water solution 4.2 Color: Colorless; solutions may contain red or green dyes 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing to prevent contact with skin chemical agents. 5.2 Symptoms Following Exposure: Nausea, vomiting, diarrhoea, salivary taste, burning in throat and stomach, and muscular pain. Acute toxicity indicated by headache, vomiting, stupor, convulsions, paralysis. About 1 ounce to 1 pound must be taken to cause these symptoms. 5.3 Treatment for Exposure: INGESTION: cause vomiting, give water and repeat, give a saline cathartic such as sodium sulfate. SKIN: wash with soap and water. EYES: wash with water, consult physician if irritation remains. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limit: Not pertinent 5.6 Toxicity by Ingestion: Grade 2 (LD₅₀ 1.5 g/kg rats) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristic: None 5.9 Liquid or Solid Irritant Characteristic: Repeated contact may cause skin irritation. 5.10 Odor Threshold: Not pertinent	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic gases may be generated in fires. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: >1000 ppm 48 hr bluegill or fish LC₅₀ fresh water 8.2 Waterford Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: None 7.2 Reactivity with Common Materials: None 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 The Ansol Co Chemical Division 1 Stanton St Marquette, Wis. 54143 2 Diamond Shamrock Corp Buckhorn, Ind. 500 E. 100th Commerce Bldg Cleveland, Ohio 44115 3 Velsicol Chemical Co P.O. Box 749 Vinceland, N.J. 08360
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) SS 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous liquid or solid, Class B 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or water solution 13.2 Molecular Weight: 162 (MSMA) 292 (DSMA hexahydrate) 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: (MSMA) 24.5°C (117°C = 300°F) (DSMA) 11°C = 51°F = 32°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: (DSMA) 1.0 at 20°C (solid) (MSMA solutions) 1.4 - 1.6 at 20°C (liquids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
3. CHEMICAL DESIGNATIONS (Cont'd.) 3.3 Chemical Formula: CH₃AsO(OH)(ONa)₂ CH₃AsO(OH)(ONa)₂ 3.4 NCO United Nations Numerical Designation: 6.1.107	

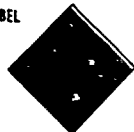
MOC

METHOXYCHLOR

Common Synonyms 2,2-Di-(p-aminyl)-1,1,1-trichloroethane DMDT Methoxy DDT 2,2-Bis-(p-methoxyphenyl)-1,1,1-trichloroethane		Solid	White to light yellow	Mild fruity odor
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear goggles and dust respirator. Call fire department. Stay upwind. Use water spray to knock down dust. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE Extinguish with water, dry chemicals, foam, or carbon dioxide.			
	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Move victim to fresh air. If in eyes, hold eyelids open and flush with plenty of water. If breathing is difficult, give oxygen. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If in eyes, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk.			
Exposure				
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison water contaminant. Restrict access. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,2-Bis-(p-methoxyphenyl)-1,1,1-trichloroethane, 2,2-Di-(p-aminyl)-1,1,1-trichloroethane, DMDT, Marlate 50, Methoxy DDT. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: C ₁₄ H ₁₁ Cl ₃ O ₂ . 3.4 IMCO/United Nations Numerical Designation: 611615.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Light cream, white to light yellow. 4.3 Odor: Slightly fruity.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator if needed, gloves and goggles. 5.2 Symptoms Following Exposure: Toxicity is relatively low. Inhalation or ingestion causes generalized depression. 5.3 Treatment for Exposure: IF YES: flush with water if irritated. SKIN: wash well with soap and water. INGESTION: consult physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 mg/m ³ . 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade I, LD ₅₀ 5 to 15 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.				
6. FIRE HAZARDS 6.1 Flash Point: Burns only at high temperatures. For liquid forms, see Kerosene. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Irritating and toxic hydrogen chloride gas may be formed in fire. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.				
8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.035 ppm/96 hr/fathead/11 m/fresh water; 0.04-0.12 ppm/96 hr/marine crustacea/11 m/salt water. 8.2 Waterfowl Toxicity: LD ₅₀ = 2,000 mg/kg. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: Data not available.				
9. SELECTED MANUFACTURERS 1. Ansol Co. 1 Stanton Street Marinette, Wis. 54143. 2. Chemical Formulators, Inc. P.O. Box 26 Nitro, W. Va. 25143. 3. I. I. duPont de Nemours & Co. Biochemicals Department 308 East Lancaster Ave. Wynnewood, Pa. 19096.				
10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical flake or chip 88% plus 12% isomers, Wettable powders 50-75% Dust concn rate 40% Emulsifiable concentrate (liquid) 25% solution in petroleum distillate. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.				
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 345.7. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: 171-192°F = 77-89°C = 350-362°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.41 at 25°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.				
NOTES (Continued on pages 5 and 6.)				

MTT

METHYL ACETATE

Common Synonyms Acetic acid, methyl ester		Liquid	Colorless	Mild sweet odor
		Mixes with water. Flammable, irritating vapor is produced.		
Shut off all ignition sources, all fire, keep smothered. Stop discharge if possible. Keep people away. May irritate eyes, water spray (if used) may irritate vapor. Be sure to remove fuel from fire area. Notify local health and pollution control agency.				
Fire		FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals or foam. Do not use water. Water may become acidic in fire. Do not use containers with water.		
Exposure		Call for medical aid. VAPOR: Irritating to eyes, nose and throat. If inhaled will cause headache, or dizziness. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is shallow, give oxygen. LIQUID: Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. Have victim drink water. Do not drink.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify proper authorities if it enters water intake.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability. Restrict access. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetic acid, methyl ester 3.2 Coast Guard Compatibility Classification: Esters (13) 3.3 Chemical Formula: $\text{CH}_3\text{COOCH}_3$ 3.4 IMCO/United Nations Numerical Designation: 12/1211		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Slightly acid, sweet, fragrant		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air mask or organic canister mask, goggles or face shield. 5.2 Symptoms Following Exposure: (Very similar to those of methyl alcohol, which constitutes 20% of commercial grade.) Inhalation causes headache, fatigue, and drowsiness; high concentrations can produce central nervous system depression and optic nerve damage. Liquid irritates eyes and may cause defatting and cracking of skin. Ingestion causes headache, dizziness, drowsiness, fatigue, may cause severe eye damage. 5.3 Treatment for Exposure: INHALATION: remove victim from affected area. If breathing has ceased, apply artificial respiration, call doctor. EYES: irrigate thoroughly with water for 15 min and call doctor. SKIN: wash affected area with water. INGESTION: get medical attention for methyl alcohol poisoning. 5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm 5.5 Short-Term Inhalation Limits: 400 ppm for 5 min 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 3,700 mg/kg (rabbit) 5.7 Late Toxicity: Optic nerve may be damaged following overexposure to vapor or liquid. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: 22°F (0°C) 14°C (57°F)	8.1	Aquatic Toxicity: Data not available
6.2	Flammable Limits in Air: 3.1% - 16%	8.2	Waterway Toxicity: Data not available
6.3	Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide	8.3	Biological Oxygen Demand (BOD): Data not available
6.4	Fire Extinguishing Agents Not to be Used: Water may be ineffective	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: Not pertinent		
6.6	Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back	9 SELECTED MANUFACTURERS	
6.7	Ignition Temperature: 915°F	1	Union Carbide Corporation Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017
6.8	Electrical Hazard: Data not available	2	Monsanto Polymers & Petrochemicals Co. 590 North Lindbergh boulevard St. Louis, Mo. 63166
6.9	Burning Rate: 3.7 mm/min	3	Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14650
7 CHEMICAL REACTIVITY			
7.1	Reactivity with Water: Reacts slowly to form acetic acid and methyl alcohol; the reaction is not violent	10 SHIPPING INFORMATION	
7.2	Reactivity with Common Materials: No reaction	10.1	Grades or Purity: 75-82% remainder is methyl alcohol
7.3	Stability During Transport: Stable	10.2	Storage Temperature: Ambient
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent	10.3	Inert Atmosphere: No requirement
7.5	Polymerization: Not pertinent	10.4	Venting: Pressure/vacuum
7.6	Inhibitor of Polymerization: Not pertinent		
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P Q R-S		13. PHYSICAL AND CHEMICAL PROPERTIES	
12. HAZARD CLASSIFICATIONS		13.1	Physical State at 15°C and 1 atm: Liquid
12.1	Code of Federal Regulations: Flammable liquid	13.2	Molecular Weight: 74.1
12.2	HAS Hazard Rating for Bulk Water Transportation:	13.3	Boiling Point at 1 atm: 124.6°F = 57.0°C = 330.2°K
	Category Rating	13.4	Freezing Point: -145.1°F = -98.5°C = 174.7°K
	Fire 3	13.5	Critical Temperature: 452.7°F = 233.7°C = 506.9°K
	Health	13.6	Critical Pressure: 666 psia = 45.3 atm = 4.60 MN/m ²
	Vapor Irritant 2	13.7	Specific Gravity: 0.927 at 20°C (liquids)
	Liquid or Solid Irritant 0	13.8	Liquid Surface Tension: 24 dynes/cm = 0.024 N/m at 20°C
	Poisons 1	13.9	Liquid-Water Interfacial Tension (est.): 30 dynes/cm = 0.030 N/m at 20°C
	Water Pollution	13.10	Vapor (Gas) Specific Gravity: 2.8
	Human Toxicity 3	13.11	Ratio of Specific Heats of Vapor (Gas): 1.1192
	Aquatic Toxicity 2	13.12	Latent Heat of Vaporization: 174 Btu/lb = 97 cal/g = 4.1 × 10 ⁵ J/kg
	Aesthetic Effect 1	13.13	Heat of Combustion: 9,260 Btu/lb = 5,150 cal/g = 215 × 10 ³ J/kg
	Reactivity	13.14	Heat of Decomposition: Not pertinent
	Other Chemicals 1	13.15	Heat of Solution: Not pertinent
	Water 0	13.16	Heat of Polymerization: Not pertinent
	Self Reaction 0		
12.3	NFPA Hazard Classifications:		
	Category Classification		
	Health Hazard (Blue) 1		
	Flammability (Red) 3		
	Reactivity (Yellow) 0		
		(Continued on pages 5 and 6)	
NOTES			

Common Synonyms		Liquefied compressed gas	Colorless	Garlic-like odor
		*Boils and boils on water. Flammable visible vapor cloud is produced.		
Shut off ignition sources. Call fire department. Avoid contact with liquid. Keep people away. Stop discharge if possible. Evacuate area if you can't handle discharge. Notify local health and pollution control agencies.				
Fire	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Let fire burn. Stop flow of gas if possible. Control exposed containers and protect from reaction, shut off with water.			
Exposure	Call for medical aid. VAPOR If inhaled will cause difficult breathing. Move victim to fresh air. If breathing is difficult, give oxygen. LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.			
Water Pollution	Not harmful to aquatic life.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability. Restrict access. Evacuate area.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Allene, methylacetylene mixture, MAPP gas, methylacetylene allene mixture, Propadiene, methylacetylene mixture. 3.2 Coast Guard Compatibility Classification: Olefin. 3.3 Chemical Formula: $\text{CH}_3\text{C}\equiv\text{CH} + \text{CH}_2=\text{C}=\text{CH}_2$ 3.4 IMCO/United Nations Numerical Designation: 21060		4. OBSERVABLE CHARACTERISTICS 4. Physical State (as shipped): Liquefied compressed gas. 4.2 Color: Colorless. 4.3 Odor: Often says like acetylene.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus for high concentrations, safety goggles, protective gloves. 5.2 Symptoms Following Exposure: Simple asphyxiant. Toxicology of propadiene component not fully established. Contact with liquid may burn eyes and cause frostbite of skin. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, give artificial respiration if necessary. EYES or SKIN: treat burns caused by cold liquid. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1000 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Not pertinent. 5.7 Late Toxicity: Lung irritation in rats and dogs. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: 100 ppm.				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent (flammable liquefied compressed gas) 6.2 Flammable Limits in Air: 3.4 - 11% 6.3 Fire Extinguishing Agents: Let fire burn shut off gas supply, cool adjacent exposures 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Containers may explode 6.7 Ignition Temperature: 850°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction, except forms explosive compounds in contact with alloys containing more than 67% copper at high pressures 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. MAPP Products 100 Mountain Avenue New Providence, N.J. 07974
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-B-C-D-E-F-G	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 65% of a mixture of methylacetylene (85%) and propadiene (15%) plus 35% of a mixture of C ₂ and C ₄ saturated and unsaturated hydrocarbons 10.2 Storage Temperature: Ambient but less than 125°F 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas 12.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 40.1 13.3 Boiling Point at 1 atm: -36 to -4°F = -38 to -20°C = 235 to 253°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.976 at 15°C (liquid) 13.8 Liquid Surface Tension: 18 dynes/cm = 0.018 N/m at -24°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.48 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1686 13.12 Latent Heat of Vaporization: 227 Btu/lb = 126 cal/g = 5.28 x 10 ³ J/kg 13.13 Heat of Combustion: -19,800 Btu/lb = -11,000 cal/g = -460 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
(Continued on pages 5 and 6.)	
NOTES	

Common Synonyms Acrylic acid methyl ester Methyl 2-propenoate	Watery liquid Colorless Sweet sharp odor Floats and mixes slowly with water. Flammable irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Containers may explode when heated. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. LIQUID Will burn skin and eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline may be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability. Evacuate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acrylic acid methyl ester Methyl 2-propenoate 3.2 Coast Guard Compatibility Classification: Acrylate 3.3 Chemical Formula: $\text{CH}_2=\text{CHCOOCH}_3$ 3.4 IMCO/United Nations Numerical Designation: 32/1919	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Characteristic acrylic, sweet, sharp, slightly fragrant
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor respirator for high vapor concentrations; rubber gloves; chemical goggles or face shield. 5.2 Symptoms Following Exposure: May irritate skin, eyes, respiratory system, and gastro-intestinal tract. Turns cause tears. 5.3 Treatment for Exposure: INHALATION: remove to fresh air; lay patient down; keep him warm; administer artificial respiration if breathing has stopped; administer oxygen. SKIN OR EYES: flush with plenty of water for 15 min.; consult physician for eye exposure. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 5.5 Short-Term Inhalation Limits: 25 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 50 to 500 mg/kg (rabbit) 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause second-degree burns on long exposure. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 27°F (-2°C), 44°F (0°C) 6.2 Flammable Limits in Air: 2.8% - 25% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Irritating vapors are generated in fires. 6.6 Behavior in Fire: May polymerize. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Heat may cause an explosive polymerization. Strong ultraviolet light can also initiate polymerization. 7.6 Inhibitor of Polymerization: Hydroquinone and its methyl ether, in presence of air.	9. SELECTED MANUFACTURERS 1 Celanese Corp. Celanese Chemical Co. Division 245 Park Ave. New York, N.Y. 10017 2 Dow Badische Co. Freeport, Tex. 77541 3 Rohm and Haas Co. Independence Mall West Philadelphia, Pa. 19105																																				
10. SHIPPING INFORMATION 10.1 Grade or Purity: 99.9% 10.2 Storage Temperature: Ambient if material is inhibited, under 40°F if no inhibitor. 10.3 Inert Atmosphere: Air MUST be present. 10.4 Venting: Open (flame arrester).																																					
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-P-Q-T-U-V-W-Z	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 86.09 13.3 Boiling Point at 1 atm: 177°F = 80.6°C = 353.8°K 13.4 Freezing Point: -105.7°F = -75.5°C = 190.2°K 13.5 Critical Temperature: 505°F = 263°C = 536°K 13.6 Critical Pressure: 630 psia = 43 atm = 4.3 MN/m ² 13.7 Specific Gravity: 0.946 at 20°C (liquid) 13.8 Liquid Surface Tension: 24.2 dyne/cm = 0.0242 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (est.) 30 dyne/cm = 0.03 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: 4.0 13.11 Ratio of Specific Heats of Vapor (Gas) 1.102 13.12 Latent Heat of Vaporization: 1.0 Btu/lb = 90 cal/g = 3.8 × 10 ⁵ J/kg 13.13 Heat of Combustion: (est.) -9900 Btu/lb = -5500 cal/g = -230 × 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: -392 Btu/lb = -218 cal/g = -9.13 × 10 ⁵ J/kg																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>3</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td>Poisons</td><td>3</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>2</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>3</td></tr> </tbody> </table> 12.3 NIPI Hazard Classifications: <table> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	3	Liquid or Solid Irritant	2	Poisons	3	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	3	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	2	(Continued on pages 5 and 6)
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NOTES

MAL

METHYL ALCOHOL

Common Synonyms Methanol Wood alcohol Wood naphtha Wood spirit Pyrolytic spirit	Watery liquid Colorless Alcohol odor Floats and mixes with water. Flammable, irritating vapor is produced.
No discharge or smoke. Keep people away. Shut off liquid leaks and spill in department. Stop up and use water spray if fire. Avoid fire. Vapor. Avoid contact with irritated vapor. Isolate and remove to large outdoors. Notify local health and pollution control agencies.	
Fire	FLAMMABLE: Vapor may explode if ignited in an enclosed area. Flashback along vapor trail may occur. Extinguish with dry chemical, alcohol foam, carbon dioxide. Water may be ineffective on fire. Confined spaces: Containers with water.
 Exposure	CAUTION - IRRITANT VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness. Move to fresh air. Breathing has stopped: Give artificial respiration. If breathing is difficult: Give oxygen. LIQUID POISONOUS IF SWALLOWED Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED: Do not induce vomiting. GIVE NOTHING TO DRINK. Water if no nausea and have victim lie on his side to prevent aspiration. IF SWALLOWED: Do not induce vomiting. GIVE NOTHING TO DRINK. Water if no nausea and have victim lie on his side to prevent aspiration.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify appropriate agencies as required.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability Restrict access Evacuate area Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: Colonial spirit, Wood alcohol, Columbian sp., Wood naphtha, Methanol, Wood spirit 32 Coast Guard Compatibility Classification: Alcohol 33 Chemical Formula: CH ₃ OH 34 IMCO/United Nations Numerical Designation: 3.2/12.30	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Faint alcohol, like ethyl alcohol, faintly sweet, characteristic pungent
5. HEALTH HAZARDS 51 Personal Protective Equipment: Approved canister mask for high vapor concentrations, safety goggles, rubber gloves. 52 Symptoms Following Exposure: Exposure to excessive vapor causes eye irritation, headache, fatigue and drowsiness. High concentrations can produce central nervous system depression and optic nerve damage. 50,000 ppm will probably cause death in 1 to 2 hrs. Can be absorbed through skin. Swallowing may cause death or eye damage. 53 Treatment for Exposure: Remove victim from exposure and apply artificial respiration if breathing has ceased. INGESTION: induce vomiting, then give 2 teaspoons of baking soda in glass of water, call a physician. SKIN OR EYES: flush with water for 15 min. 54 Toxicity by Inhalation (Threshold Limit Value): 200 ppm 55 Short-Term Inhalation Limits: 260 mg/m ³ for 60 min 56 Toxicity by Ingestion: Grade 1, 5 to 15 g/kg (rat) 57 Low Toxicity: None 58 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 59 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 510 Odor Threshold: 100 ppm	

6. FIRE HAZARDS

- 51 **Flash Point:** 54°F (C) 61°F (C)
 52 **Flammable Limits in Air:** 6.0% - 36.5%
 53 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide.
 54 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
 55 **Special Hazards of Combustion Products:** Not pertinent.
 56 **Behavior in Fire:** Containers may explode.
 57 **Ignition Temperature:** 867°F
 58 **Electrical Hazard:** Class I, Group D.
 59 **Burning Rate:** 1.7 mm/min

8. WATER POLLUTION

- 81 **Aquatic Toxicity:** 240 ppm/11 hr/goldfish/died/fresh water.
 82 **Waterfowl Toxicity:** Data not available.
 83 **Biological Oxygen Demand (BOD):** 0.6 to 1.12 lb/lb in 5 days.
 84 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

- 1 Borden Inc.
 Borden Chemical Division
 Gretna, Pa. 15034
 2 Celanese Corp.
 Celanese Chemical Co. Division
 245 Park Ave.
 New York, N.Y. 10017
 3 E. I. du Pont de Nemours & Co., Inc.
 Industrial and Biochemical Dept.
 Wilmington, Del. 19898

10. SHIPPING INFORMATION

- 101 **Grade or Purity:** C.P. Crude ACS, all 99.9%
 102 **Storage Temperature:** Ambient
 103 **Inert Atmosphere:** No requirement
 104 **Venting:** Open (flame arrester) or pressure/vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 A P Q K S

13. PHYSICAL AND CHEMICAL PROPERTIES

- 131 **Physical State at 15°C and 1 atm:** Liquid
 132 **Molecular Weight:** 32.04
 133 **Boiling Point at 1 atm:** 148.1°F = 64.5°C = 337.7°K
 134 **Freezing Point:** -144.0°F = -97.8°C = 175.4°K
 135 **Critical Temperature:** 464°F = 240°C = 513°K
 136 **Critical Pressure:** 1142.0 psia = 77.7 atm = 7.87 MN/m²
 137 **Specific Gravity:** 0.792 at 20°C (liquid)
 138 **Liquid Surface Tension:** Not pertinent
 139 **Liquid-Water Interfacial Tension:** Not pertinent
 1310 **Vapor (Gas) Specific Gravity:** 1.1
 1311 **Ratio of Specific Heats of Vapor (Gas):** 1.254
 1312 **Latent Heat of Vaporization:** 473.0 Btu/lb = 262.5 cal/g = 11.00 × 10³ J/kg
 1313 **Heat of Combustion:** -8419 Btu/lb = -4677 cal/g = -195.8 × 10³ J/kg
 1314 **Heat of Decomposition:** Not pertinent
 1315 **Heat of Solution:** (gas) -9 Btu/lb = -5 cal/g = -0.2 × 10³ J/kg
 1316 **Heat of Polymerization:** Not pertinent

12. HAZARD CLASSIFICATIONS

- 121 **Code of Federal Regulations:** Flammable liquid
 122 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 3 |
| Health | |
| Vapor Irritant | 1 |
| Liquid or Solid Irritant | 1 |
| Poisons | 2 |
| Water Pollution | |
| Human Toxicity | 1 |
| Aquatic Toxicity | 1 |
| Aesthetic Effect | 1 |
| Reactivity | |
| Other Chemicals | 2 |
| Water | 0 |
| Self Reaction | 0 |
- 123 **NFPA Hazard Classifications:**
- | Category | Classification |
|---------------------|----------------|
| Health (Blue) | 1 |
| Flammability (Red) | 3 |
| Reactivity (Yellow) | 0 |

NOTES

(Continued on pages 5 and 6)

MTA

METHYLAMINE

Common Synonyms Aminomethane Monomethylamine Mercaptan	Liquefied compressed gas Colorless Ammonia-like odor Mixes with water and boils
See Health Hazards section for first aid instructions. See Physical Properties section for physical data. See Environmental section for environmental data.	
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, carbon dioxide, or alcohol foam. Do not use water.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. May be asphyxiant if inhaled in high concentrations. If breathing has stopped, administer artificial respiration. If breathing is difficult, use oxygen. LIQUID Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If in eyes, hold eyelids open and flush with plenty of water. If swallowed, do not induce vomiting. Give plenty of water to drink. DO NOT INHALE COMBUSTION PRODUCTS
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify water quality and water control agencies. Notify local authorities of any water releases.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability, air contaminant, water contaminant. Restrict access. Evacuate area. Disperse and flush.	2. LABEL 
3 CHEMICAL DESIGNATIONS 31 Synonyms: Aminomethane, Mercaptan, Monomethylamine, anhydrous. 32 Coast Guard Compatibility Classification: Amines (4). 33 Chemical Formula: CH ₃ NH ₂ . 34 IMCO/United Nations Numerical Designation: Anhydrous 2.1061. Aqueous soln. 3.1.1235.	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquefied compressed gas. 42 Color: Colorless. 43 Odor: Like ammonia; pungent, fishy, suffocating.
5 HEALTH HAZARDS 51 Personal Protective Equipment: Goggles or face mask, rubber suit, apron, sleeves and/or gloves, rubber or leather safety shoes, air line mask, positive pressure hose mask, self-contained breathing apparatus, or industrial canister type gas mask. 52 Symptoms Following Exposure: Inhalation causes irritation of nose and throat, followed by violent sneezing, burning sensation in throat, coughing, constriction of larynx and difficulty in breathing, pulmonary congestion, edema of the lungs, and conjunctivitis. Contact with liquid burns skin and eyes. (Severe exposure may cause blindness.) Vapors may cause dermatitis. Ingestion causes burning of the mouth, throat, and esophagus. 53 Treatment for Exposure: Get medical attention for anyone who is or may be injured by exposure to this compound. INHALATION: remove victim to fresh air at once, apply artificial respiration if breathing has stopped, administer oxygen. EYES: flush with water for at least 15 min. flush with water if skin is burned; do not use ointments or cover for 24 hours. INGESTION: do NOT induce vomiting; give large amount of water. 54 Toxicity by Inhalation (Threshold Limit Value): 10 ppm. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Grade 2.1.D.0.5 to 5 g/kg. 57 Late Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating, such that personnel will not usually tolerate moderate or high concentrations.	

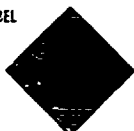
Continued on page 4.

6 FIRE HAZARDS 61 Flash Point: Not pertinent (flammable liquefied compressed gas). 62 Flammable Limits in Air: 4.3 - 21. 63 Fire Extinguishing Agents: Let gas fire burn; stop flow of gas. If extinguish solution fires with dry chemical, alcohol foam, or carbon dioxide. 64 Fire Extinguishing Agent: 1 to be Used. Not pertinent. 65 Special Hazards of Combustion Products: Toxic nitrogen oxides may be formed. 66 Behavior in Fire: Vapors are heavier than air and may travel considerable distance to a source of ignition and flash back. 67 Ignition Temperature: 506 °F. 68 Electrical Hazard: Data not available. 69 Burning Rate: Not pertinent.	8 WATER POLLUTION 81 Aquatic Toxicity: > 10 and < 30 ppm 24 hr. creek chub TL. 82 Waterfowl Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): 6.8% of theoretical in 14 days. 84 Food Chain Concentration Potential: None.																																				
7 CHEMICAL REACTIVITY 71 Reactivity with Water: Dissolves completely. 72 Reactivity with Common Materials: Corrosive to copper, copper alloys, zinc, alloys, aluminum, and galvanized surfaces. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Not pertinent. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Commercial Solvents Corporation, Terre Haute, Ind. 47766. 2. E. I. du Pont de Nemours & Co., Inc., Biochemicals Department, 1097 Market Street, Wilmington, Del. 19895. 3. Matheson Gas Products Co., East Rutherford, N. J. 07073.																																				
11. HAZARD ASSESSMENT CODE (See HAZOP Assessment Handbook, CG 446-3) ABC-K-M-N	10 SHIPPING INFORMATION 101 Grade or Purity: Anhydrous 99.9+. Water solutions 40 - 50% by weight. 102 Storage Temperature: Ambient. 103 Inert Atmosphere: No requirements. 104 Venting: Safety relief.																																				
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable compressed gas. 122 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>4</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td> Vapor Irritant</td> <td>3</td> </tr> <tr> <td> Liquid Irritant</td> <td>2</td> </tr> <tr> <td> Poison</td> <td>3</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td> Human Toxicity</td> <td>2</td> </tr> <tr> <td> Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td> Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td> Other Chemicals</td> <td>3</td> </tr> <tr> <td> Water</td> <td>0</td> </tr> <tr> <td> Self Reaction</td> <td>0</td> </tr> </tbody> </table> 123 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>3</td> </tr> <tr> <td>Flammability (Red)</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	3	Liquid Irritant	2	Poison	3	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	3	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	4	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES* 131 Physical State at 15°C and 1 atm: Gas. 132 Molecular Weight: 31.1. 133 Boiling Point at 1 atm: 20.3°F = -6.5°C = 266.7°K. 134 Freezing Point: -134.5°F = -92.5°C = 180.7°K. 135 Critical Temperature: 313°F = 159°C = 432°K. 136 Critical Pressure: 1,080 psi = 73.6 atm = 7.47 MN/m ² . 137 Specific Gravity: 0.683 at -6.5°C (liquids). 138 Liquid Surface Tension: 10.59 dynes/cm = 0.106 N/m at 20°C. 139 Liquid-Water Interfacial Tension: Not pertinent. 1310 Vapor (Gas) Specific Gravity: 1.1. 1311 Ratio of Specific Heats of Vapor (Gas): 1.1946. 1312 Latent Heat of Vaporization: 335 Btu/lb = 199 cal/g = 8.33 x 10 ³ J/kg. 1313 Heat of Combustion: -15,000 Btu/lb = -8,140 cal/g = -34.9 x 10 ³ J/kg. 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: Data not available. 1316 Heat of Polymerization: Not pertinent. *Properties apply to anhydrous material.
Category	Rating																																				
Fire	4																																				
Health																																					
Vapor Irritant	3																																				
Liquid Irritant	2																																				
Poison	3																																				
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Health Hazard (Blue)	3																																				
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Reactivity (Yellow)	0																																				
5 HEALTH HAZARDS (Cont'd) 59 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure and may cause second degree burns on long exposure. 510 Odor Threshold: 0.02 ppm.																																					

(continued on page 4 and 5)

MAC

METHYL AMYL ACETATE

Common Synonyms: 4-Methyl-2-pentanol acetate MAAc 4-Methyl-2-pentyl acetate Hexyl acetate	Watery liquid	Colorless	Pleasant fruity odor
Safety Data Sheet (SDS) information: Hazardous to the environment Hazardous to aquatic life Hazardous to the ozone layer Hazardous to the atmosphere Hazardous to the soil			
Fire	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Hazardous to the environment Hazardous to aquatic life Hazardous to the ozone layer Hazardous to the atmosphere Hazardous to the soil		
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Hazardous to the environment Hazardous to aquatic life Hazardous to the ozone layer Hazardous to the atmosphere Hazardous to the soil		
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Hazardous to the environment Hazardous to aquatic life Hazardous to the ozone layer Hazardous to the atmosphere Hazardous to the soil		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Mechanical containment Chemical and physical treatment		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Hexyl acetate MAAc Methylnonylcarbinyl acetate 4-Methyl-2-pentanol acetate 4-Methyl-2-pentyl acetate 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: CH3COOCH(CH2)4CH3 (Continued on page 4)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Fruity, mild, pleasant, mild and nonresidual	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic canister or air pack, rubber gloves, goggles 5.2 Symptoms Following Exposure: Headache, dizziness, nausea, irritation to respiratory passages, irritates eyes 5.3 Treatment for Exposure: INHALATION: remove from exposure immediately, call a physician if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYE CONTACT: flush with water for at least 15 min 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade I LD50 5 to 15 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors irritate mucous membranes, such that personnel will find high concentrations unpleasant. The odor is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available			

6. FIRE HAZARDS 6.1 Flash Point: 113°F (CC) 110°F (OC) 6.2 Flammable Limits in Air: 0.9% - 5.7% (cal.) 6.3 Fire Extinguishing Agents: Alcohol foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 510°F (cal.) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: 230 ppm/24 hr/brine shrimp/TL ₅₀ 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 20% of theoretical in 5 days/freshwater 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Exxon Chemical Co. Houston, Tex. 77001 2. Shell Chemical Co. Polymers Division Houston, Tex. 77001 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N. Y. 10017																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U	10. SHIPPING INFORMATION 10.1 Grades or Purities: 95-99%+ 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAB Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>2</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>2</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></tbody></table> 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></tbody></table>	Category	Rating	Fire	2	Health		Vapor Irritant	2	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 144.22 13.3 Boiling Point at 1 atm: 295.2°F = 146.2°C = 419.4°K 13.4 Freezing Point: -42.8°F = -41.6°C = 269.4°K 13.5 Critical Temperature: 606°F = 319°C = 592°K 13.6 Critical Pressure: 382 psia = 26 atm = 2.6 MN/m ² 13.7 Specific Gravity: 0.860 at 20°C (liquid) 13.8 Liquid Surface Tension: (at 25°C) dynes/cm = 0.025 N/m at 25°C 13.9 Liquid-Water Interfacial Tension: (at 25°C) dynes/cm = 0.04 N/m at 25°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.046 13.12 Latent Heat of Vaporization: 225 Btu/lb = 125 cal/g = 5.23 X 10 ³ J/kg 13.13 Heat of Combustion: (est.) = 14,400 Btu/lb = 8,000 cal/g = 33.5 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent (Continued on pages 4 and 5)
Category	Rating																																				
Fire	2																																				
Health																																					
Vapor Irritant	2																																				
Liquid or Solid Irritant	1																																				
Poisons	1																																				
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Flammability (Red)	2																																				
Reactivity (Yellow)	0																																				
3. CHEMICAL DESIGNATIONS (Cont'd) 3.4 IMCO/United Nations Numerical Designation: 1.1, 1.2, 1.3																																					

REVISED 1978

MAA

METHYL AMYL ALCOHOL

Common Synonyms Isobutylmethylcarbinol 4-Methyl-2-pentanol Methylisobutylcarbinol	Only liquid Colorless Mild alcohol odor Floats on water. Irritating vapor is produced.
May dislodge if poured. Keep away from fire department. Avoid contact with liquid and vapor. In water and in non-flammable material. Not a flammable liquid and not a flammable gas.	
Fire	Combustible Extinguish with dry chemical, water, foam, or alcohol-resistant foam. Do not use water spray.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. Harmful if skin is exposed. May cause skin irritation. If breathing gas is present, get out of breathing zone. If necessary, use self-contained breathing apparatus. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Wash affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED, do not induce vomiting. Do not take any food or drink. Drink milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Tending to bioaccumulate. May be dangerous if it enters water intakes. Not a major source of pollution. Not a threat to the aquatic environment.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4. Mechanical containment. Chemical and physical treatment.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Isobutylmethylcarbinol, Isobutylmethylmethanol, MAOH, Methylisobutylcarbinol, 4-Methyl-2-pentanol, MIC. 3.2 Coast Guard Compatibility Classification: Alcohol. 3.3 Chemical Formula: $(CH_3)_2CHCH_2CH_2CH_3$. 3.4 IMCO United Nations Numerical Designation: 3.1, 2053.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Sharp, mild and non-pungent.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air pack or organic canister mask, rubber gloves, goggles, or face shield. 5.2 Symptoms Following Exposure: Vapors irritate eyes and nose. May cause anesthesia. Prolonged contact with liquid causes irritation and cracking of skin and irritates eyes. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; give artificial respiration if needed; call a doctor. SKIN: flush with water. EYES: flush with water for at least 15 min.; consult a doctor. 5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2.0 to 5.0 g/kg rat. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 120-130°F (44-55°C). 6.2 Flammable Limits in Air: 1.0% - 5.5%. 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 553°F (284°C). 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 4.7 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 370 ppm/24 hr/brine shrimp/TL ₅₀ . 8.2 Waterfowl Toxicity: Not pertinent. 8.3 Biological Oxygen Demand (BOD): 50% of theoretical in 5 days, freshwater. 8.4 Food Chain Concentration Potential: Not pertinent.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Exxon Chemical Co. Houston, Tex. 77001. 2. Shell Chemical Co. Industrial Chemical Division. Houston, Tex. 77001. 3. Union Carbide Corp. Chemical and Plastics Division. 270 Park Ave. New York, N.Y. 10017.																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3). A-P-Q-T-U 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="908 1457 1179 1737"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>2</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>2</td></tr> <tr><td>Liquid or Solid Irritant</td><td>1</td></tr> <tr><td>Poisons</td><td>2</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>2</td></tr> <tr><td>Aquatic Toxicity</td><td>2</td></tr> <tr><td>Nesthetic Effect</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>2</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="908 1737 1179 1845"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>2</td></tr> <tr><td>Flammability (Red)</td><td>2</td></tr> <tr><td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	2	Health		Vapor Irritant	2	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Nesthetic Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	0	10. SHIPPING INFORMATION 10.1 Grades or Purity: Data not available. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arresters). 13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 102.18. 13.3 Boiling Point at 1 atm: 269.2°F = 131.8°C = 405°K. 13.4 Freezing Point: < -130°F = < -90°C = < 183°K. 13.5 Critical Temperature: 556°F = 291°C = 564°K. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.807 at 20°C (liquid). 13.8 Liquid Surface Tension: 22.8 dynes/cm = 0.0228 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: (est.) 140 dynes/cm = 0.04 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.053. 13.12 Latent Heat of Vaporization: 162 Btu/lb = 90.1 cal/g = 3.77 × 10 ⁵ J/kg. 13.13 Heat of Combustion: -16,640 Btu/lb = -9240 cal/g = -387 × 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	2																																				
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Vapor Irritant	2																																				
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NOTES (Continued on pages 5 and 6)																																					

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MAN

N-METHYLANILINE

Common Synonyms: Anilinebase (base) N-Methylaminobenzene Methyl aniline (monomer) Methylphenylamine		Liquid Yellow to light brown Chemical Odor May float or sink in water
Avoid contact with liquid. Keep people away. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam or carbon dioxide. Water may be ineffective on fire. Use exposed containers with water.	
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED: and victim is CONSCIOUS: Have victim drink water or milk. IF NOT ALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife agencies. Operations of nearby water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Issue warning: poison water contaminant. Restrict access. Mechanical containment. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Aniline-methane N-Methylaminobenzene Methylaniline (monomer), Methylphenylamine 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: C ₆ H ₇ NCH ₃ 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow to light brown 4.3 Odor: Moderate aniline type
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approval respirator, rubber gloves, splash proof goggles. 5.2 Symptoms Following Exposure: Inhalation causes dizziness and headache. Ingestion causes black discoloration (cyanosis) of lips, ear lobes and internal beds. Liquid irritates eyes. Absorption through skin produces same symptoms as ingestion. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air and call a physician at once. Administer oxygen until physician arrives. INGESTION: give large amount of water; get medical attention at once. EYES OR SKIN: flush with plenty of water for at least 15 min. if cyanosis is present; shower with soap and warm water with special attention to scalp and finger nails; remove any contaminated clothing. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS 6.1 Flash Point: 177°F (80°C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Toxic vapors are generated when heated. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 160 mm/min.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: May attack some forms of plastics. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. American Cyanamid Co. Bound Brook, N. J. 08805 2. Eastman Organic Chemicals Rochester, N. Y. 14650 3. Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-5.) ALC-NY		10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical. Pure 99+%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirements. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 MFPA Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 107.2. 13.3 Boiling Point at 1 atm: 164°C (327°F) = 165.9°C = 329.1°F. 13.4 Freezing Point: -71°F = -57°C = 216°K. 13.5 Critical Temperature: 302°F = 150°C = 423°K. 13.6 Critical Pressure: 24.4 psia = 51.3 atm = 5.20 MN/m ² . 13.7 Specific Gravity: 0.959 at 20°C (liquid). 13.8 Liquid Surface Tension: 39.6 dynes/cm = 0.0396 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: 3.70. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 140 Btu/lb = 100 cal/g = 4.20 × 10 ³ J/kg. 13.13 Heat of Combustion: -16,350 Btu/lb = -9,165 cal/g = -140.1 × 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
(continued on page 5 and 6)		
NOTES		

MTB

METHYL BROMIDE

Common Synonyms: Bromomethane Embafume	Liquefied gas Colorless Odorless to sweet odor
Sinks and boils in water. Poisonous vapor cloud is formed. Boiling point is 199°F.	
COMBUSTIBLE POISONOUS AND IRRITATING GASES ARE PRODUCED IN FIRE	
Fire	COMBUSTIBLE POISONOUS AND IRRITATING GASES ARE PRODUCED IN FIRE
 Exposure	VAPOR POISONOUS IF INHALED Irritating to eyes. LIQUID Will burn skin and eyes. Harmful if swallowed.
Water Pollution	Not harmful to aquatic life. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3) Issue warning: poison Restrict access	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Bromomethane Embafume M-B-C Fumigant Monobromomethane 3.2 Coast Guard Competibility Classification: Halogenated hydrocarbon 3.3 Chemical Formula: CH ₃ Br 3.4 IMCO/United Nations Numerical Designation: 2.0/1062	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied gas 4.2 Color: Colorless 4.3 Odor: Relatively odorless, sweet, chloroform-like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles 5.2 Symptoms Following Exposure: Inhalation of vapor causes lung congestion and pulmonary edema. Higher concentrations cause rapid narcosis and death. Contact with liquid irritates eyes and burns skin. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, give artificial respiration if needed. SKIN OR EYES: flush with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 15 ppm 5.5 Short-Term Inhalation Limits: 20 ppm for 5 min 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant; may cause pain and second-degree burns after a few minutes' contact. 5.10 Odor Threshold: Odorless	

6. FIRE HAZARDS 6.1 Flash Point: Practically not flammable 6.2 Flammable Limits in Air: 10% - 15% 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating gases are generated when exposed to fire or heat. 6.6 Behavior in Fire: Containers may explode 6.7 Ignition Temperature: 999°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Corrosives: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Dow Chemical Co Midland, Mich. 48640 2 Great Lakes Chemical Corp West Lafayette, Ind. 47906 3 Northwest Industries, Inc Michigan Chemical Corp 351 E. Ohio St. Chicago, Ill. 60611																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-B-C-I-J	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial not less than 99.5% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous liquid or solid, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: <table> <tr> <th>Category</th><th>Rating</th></tr> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>3</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>3</td></tr> <tr> <td>Poisons</td><td>4</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>0</td></tr> <tr> <td>Aquatic Toxicity</td><td>1</td></tr> <tr> <td>Acute Effect</td><td>2</td></tr> <tr> <td>Reactions</td><td></td></tr> <tr> <td>Other Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	3	Liquid or Solid Irritant	3	Poisons	4	Water Pollution		Human Toxicity	0	Aquatic Toxicity	1	Acute Effect	2	Reactions		Other Chemicals	1	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 94.95 13.3 Boiling Point at 1 atm: 38.5°F = 3.6°C = 276.8°K 13.4 Freezing Point: -135°F = -93°C = 180°K 13.5 Critical Temperature: 376°F = 191°C = 464°K 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.68 at 20°C (liquid) 13.8 Liquid Surface Tension: 24.5 dynes/cm = 0.0245 N/m at 15°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 3.3 13.11 Ratio of Specific Heats of Vapor (Gas): 1.247 13.12 Latent Heat of Vaporization: 106 Btu/lb = 49.7 cal/g = 2.50 × 10 ⁵ J/kg 13.13 Heat of Combustion: -3188 Btu/lb = -1771 cal/g = -74.15 × 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	1																												
Health																													
Vapor Irritant	3																												
Liquid or Solid Irritant	3																												
Poisons	4																												
Water Pollution																													
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12.3 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	1	Reactivity (Yellow)	0	(Continued on pages 5 and 6) NOTES																				
Category	Classification																												
Health Hazard (Blue)	3																												
Flammability (Red)	1																												
Reactivity (Yellow)	0																												

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MBK

METHYL n-BUTYL KETONE

Common Synonyms 2-Hexanone n-Butyl methyl ketone		Liquid	Clear	Disagreeable Odor
Floats and mixes with water				
Shuts off engine in vehicles that have an automatic choke. As a solvent, it dissolves many organic compounds. It is not a good solvent for water-soluble compounds. It is a good solvent for many organic compounds.				
Fire	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.			
Exposure	ALL FOR MEDICAL USE VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. LIQUID Irritating to skin and eyes. Harmful if swallowed. ENVIRONMENTAL May be harmful to aquatic life if released into water. May be harmful to birds if released into air.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: air contaminant, water contaminant, high flammability. Restrict access. Mechanical containment should be removed. Chemical and physical treatment.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: n-Butyl methyl ketone, 2-Hexanone. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: CH ₃ CH ₂ CH ₂ COCH ₃ . 3.4 HBCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Clear. 4.3 Odor: Characteristic, strong disagreeable odor resembling acetone.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles or face shield, approved respirator (for major spills). 5.2 Symptoms Following Exposure: Inhalation of high concentrations of vapor may result in narcosis; peripheral neuropathy may develop. Ingestion of large amounts may cause severe systemic injury. Contact with eyes causes mild to moderate irritation. Liquid irritates skin; prolonged or repeated contact may cause defatting of the skin with resultant dermatitis. 5.3 Treatment for Exposure: INHALATION: move to uncontaminated area; breathe fresh air; if necessary, alert physician to possible development of peripheral neuropathy. INGESTION: give large amount of water and induce vomiting. EYES: irrigate immediately and thoroughly with water for 15 min. and get medical attention. SKIN: flush exposed areas thoroughly with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 2,000 mg/kg (rats). 5.7 Late Toxicity: Peripheral neuropathy in experimental animals and man (degeneration of motor and/or sensory nerves). 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 6.1 Flash Point: 33°F (0°C) (77°F (25°C)). 6.2 Flammable Limits in Air: 1.1% - 8.0%. 6.3 Fire Extinguishing Agents: Dry chemical, alcohol, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: 795°F. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 4.4 ft/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1 Eastman Chemical Products, Inc. Kingsport, Tenn. 37662 2 Aldrich Chemical Co. 440 W. Saint Paul Ave. Milwaukee, Wis. 53233 3 Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NFPA 11	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 95% Pure, 99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arresters								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 100.16. 13.3 Boiling Point at 1 atm: 101°F = 37.7°C = 309°K. 13.4 Freezing Point: -70.4°F = -56.4°C = 216°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.812 at 20°C (liquids). 13.8 Liquid Surface Tension: 23.4 dyne/cm = 0.02349 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 9.7 dyne/cm = 0.00971 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: 3.4. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 14,800 Btu/lb = 32 cal/g = 1.4 x 10 ⁵ J/kg. 13.13 Heat of Combustion: -16,100 Btu/lb = -3,940 cal/g = -1.7 x 10 ⁷ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	3								
Reactivity (Yellow)	0								
NOTES (continued on page 2 and 3)									

MTC

METHYL CHLORIDE

Common Synonyms: Chloromethane	Liquefied compressed gas. Colorless. Slightly sweet odor. Floats and boils on water. Flammable: visible vapor cloud is formed.
HAZARD PICTOGRAMS	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Inhalation of vapors may cause death or serious injury Vapor may irritate eyes, nose and throat Vapor may cause nausea, vomiting, headache, difficulty breathing, or loss of consciousness Symptoms may be delayed First Aid: Remove to fresh air. If inhaled, give artificial respiration if breathing is difficult. If on skin, wash with soap and water. If in eyes, flush with water for 15 minutes.
Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Inhalation of vapors may cause death or serious injury Vapor may irritate eyes, nose and throat Vapor may cause nausea, vomiting, headache, difficulty breathing, or loss of consciousness Symptoms may be delayed First Aid: Remove to fresh air. If inhaled, give artificial respiration if breathing is difficult. If on skin, wash with soap and water. If in eyes, flush with water for 15 minutes.
Exposure	VAPOR Not irritating to eyes, nose or throat If inhaled, will cause nausea, vomiting, headache, difficulty breathing, or loss of consciousness Symptoms may be delayed First Aid: Remove to fresh air. If inhaled, give artificial respiration if breathing is difficult. If on skin, wash with soap and water. If in eyes, flush with water for 15 minutes. LIQUID Will cause frostbite First Aid: Wash with soap and water. If on face, wash with water. If in eyes, flush with water for 15 minutes.
Water Pollution	Not harmful to aquatic life
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning by flammability, air contaminant, restrict access, evacuate area	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Arin, Chloromethane 3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon 3.3 Chemical Formula: CH₃Cl 3.4 IMCO/United Nations Numerical Designation: 201063	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied gas 4.2 Color: Colorless 4.3 Odor: Faint, sweet, non irritating, fruit ether like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved canister mask, leather or vinyl gloves, goggles or face shield 5.2 Symptoms Following Exposure: Inhalation causes nausea, vomiting, weakness, headache, emotional disturbances. High concentrations cause mental confusion, eye disturbances, muscular tremors, cyanosis, convulsions. Contact of liquid with skin may cause frostbite. 5.3 Treatment for Exposure: Remove to fresh air. Call a doctor and have patient hospitalized for observation of slowly developing symptoms. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm. 5.5 Short-Term Inhalation Limit: 100 ppm for 5 min 5.6 Toxicity by Ingestion: Not pertinent 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin because it evaporates quickly. May cause frostbite 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS

- 6.1 Flash Point: -122°F (-27°C)
- 6.2 Flammable Lim. in Air: 3.1% - 17.2%
- 6.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide. Stop flow of gas.
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
- 6.5 Special Hazards: Combustion Products: Toxic and irritating gases are generated in fires.
- 6.6 Behavior in Fire: Container may explode
- 6.7 Ignition Temperature: 1°C
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: 2.2 mm/min

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: None
- 8.2 Waterford Toxicity: None
- 8.3 Biological Oxygen Demand (BOD): None
- 8.4 Feed Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

1. Ancon Chemical Corp.
Westlake, La. 70669
2. Dow Chemical Co.
Midland, Mich. 48640
3. Ethyl Corp.
Industrial Chemicals Division
451 Florida St.
Baton Rouge, La. 70801

7. CHEMICAL REACTIVITY

7. Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials: Reacts with zinc, aluminum, magnesium, and their alloys, reaction is not violent
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Technical grade
"Arin," refrigerant grade
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Safety relief

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
A-B-C-D-E-F-G

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable compressed gas
- 12.2 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	4
Health	
Vapor Irritant	0
Liquid or Solid Irritant	0
Poison	2
Air Pollution	
Human Toxics	0
Aquatic Toxics	1
Aesthetic Effect	0
Reactivity	
Other Chemicals	1
Water	0
Self Reaction	0
- 12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Red)	2
Flammability (Red)	4
Reactivity (Blue)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Gas
- 13.2 Molecular Weight: 50.49
- 13.3 Boiling Point at 1 atm: -11.6°F = -22.2°C = 249°K
- 13.4 Freezing Point: -143.9°F = -97.7°C = 175.5°K
- 13.5 Critical Temperature: 290.5°F = 143.6°C = 416.8°K
- 13.6 Critical Pressure: 940 psia = 63.9 atm = 6.48 MPa
- 13.7 Specific Gravity: 0.997 at -22°C (liquid)
- 13.8 Liquid Surface Tension: 16.2 dynes/cm = 0.0162 N/m at 20°C
- 13.9 Liquid-Water Interfacial Tension: 16.1 mN/m = 0.0161 N/m at -22°C
- 13.10 Vapor (Gas) Specific Gravity: 1.7
- 13.11 Ratio of Specific Heats of Vapor (Gas): 1.249
- 13.12 Latent Heat of Vaporization: 182.1 Btu/lb = 101.1 kcal/g = $4.241 \times 10^3 \text{ J/kg}$
- 13.13 Heat of Combustion: -5290 Btu/lb = -249 kcal/g = $-121.1 \times 10^3 \text{ J/kg}$
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 1 and 8)

NOTES

METHYL CHLOROFORMATE

Common Synonyms Chloroform acid methyl ester Methyl chloroformate	Liquid Sinks and reacts in water. Flammable, irritating vapor is produced.	Colorless to light yellow Unpleasant odor
Fire 	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with water or alcohol. (Alcohol may be used on small fires.)	Exposure VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. May irritate the lungs. LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. If swallowed, do not induce vomiting. If in eyes, flush with water. If on skin, wash with soap and water. If on clothing, remove clothing and wash skin.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Do not empty into sewer or drain.	
1. RESPONSE TO DISCHARGE See Response Summary, MSDS 001-001-001. Issue warning - extremely flammable. High flammability. Moderate toxicity. Irritant and flammable.		2. LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Chloroform acid, methyl ester; chloroformic acid; methyl chloroformate. 3.2 Coast Guard Chemical Classification: Not applicable. 3.3 Chemical Formula: CH_3OCCl_2 3.4 IMCO/United Nations Numerical Designation: 1.2, 1.3.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless to light yellow. 4.3 Odor: Astringent.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Avoid breathing vapor. Wear self-contained breathing apparatus, goggles or face shield, plastic gloves. 5.2 Symptoms Following Exposure: Inhalation of vapor irritates nose and throat and can cause delayed pulmonary edema. Liquid irritates eyes and causes severe skin burns. If swallowed, it remains. Ingestion causes burns to mouth and stomach. 5.3 Treatment for Exposure: INHALATION: Remove victim from exposure. If breathing stops, administer artificial respiration. Call physician. EYES: Irrigate with copious amounts of water for at least 15 min. Call physician if needed. SKIN: Flush with water for 15 min. Get medical attention for burns. INGESTION: Do not give large amounts of water. Do NOT induce vomiting. Get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Toxic 4.0 (oral LD ₅₀) - 10 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS 6.1 Flash Point: 76°F (24°C) (10°C). 6.2 Flammable Limits in Air: 11% - 11%. 6.3 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Irritating and toxic byproducts, cyanide and phosgene may be formed. 6.6 Behavior in Fire: Vapor is heavier than air and will travel a considerable distance to a source of ignition and flammable. 6.7 Ignition Temperature: Data not available. 6.8 Electric Hazard: Data not available. 6.9 Burning Rate: 2.0 in/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterway Toxicity: Data not available. 8.3 Ecological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts slowly, causing but open chloride hydrochloric acid. Reaction can be hazardous if water is hot. 7.2 Reactivity with Common Materials: Corrosive. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with sodium bicarbonate - same solution. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Chemtron Corporation Chemical Group 363 Seventh Avenue New York, N.Y. 10001. 2. Air Products and Chemicals, Inc. Specialty Chemicals Department P.O. Box 513 Allentown, Pa. 18105. 3. Aldrich Chemical Co. 940 West 81st Avenue Milwaukee, Wis. 53233.
10. SHIPPING INFORMATION 10.1 Grades or Purity: 97+%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure vacuum.	
11. HAZARD ASSESSMENT CODE See Hazard Assessment Code, 10-001-001. 1.43 N 1.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 97.4. 13.3 Boiling Point at 1 atm: 100°F = 37.8°C = 311°K. 13.4 Freezing Point: -10.2°F = -23.6°C = 249°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.22 at 20°C (liquid). 13.8 Liquid Surface Tension: 26 dynes/cm = 0.026 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 1.25. 13.11 Rate of Specific Heats of Vapor (Gas): 11544. 13.12 Latent Heat of Vaporization: 104.1 Btu/lb = 30.5 kJ/kg at 100°F = 37.8°C. 13.13 Heat of Combustion: 4.000 Btu/lb = 11.63 kJ/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.
NOTES (continued on page 1 and 2)	

MCT

METHYLCYCLOPENTADIENYLMANGANESE TRICARBONYL

Common Synonyms Combustion Improver C-12	Liquid Sinks in water	Yellow to dark orange Faint pleasant odor
AVOID CONTACT WITH LIQUID. KEEP PEOPLE AWAY. Wear rubber gloves, thick clothing, goggles. No food, no drink, no smoking. Wash and remove contaminated material. No fire, no sparks, no open flames, no smoking.		
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE. When exposed and vented, use fire-fighting apparatus. Extinguish with water or chemical foam or carbon dioxide.	
 <u>Exposure</u>	CALL FOR MEDICAL AID LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED If swallowed will cause loss of consciousness. Keep victim calm, do not induce vomiting. If on skin, flush with plenty of water. If IN EYES, flush eyes, open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water, milk and have water induce vomiting. If SWALLOWED and victim is UNCONSCIOUS, DO NOT HAVE VOMITING INDUCED. If breathing, keep victim warm.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. No fish, birds, bees, and waterfowl hazards. No fish, birds, bees, and waterfowl hazards.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Inert material. Periodic water contamination. Restrict access. Should be removed. Chemical and physical treatment.		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Combustion Improver C-12 3.2 Coast Guard Compatibility Classification: To be developed 3.3 Chemical Formula: $C_{11}H_8Mn$ 3.4 HOCG/USCG Notations Numerical Designation: 5.1		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Straw to dark orange 4.3 Odor: Faint pleasant herbaceous
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor cartridge mask, rubber gloves and apron, protective goggles or face shield. 5.2 Symptoms Following Exposure: Inhalation, ingestion, or skin contact affect central nervous system, causing convulsions, respiratory depression, cyanosis, and coma. Liquid irritates eyes. 5.3 Treatment for Exposure: Get medical attention following all exposures to this compound. INHALATION: remove victim from exposure, administer artificial respiration if necessary. EYES: flush with plenty of water for at least 15 min. SKIN: wash well with soap and water. INGESTION: induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0 ppm (Manganese) 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 4 oral LD_{50} = 23 mg/kg (rats) 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS 6.1 Flash Point: $> 200^{\circ}\text{F}$ (< 1) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical foam, water spray, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic vapors are formed in a fire. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterborne Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: Data not available.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Data not available. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Ethyl Corporation Industrial Chemical Division Ethyl Tower 451 Florida Baton Rouge, La. 70802 2. Vencor Corporation Alfa Products Box 154 Beverly, Mass. 01915 3. P.R. Inc. P.O. Box 1466 Greenville, Fla. 32602
10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.5% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure vacuum.	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-2) XXX	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Liquid 13.2 Molecular Weight: 214 13.3 Boiling Point at 1 atm.: 251°F = 233°C = 590 K 13.4 Freezing Point: 34°F = 1°C = 273 K 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.34 at 20°C (liquids) 13.8 Liquid Surface Tension: Data not available. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: heat = 4,497 Btu/lb = 12,900 cal/g = 1240 x 10 J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Permanent, Class II 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	
(Continued on pages 1 and 2)	
NOTES	

MCP

METHYL CYCLOPENTANE

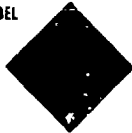
Common Synonyms Cyclopentane, methyl	Liquid Colorless Gasoline-like odor Floats on water. Flammable, irritating vapor is produced.
Shut off ignition sources. Call fire department. Stop discharge, if possible. Keep people away. Evacuate and remove from area if in fire. Notify local health and pollution control agencies.	
Fire	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Exposed containers with water.
Exposure	Call for medical aid. VAPOR If inhaled will cause dizziness or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyes open and flush with plenty of water. IF SWALLOWED, do not induce vomiting. Have victim drink water or milk.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability. Evacuate area. Mechanical containment. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Cyclopentane, methyl 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C_5H_{12} 3.4 IMCO/United Nations Numerical Designation: 111241	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like gasoline
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes dizziness, nausea, and vomiting; concentrated vapor may cause unconsciousness and collapse. Liquid causes irritation of eyes and mild irritation of skin if allowed to remain. Ingestion causes irritation of stomach. Aspiration causes severe lung irritation, rapidly developing pulmonary edema, and central nervous system excitement followed by depression. 5.3 Treatment for Exposure: INHALATION: remove victim from exposure; if breathing has stopped, begin artificial respiration; call physician. EYES: flush with water for 15 min; call physician. SKIN: flush well with water; then wash with soap and water. INGESTION: do NOT induce vomiting; guard against aspiration into lungs. ASPIRATION: enforce bed rest, give oxygen; get medical attention. 5.4 Toxicity by Inhalation (Three- and Six-Hour Limit Values): Data not available. 5.5 Short-Term Inhalation Limits: 300 ppm for 60 min. 5.6 Toxicity by Ingestion: Grade I, ED ₅₀ 5 to 15 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is nonirritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: $<0^{\circ}\text{F}$ ($<0^{\circ}\text{C}$) 6.2 Flammable Limits in Air: 1.1% - 8.7% (approx.) 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 621°F 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 7 ft/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Phillips Petroleum Company, Chemical Department, Special Products Division, Bartlesville, Okla. 74004. 2. Aldrich Chemical Co., 940 West St. Paul Ave., Milwaukee, Wis. 53233. 3. Pfaltz and Bauer, Inc., 126-04 Northern Boulevard, Flushing, N.Y. 11368.																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-T-U-V-W	10. SHIPPING INFORMATION 10.1 Grades or Purity: Research 99.94%, Pure 99.5%, Technical 96.5%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure vacuum.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>0</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td> Poison</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>1</td></tr> <tr> <td> Aquatic Toxicity</td><td>2</td></tr> <tr> <td> Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>0</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	0	Liquid or Solid Irritant	1	Poison	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 72. 13.3 Boiling Point at 1 atm: $161.3^{\circ}\text{F} = 71.8^{\circ}\text{C} = 345.0^{\circ}\text{K}$. 13.4 Freezing Point: $-224^{\circ}\text{F} = -142^{\circ}\text{C} = 131^{\circ}\text{K}$. 13.5 Critical Temperature: $499.3^{\circ}\text{F} = 259.6^{\circ}\text{C} = 532^{\circ}\text{K}$. 13.6 Critical Pressure: 550 psia = 37.4 atm = 3.79 MPa/m ² . 13.7 Specific Gravity: 0.749 at 20°C (liquid). 13.8 Liquid Surface Tension: 21.60 dynes/cm = 0.0216 N/m at 20°C . 13.9 Liquid-Water Interfacial Tension: (est.) 35 dynes/cm = 0.035 N/m at 20°C . 13.10 Vapor (Gas) Specific Gravity: 2.9. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0834. 13.12 Latent Heat of Vaporization: 162 Btu/lb = 38 cal/g = $3.8 \times 10^5 \text{ J/kg}$. 13.13 Heat of Combustion: (liquid) -18,900 Btu/lb = -10,500 cal/g = $-440 \times 10^3 \text{ J/kg}$. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	3																												
Health																													
Vapor Irritant	0																												
Liquid or Solid Irritant	1																												
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Self Reaction	0																												
12.3 NFPA Hazard Classifications: <table> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	(Continued on pages 4 and 5)																				
Category	Classification																												
Health Hazard (Blue)	2																												
Flammability (Red)	3																												
Reactivity (Yellow)	0																												

NOTES

MCS

METHYLDICHLOROSILANE

Common Synonyms		Liquid	Colorless	Sharp irritating odor
		Reacts violently with water. Irritating gas is produced on contact with water.		
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear goggles and self-contained breathing apparatus. Shut off ignition sources. Call fire department. Stop discharge if possible. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals or carbon dioxide. DO NOT USE WATER OR FOAM ON FIRE. DO NOT USE WATER OR FOAM ON ADJACENT FIRES.			
Exposure	Call for medical aid. VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability. Restrict access. Evacuate area. Disperse and flush with care.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 31 Synonyms: No common synonyms. 32 Coast Guard Competibility Classification: Not applicable. 33 Chemical Formula: CH ₃ SiHCl. 34 IMCO/United Nations Numerical Designation: 3.2/1242.		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid. 42 Color: Colorless. 43 Odor: Acid, sharp, hydrochloric acid like.		
5. HEALTH HAZARDS 51 Personal Protective Equipment: Full protective clothing, acid vapor type respiratory protection, rubber gloves, chemical worker's goggles, other protective equipment as necessary to protect skin and eyes. 52 Symptoms Following Exposure: Inhalation causes irritation of respiratory tract; heavy exposure can cause pulmonary edema. Contact of liquid with skin or eyes causes severe burns. Ingestion causes burns of mouth and stomach. 53 Treatment for Exposure: Get medical attention following all exposures to this compound. INHALATION: remove victim from exposure; if breathing has stopped, begin artificial respiration. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting, give large amounts of water. 54 Toxicity by Inhalation: (Threshold Limit Value): Data not available. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Grade 3 LD ₅₀ 50 to 500 mg/kg. 57 Late Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 59 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 510 Odor Threshold: Data not available.				

6. FIRE HAZARDS		8. WATER POLLUTION	
61	Flash Point: -14°F (0°C)	81	Aquatic Toxicity: Data not available
62	Flammable Limits in Air: 6% - 55%	82	Waterfowl Toxicity: Data not available
63	Fire Extinguishing Agents: Dry chemical or carbon dioxide	83	Biological Oxygen Demand (BOD): Data not available
64	Fire Extinguishing Agents Not to be Used: Water foam	84	Food Chain Concentration Potential: None
65	Special Hazards of Combustion Products: Toxic hydrogen chloride and phosgene gases may be formed		
66	Behavior in Fire: Difficult to extinguish; re-ignition may occur. Contact with water applied to adjacent fires will generate irritating hydrogen chloride gas	9. SELECTED MANUFACTURERS	
67	Ignition Temperature: >600°F	1	Union Carbide Corporation Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017
68	Electrical Hazard: Data not available	2	Dow Corning Corporation P.O. Box 592 Midland, Mich. 48640
69	Burning Rate: 10 mm/min	3	PCR, Inc. P.O. Box 1466 Gainesville, Fla. 32602
7. CHEMICAL REACTIVITY		10. SHIPPING INFORMATION	
71	Reactivity with Water: Reacts violently to form hydrogen chloride (hydrochloric acid)	10.1	Grades or Purity: 97%
72	Reactivity with Common Materials: Reacts with surface moisture to evolve hydrogen chloride, which is corrosive to common metals	10.2	Storage Temperature: Ambient
73	Stability During Transport: Stable	10.3	Inert Atmosphere: No requirement
74	Neutralizing Agents for Acids and Caustics: Flood with water and rinse with sodium bicarbonate or lime solution	10.4	Venting: Pressure/vacuum
75	Polymerization: Not pertinent		
76	Inhibitor of Polymerization: Not pertinent		
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A O		13. PHYSICAL AND CHEMICAL PROPERTIES	
12. HAZARD CLASSIFICATIONS		13.1	Physical State at 15°C and 1 atm: Liquid
12.1	Code of Federal Regulations: Flammable liquid	13.2	Molecular Weight: 115
12.2	NFPA Hazard Rating for Bulk Water Transportation:	13.3	Boiling Point at 1 atm: 106.7°F = 41.5°C = 314.7°K
	Category Rating	13.4	Freezing Point: -135°F = -93°C = 180°K
	Fire 3	13.5	Critical Temperature: Not pertinent
	Health 4	13.6	Critical Pressure: Not pertinent
	Vapor Irritant 4	13.7	Specific Gravity: 1.11 at 25°C (liquid)
	Liquid or Solid Irritant 4	13.8	Liquid Surface Tension* (est.) 35 dynes/cm = 0.035 N/m at 20°C
	Poisons 3	13.9	Liquid-Water Interfacial Tension: Not pertinent
	Water Pollution	13.10	Vapor (Gas) Specific Gravity: 4
	Human Toxicity 3	13.11	Ratio of Specific Heats of Vapor (Gas): Data not available
	Aquatic Toxicity 3	13.12	Latent Heat of Vaporization: 106 Btu/lb = 49 cal/g = 2.5 x 10 ⁵ J/kg
	Aesthetic Effect 2	13.13	Heat of Combustion* (est.) -4700 Btu/lb = -2600 cal/g = -110 x 10 ³ J/kg
	Reactivity	13.14	Heat of Decomposition: Not pertinent
	Other Chemicals 3	13.15	Heat of Solution: Data not available
	Water 4	13.16	Heat of Polymerization: Not pertinent
	Self-Reaction 1		
12.3	NFPA Hazard Classifications:		
	Category Classification		
	Health Hazard (Blue) 3		
	Flammability (Red) 3		
	Reactivity (Yellow) 2		
		Continued on pages 5 and 6.	
NOTES			

MEK

METHYL ETHYL KETONE

Common Synonyms MEK 2-Butanone Ethyl methyl ketone	Liquid Colorless Sweet odor Floats and mixes with water. Flammable, irritating vapor is produced.
Spilling or discharge if possible, keep people away. Shut off nearby sources and call fire department. Stay upwind and use water spray for knockdown vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES , hold eyes open and flush with plenty of water. IF SWALLOWED , do not induce vomiting. Have victim drink water or milk.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify petroleum spill spill water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning: high flammability. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Butanone Ethyl methyl ketone MEK 3.2 Coast Guard Compatibility Classification: Ketone 3.3 Chemical Formula: $\text{CH}_3\text{COCH}_2\text{CH}_3$ 3.4 IMCO/United Nations Numerical Designation: 3.2/1191	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like acetone: pleasant, pungent
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic canister or air pack, plastic gloves, goggles or face shield. 5.2 Symptoms Following Exposure: Liquid causes eye burn. Vapor irritates eyes, nose, and throat and can cause headache, dizziness, nausea, weakness, and loss of consciousness. 5.3 Treatment for Exposure: INHALATION : remove victim to fresh air, if breathing is irregular or has stopped, start resuscitation and administer oxygen. EYES : wash with plenty of water for at least 15 min. and call physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm 5.5 Short-Term Inhalation Limit: 290 mg/m ³ for 60 min 5.6 Toxicity by Ingestion: Grade 2.0 to 5 g/kg (rat) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 10 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 20°F C.C., 22°F O.C. 6.2 Flammable Limits in Air: 1.8% - 11.5% 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 961°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 4.1 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 5640 mg/l (48 hr. bioassay) 11 mg/fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 2143 5 days 8.4 Food Chain Concentration Potential: None																																						
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Celanese Corp. Celanese Chemical Co. Division 245 Park Ave. New York, N.Y. 10017 2 Exxon Chemical Co. Houston, Tex. 77001 3 Shell Chemical Co. Industrial Chemicals Division Houston, Tex. 77001																																						
	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.5+ % 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arrester or pressure vacuum																																						
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-P-Q-R-S	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 72.11 13.3 Boiling Point at 1 atm: 175.3°F = 79.6°C = 352.8°K 13.4 Freezing Point: -123.3°F = -86.3°C = 186.9°K 13.5 Critical Temperature: 504.4°F = 262.5°C = 535.7°K 13.6 Critical Pressure: 603 psia = 41.0 atm = 4.15 MN/m ² 13.7 Specific Gravity: 0.806 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 2.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.075 13.12 Latent Heat of Vaporization: 191 Btu/lb = 106 cal/g = 4.44 × 10 ³ J/kg 13.13 Heat of Combustion: -13 480 Btu/lb = -7491 cal/g = -313.6 × 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: (est.) -9 Btu/lb = -5 cal/g = -0.2 × 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent																																						
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="933 1455 1172 1821"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td></td></tr> <tr> <td> Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td> Poisons</td><td>2</td></tr> <tr> <td> Aesthetic Effect</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>2</td></tr> <tr> <td> Aquatic Toxicity</td><td>1</td></tr> <tr> <td> Aesthetic Effect</td><td>1</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>2</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="933 1757 1172 1821"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant		Liquid or Solid Irritant	1	Poisons	2	Aesthetic Effect	1	Water Pollution		Human Toxicity	2	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0	(Continued on pages 5 and 6)
Category	Rating																																						
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NOTES																																							

MEP

METHYLETHYLPYRIDINE

Common Synonyms 5-Ethyl-2-methylpyridine 5-Ethyl-2-picoline MEP	Liquid Colorless Sharp odor Floats on water
Avoid contact with liquid. Keep people away. Wear goggles, self-contained breathing apparatus, and rubber over-boots. Stop discharges immediately. Call fire department. Isolate and remove discharge to national. Notify local health and pollution control agencies.	
Fire	Combustible Wear goggles, self-contained breathing apparatus, and rubber over-boots. Extinguish with water, dry chemical, alcohol foam, carbon dioxide. Control exposed containers with water.
Exposure	CALL FOR MEDICAL AID LIQUID Will burn skin and eyes Harmful if swallowed Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If swallowed, do not induce vomiting. If conscious, have victim drink water. Notify local health and pollution control agencies.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify port and nearby water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Mechanical containment should be removed. Chemical and physical treatment.	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Aldehyde-ethylidene, Aldehyde, 5-Ethyl-2-methylpyridine, 5-Ethyl-2-picoline, MEP. 3.2 Coast Guard Compatibility Classification: Aromatic amine. 3.3 Chemical Formula: C ₇ H ₉ N. 3.4 IMCO/United Nations Numerical Designation: Not listed.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Sharp penetrating.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supplied mask for high vapor concentrations, plastic gloves, goggles or face shield. 5.2 Symptoms Following Exposure: Breathing of vapors will cause vomiting and chest discomfort. Contact with liquid causes skin and eye burns. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, give oxygen if breathing is difficult, call a physician. SKIN OR EYES: immediately flush with plenty of water for at least 15 min., get medical care for eyes. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1700 ppm, 3.7 hr lethality (a). 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: (Grade 2) LD ₅₀ 0.5 to 0.6 g/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure, may cause secondary burns on long exposure. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 155°F O.C. 6.2 Flammable Limits in Air: 1.1% - 6.6% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Irritating vapors are generated when heated. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 939°F. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): (hour) 4.4%, 5 days 56.6%, 20 days 0.12-2.14 lb/lb 5 days. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, neutralize with dilute acetic acid. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1 Lonza Inc. 22-10 Route 208 Fairlawn, N.J. 07410 2 Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-3) A-P-Q-T-U 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive Material. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="933 1476 1181 1757"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>2</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>2</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect</td> <td>3</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="933 1757 1181 1864"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	2	Liquid or Solid Irritant	2	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	3	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 121.18. 13.3 Boiling Point at 1 atm: 152°F = 178°C = 451°K. 13.4 Freezing Point: -94.5°F = -70.3°C = 202.9°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.922 at 20°C (liquid). 13.8 Liquid Surface Tension: 36 dynes/cm = 0.036 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Data not available. 13.13 Heat of Combustion: Data not available. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	1																																				
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Vapor Irritant	2																																				
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NOTES (Continued on pages 5 and 6)																																					

REVISED 1978

MTF

METHYL FORMAL

Common Synonyms		Liquid	Colorless	Mild sweet odor
Methylal Methylol dimethyl ether Dimethoxymethane Diethyl formal Formaldehyde dimethylacetal		Mixes with water. Flammable, irritating vapor is produced.		
Shut off to those sources. Call fire department. Stop discharge if possible. Keep people away. Isolate and remove discharged material. Notify local health and pollution control agencies.				
Fire		FLAMMABLE Irritating gases may be produced when heated Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Extinguish with dry chemicals, foam, or carbon dioxide Water may be ineffective on fire Cool exposed containers with water		
Exposure		Call for medical aid VAPOR Irritating to eyes, nose and throat. Harmful if inhaled Move victim to fresh air If breathing, have victim use artificial respiration If breathing is difficult, give oxygen LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water If EYES: hold eyelids open and flush with plenty of water If SWALLOWED and victim is CONSCIOUS: having victim drink water or milk and have victim induce vomiting If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: do nothing except keep victim warm		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local health and wildlife agencies Notify operators of nearby water intakes		
1. RESPONSE TO DISCHARGE (See Response Manual Handbook, CG 444-4) Issue warning: high flammability, water contaminant Restrict access Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dimethoxymethane, Dimethylformal, Formaldehyde, dimethylacetal, Methylal, Methylene dimethyl ether 3.2 Coast Guard Competibility Classification: F+her 3.3 Chemical Formula: CH ₂ (OCH ₃) ₂ 3.4 IMCO/United Nations Numerical Designation: 1.1/12.14		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild ethereal, chloroform like		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus or all purpose canister mask, rubber gloves, chemical safety goggles, impervious apron and boots 5.2 Symptoms Following Exposure: Inhalation causes irritation of respiratory system and depression of central nervous system. Liquid causes irritation of eyes and will irritate skin if allowed to remain. Ingestion causes depression of central nervous system 5.3 Treatment for Exposure: INHALATION: remove victim from contaminated area and administer artificial respiration and oxygen if necessary. EYES: flush with plenty of water, get medical attention. SKIN: flush with plenty of water. INGESTION: induce vomiting, administer gastric lavage and saline cathartics; subsequent treatment is symptomatic and supportive 5.4 Toxicity by Inhalation (Threshold Limit Value): 1.000 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade I LD ₅₀ 5 to 15 g/kg 5.7 Late Toxicity: Liver and kidney injury may follow high exposures 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory if present in high concentrations. The effect is temporary 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS

6.1 **Flash Point:** 0°F O.C.
6.2 **Flammable Limits in Air:** 1.6% - 17.6%
6.3 **Fire Extinguishing Agents:** Dry chemical, foam, carbon dioxide
6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective
6.5 **Special Hazards of Combustion Products:** Irritating formaldehyde gas may be present in smoke
6.6 **Behavior in Fire:** Not pertinent
6.7 **Ignition Temperature:** 459°F
6.8 **Electrical Hazard:** Data not available
6.9 **Burning Rate:** 5.5 mm/min

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction
7.2 **Reactivity with Common Materials:** No reaction
7.3 **Stability During Transport:** Stable
7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
7.5 **Polymerization:** Not pertinent
7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** Data not available
8.2 **Waterfowl Toxicity:** Data not available
8.3 **Biological Oxygen Demand (BOD):** Data not available
8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Celanese Chemical Company
245 Park Avenue
New York, N.Y. 10017
2. Aldrich Chemical Co.
940 West Saint Paul Ave.
Milwaukee, Wis. 53233
3. Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** 97+%
10.2 **Storage Temperature:** Ambient
10.3 **Inert Atmosphere:** No requirement
10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Manual, CG 444-3)

A P Q R S

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Flammable liquid
12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	3
Health	
Vapor Irritant	1
Liquid or Solid Irritant	1
Poisons	1
Water Pollution	
Human Toxicity	1
Aquatic Toxicity	2
Aesthetic Effect	1
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid
13.2 **Molecular Weight:** 76.1
13.3 **Boiling Point at 1 atm:** 108°F = 42°C = 315°K
13.4 **Freezing Point:** -157°F = -105°C = 168°K
13.5 **Critical Temperature:** 419°F = 215°C = 488°K
13.6 **Critical Pressure:** Not pertinent
13.7 **Specific Gravity:** 0.861 at 20°C (liquid)
13.8 **Liquid Surface Tension:** 21.1 dynes/cm = 0.0211 N/m at 20°C
13.9 **Liquid-Water Interfacial Tension:** Not pertinent
13.10 **Vapor (Gas) Specific Gravity:** 2.6
13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.0888
13.12 **Latent Heat of Vaporization:** 161.5 Btu/lb = 89 kcal/g = 3.76 × 10⁵ J/kg
13.13 **Heat of Combustion:** -10,970 Btu/lb = -6,100 cal/g = -255 × 10³ J/kg
13.14 **Heat of Decomposition:** Not pertinent
13.15 **Heat of Solution:** Not pertinent
13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

MFM

METHYL FORMATE

Common Synonyms		Liquid	Colorless	Pleasant odor
Formic acid, methyl ester		Mixes with water. Flammable, irritating vapor is produced. Boiling point is 88° F.		
See the caution sources. Call fire department if spill is large. If possible, keep people away from the spill. Do not use contaminated material. Do not use contaminated material in food or drink.				
Fire	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemical or carbon dioxide. Do not use water. Do not use water on burning containers with water.			
Exposure	VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. May irritate skin. Prolonged exposure may cause irritation of skin. Do not breathe vapors. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, flush eyes with plenty of water. If SWALLOWED, do not induce vomiting.			

6 FIRE HAZARDS		8. WATER POLLUTION																													
6.1	Flash Point: -26°F C C	8.1	Aquatic Toxicity: Data not available																												
6.2	Flammable Limits in Air: 5% - 22.7%	8.2	Waterfowl Toxicity: Data not available																												
6.3	Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide	8.3	Biological Oxygen Demand (BOD): Data not available																												
6.4	Fire Extinguishing Agents Not to be Used: Water may be ineffective	8.4	Food Chain Concentration Potential: None																												
6.5	Special Hazards of Combustion Products: Not pertinent																														
6.6	Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back	9. SELECTED MANUFACTURERS																													
6.7	Ignition Temperature: 853°F	1	I. I. duPont de Nemours & Co., Inc. Biochemicals Department, 1007 Market Street, Wilmington, Del. 19898																												
6.8	Electrical Hazard: Data not available	2	Aldrich Chemical Co. 940 West Saint Paul Ave. Milwaukee, Wis. 53233																												
6.9	Burning Rate: 2.5 mm/min	3	Eastman Kodak Co. Eastman Organic Chemicals, Rochester, N. Y. 14650																												
7 CHEMICAL REACTIVITY																															
7.1	Reactivity with Water: Slow reaction to form formic acid and methyl alcohol. Reaction is not hazardous	10 SHIPPING INFORMATION																													
7.2	Reactivity with Common Materials: No reaction	10.1	Grades or Purity: Technical, practical and spectro grades, all 97.54%																												
7.3	Stability During Transport: Stable	10.2	Storage Temperature: <85°F																												
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent	10.3	Inert Atmosphere: No requirement																												
7.5	Polymerization: Not pertinent	10.4	Venting: Pressure-vacuum																												
7.6	Inhibitor of Polymerization: Not pertinent																														
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A-P-Q-R-S		13. PHYSICAL AND CHEMICAL PROPERTIES																													
12 HAZARD CLASSIFICATIONS		13.1	Physical State at 15°C and 1 atm: Liquid																												
12.1	Code of Federal Regulations: Flammable liquid	13.2	Molecular Weight: 60.1																												
12.2	NAS Hazard Rating for Bulk Water Transportation:	13.3	Boiling Point at 1 atm: 89.2°F = 31.8°C = 305°K																												
	<table><tr><td>Category</td><td>Rating</td></tr><tr><td>Fire</td><td>4</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>4</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>1</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>1</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table>	Category	Rating	Fire	4	Health		Vapor Irritant	4	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	13.4	Freezing Point: -147.6°F = -99.8°C = 173.4 K
Category	Rating																														
Fire	4																														
Health																															
Vapor Irritant	4																														
Liquid or Solid Irritant	1																														
Poisons	1																														
Water Pollution																															
Human Toxicity	1																														
Aquatic Toxicity	1																														
Aesthetic Effect	1																														
Reactivity																															
Other Chemicals	1																														
Water	0																														
Self Reaction	0																														
12.3	NFPA Hazard Classifications:	13.5	Critical Temperature: 417°F = 214°C = 487°K																												
	<table><tr><td>Category</td><td>Classification</td></tr><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>4</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	4	Reactivity (Yellow)	0	13.6	Critical Pressure: 870 psia = 59.2 atm = 6.00 MN/m ²																				
Category	Classification																														
Health Hazard (Blue)	2																														
Flammability (Red)	4																														
Reactivity (Yellow)	0																														
		13.7	Specific Gravity: 0.977 at 20°C (liquid)																												
		13.8	Liquid Surface Tension: 25 dyne/cm = 0.025 N/m at 20°C																												
		13.9	Liquid-Water Interfacial Tension: Not pertinent																												
		13.10	Vapor (Gas) Specific Gravity: 2.07																												
		13.11	Ratio of Specific Heats of Vapor (Gas): 1.146																												
		13.12	Latent Heat of Vaporization: 202 Btu/lb = 112 cal/g = 4.69 x 10 ³ J/kg																												
		13.13	Heat of Combustion: -6980 Btu/lb = -3880 cal/g = -162 x 10 ³ J/kg																												
		13.14	Heat of Decomposition: Not pertinent																												
		13.15	Heat of Solution: Not pertinent																												
		13.16	Heat of Polymerization: Not pertinent																												
		(Continued on page 5 and 6)																													
NOTES																															

MHZ

METHYLHYDRAZINE

Common Synonyms Monomethylhydrazine MMH	Liquid Colorless Ammonia-like odor Mixes with water. Poisonous. Flammable vapor is produced.
AVOID CONTACT WITH EYES OR SKIN. IF CONTACT OCCURS, WASH IMMEDIATELY WITH WATER. IF EYES ARE CONTACTED, FLUSH EYES FOR AT LEAST 15 MINUTES. IF SKIN IS CONTACTED, WASH SKIN IMMEDIATELY WITH WATER. IF INGESTED, DO NOT INDUCE VOMITING. IF SWALLOWED, DRINK WATER OR MILK. IF INGESTED, DRINK WATER OR MILK. IF INGESTED, DRINK WATER OR MILK.	
Fire	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. May explode if exposed to heat or flames.
 Exposure	VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED Irritating to eyes, nose and throat. May cause respiratory distress. If inhaled, stop activity and get fresh air. If on skin, wash immediately with water. LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Will burn skin and eyes. If swallowed, do not induce vomiting. If on skin, wash immediately with water. If in eyes, flush immediately with water. If in eyes, flush immediately with water. If in eyes, flush immediately with water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning: poison high. Flammability, water contaminant. Restrict access. Evacuate area. Disperse and flush.	2. LABELS  
3. CHEMICAL DESIGNATIONS 31 Synonyms: Monomethylhydrazine, MMH. 32 Coast Guard Compatibility Classification: Not applicable. 33 Chemical Formula: CH ₃ NHNH. 34 IMCO/United Nations Numerical Designation: 1.2/1.4.	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid. 42 Color: Colorless. 43 Odor: Like ammonia.
5. HEALTH HAZARDS 51 Personal Protective Equipment: Organic canister mask or self-contained breathing apparatus, goggles or face shield, rubber gloves, protective clothing. 52 Symptoms Following Exposure: Tremors and convulsions follow absorption by any route. Inhalation causes local irritation of respiratory tract, respiratory distress, and systemic effect. Contact of liquid with eyes or skin causes irritation and burns. Ingestion causes irritation of mouth and stomach. 53 Treatment for Exposure: Get medical attention at once following all exposures to this compound. INHALATION: move victim to fresh air and keep him quiet; give artificial respiration if breathing stops. EYES: flush for at least 15 min. with large quantities of water. SKIN: immediately wash with large quantities of water and treat as for alkali burn. INGESTION: give egg whites or other emollient, followed by a 5% salt solution; if other mild emetic keep patient as quiet as possible. To control convulsions, short acting barbiturates may be administered parenterally by a physician with due regard for depression of respiration. 54 Toxicity by Inhalation (Threshold Limit Value): 0.2 ppm. 55 Short-Term Inhalation Limits: 90 ppm for 10 min.; 40 ppm for 30 min.; 15 ppm for 60 min. 56 Toxicity by Ingestion: (Grade 4 oral LD ₅₀) = 33 mg/kg (rat). 57 Late Toxicity: Hemolytic anemia may result from large doses by any route. 58 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations.	

(Continued on page 4)

6. FIRE HAZARDS 61 Flash Point: 62°F O.C. 62 Flammable Limits in Air: 2.4% - 98% 63 Fire Extinguishing Agents: Water or dry chemical. 64 Fire Extinguishing Agents Not to be Used: Not pertinent. 65 Special Hazards of Combustion Products: Irritating nitrogen oxides are produced. 66 Behavior in Fire: May explode. 67 Ignition Temperature: 362°F. 68 Electrical Hazard: Data not available. 69 Burning Rate: 20 mm/min.	8. WATER POLLUTION 81 Aquatic Toxicity: Data not available. 82 Waterfowl Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): Data not available. 84 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: Reacts slowly with air, but heat may cause ignition of rags, rust, or other combustibles. 73 Stability During Transport: Stable, not in contact with iron, copper, or other alloys. 74 Neutralizing Agents for Acids and Caustics: Flush with water. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1 Olin Corporation 120 Long Ridge Road Stamford, Conn. 06904 2 Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14650 3 Aldrich Chemical Co. 940 West St. Paul Ave. Milwaukee, Wis. 53233																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) APQRN	10. SHIPPING INFORMATION 101 Grades or Purity: Propellant grade 99+%; Laboratory grade 98+%. 102 Storage Temperature: Ambient. 103 Inert Atmosphere: Padded with nitrogen. 104 Venting: Safety relief.																																				
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable liquid. 122 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="966 1412 1181 1692"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>4</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>3</td></tr> <tr><td>Liquid or Solid Irritant</td><td>4</td></tr> <tr><td>Poisons</td><td>4</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>4</td></tr> <tr><td>Aquatic Toxicity</td><td></td></tr> <tr><td>Aesthetic Effect</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>4</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self Reaction</td><td>4</td></tr> </tbody> </table> 123 NFPA Hazard Classifications: <table data-bbox="966 1714 1181 1800"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>3</td></tr> <tr><td>Flammability (Red)</td><td>3</td></tr> <tr><td>Reactivity (Yellow)</td><td>3</td></tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	3	Liquid or Solid Irritant	4	Poisons	4	Water Pollution		Human Toxicity	4	Aquatic Toxicity		Aesthetic Effect	2	Reactivity		Other Chemicals	4	Water	0	Self Reaction	4	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	3	Reactivity (Yellow)	3	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid. 132 Molecular Weight: 46.1. 133 Boiling Point at 1 atm: 189.4°F = 87.5°C = 360.7°K. 134 Freezing Point: -62.3°F = -52.4°C = 220.8°K. 135 Critical Temperature: 504°F = 262°C = 535°K. 136 Critical Pressure: 1195 psia = 81.3 atm = 8.25 MN/m. 137 Specific Gravity: 0.878 at 20°C (liquid). 138 Liquid Surface Tension: 34.3 dyne/cm = 0.0343 N/m at 20°C. 139 Liquid-Water Interfacial Tension: Not pertinent. 1310 Vapor (Gas) Specific Gravity: 1.59. 1311 Ratio of Specific Heats of Vapor (Gas): 1.1326. 1312 Latent Heat of Vaporization: 176 Btu/lb = 209 cal/g = 8.75 x 10 ³ J/kg. 1313 Heat of Combustion: -12,178 Btu/lb = -6,766 cal/g = -283.1 x 10 ³ J/kg. 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: Not pertinent. 1316 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	4																																				
Health																																					
Vapor Irritant	3																																				
Liquid or Solid Irritant	4																																				
Poisons	4																																				
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Other Chemicals	4																																				
Water	0																																				
Self Reaction	4																																				
Category	Classification																																				
Health Hazard (Blue)	3																																				
Flammability (Red)	3																																				
Reactivity (Yellow)	3																																				
5. HEALTH HAZARDS (Cont'd) 59 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 510 Odor Threshold: 1 - 3 ppm.																																					

(Continued on pages 5 and 6)

MIC

METHYL ISOBUTYL CARBINOL

Common Synonyms: Methyl isobutyl alcohol 4-Methyl-2-pentanol Isobutyl methyl carbinol		Only liquid Colorless Mild alcohol odor
Floats on water. Irritating vapor is produced.		
No special safety precautions. Keep people away. Avoid contact with eyes and skin. In case of fire, use dry chemical or foam. In case of spill, absorb with inert material. Do not breathe vapors.		
Fire	Combustible Extinguish with dry chemical, foam, or carbon dioxide. Do not use water.	
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. Harmful if skin is exposed. If inhaled, will cause dizziness or difficult breathing. Move to fresh air. If in eyes, flush with water for at least 15 minutes. If on skin, flush with plenty of water. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing as soon as possible. Flush with plenty of water. If IN EYES, hold eyelids open, flush with plenty of water. If SWALLOWED, do not induce vomiting. Flush with plenty of water. If on skin, flush with plenty of water.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. Not a health and safety hazard. Not a serious health and safety hazard.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 2.1 Synonyms: Isobutyl methyl carbinol, Methyl isobutyl Alcohol, MIAOH, 4-Methyl-2-pentanol, MIBC, MIC. 3.2 Coast Guard Compatibility Classification: Alcohol. 3.3 Chemical Formula: $(CH_3)_2CHCH_2CH_2OH$. 3.4 IMCO, UN, & Nations Numerical Designation: 111, 2051.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Mild, sharp, non-residual.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air pack or organic canister mask, rubber gloves, goggles, or face shield. 5.2 Symptoms Following Exposure: Vapor irritates eyes and nose, may cause anesthesia. Prolonged contact with liquid causes irritation and cracking of skin, also irritates eyes. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, give artificial respiration if needed, call doctor. SKIN: flush with water. EYES: flush with water for at least 15 min, consult a doctor. 5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, LD ₅₀ 5 to 5 g/kg (rat). 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause staining and reddening of the skin. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS

6.1 **Flash Point:** 120-130°F O.C.
106°F C.C.

6.2 **Flammable Limits in Air:** 1.0% - 5.5%

6.3 **Fire Extinguishing Agents:** Alcohol foam, dry chemical or carbon dioxide

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Not pertinent

6.7 **Ignition Temperature:** Data not available

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Data not available

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:** No reaction

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8. WATER POLLUTION

8.1 **Aquatic Toxicity:** 370 ppm/24 hr/brine shrimp/TL₅₀

8.2 **Waterfowl Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** 50% of theoretical in 5 days, freshwater

8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

- Exxon Chemical Co.
Houston, Tex. 77001
- Shell Chemical Co.
Industrial Chemicals Division
Houston, Tex. 77001
- Union Carbide Corp.
Chemicals & Plastics Division
270 Park Ave.
New York, N.Y. 10017

10. SHIPPING INFORMATION

10.1 **Grades or Purity:** Data not available

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
A-P-Q, F-U

12. HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Combustible Liquid

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	2
Health	
Vapor Irritant	2
Liquid or Solid Irritant	4
Poisons	2
Water Pollution	
Human Toxics	2
Aquatic Toxics	2
Aesthetic Effect	2
Reactivity	
Other Chemicals	2
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	2
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Liquid

13.2 **Molecular Weight:** 102.18

13.3 **Boiling Point at 1 atm:** 269.2°F = 131.8°C = 405°K

13.4 **Freezing Point:** < -130°F = < -90°C = < 183°K

13.5 **Critical Temperature:** 556°F = 291°C = 562°K

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 0.807 at 20°C (liquid)

13.8 **Liquid Surface Tension:** 22.8 dynes/cm = 0.0228 N/m at 20°C

13.9 **Liquid-Water Interfacial Tension:** (est.) 25 dynes/cm = 0.025 N/m at 20°C

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.05

13.12 **Latent Heat of Vaporization:** 162 Btu/lb = 90.1 cal/g = 3.77 x 10⁵ J/kg

13.13 **Heat of Combustion:** (est.) -16,600 Btu/lb = -9,300 cal/g = -387 x 10³ J/kg

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 1 and 2)

NOTES

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MIK

METHYL ISOBUTYL KETONE

Common Synonyms 4-Methyl-2-pentanone Isobutyl methyl ketone MIBK	Watery liquid Colorless Mild pleasant odor Floats and mixes slowly with water. Flammable irritating vapor is produced.
Fire	FLAMMABLE: Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Will burn on water surface.
Exposure	CAUTION OF HAZARD VAPOR: Irritating to eyes, nose and throat. If inhaled, will cause dizziness or loss of consciousness. LIQUID: Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing. Flush affected area with plenty of water. IF IN EYES: hold eyelids open and flush with stream of water. IF SWALLOWED: do not induce vomiting. Give 1-2 glasses of water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to surface. May be dangerous if it enters water intakes. Notify local health and fire authorities. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 448-1) Issue warning - high flammability Evacuate area Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: Hexone; Isobutyl methyl ketone; Isopropylacetone; 4-Methyl-2-pentanone; MIBK; MIK. 32 Coast Guard Compatibility Classification: Ketone 33 Chemical Formula: $(CH_3)_2CHCH_2COCH_3$ 34 IMCO/United Nations Numerical Designation: 3271245	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Pleasant mild characteristic, sharp non residual, ketonic
5. HEALTH HAZARDS 51 Personal Protective Equipment: Organic canister or air pack, rubber gloves, goggles or face shield. 52 Symptoms Following Exposure: Vapor causes irritation of eyes and nose, high concentrations cause numbness and depression. Liquid dries out skin and may cause dermatitis, irritates eyes but does not injure them. 53 Treatment for Exposure: INHALATION: remove to fresh air, give artificial respiration if needed, call a doctor. SKIN OR EYES: wash eyes thoroughly with water, wash skin with water until irritation stops. 54 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 55 Short-Term Inhalation Limit: 100 ppm for 60 min. 56 Toxicity by Ingestion: Grade 2, LD ₅₀ 0.5 to 5 g/kg (rat) 57 Late Toxicity: None 58 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 59 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 510 Odor Threshold: 0.47 ppm	

6. FIRE HAZARDS

- 61 **Flash Point:** 73°F C.C., 75°F O.C.
 62 **Flammable Limits in Air:** 1.4% - 7.5%
 63 **Fire Extinguishing Agents:** Alcohol foam, dry chemical, or carbon dioxide.
 64 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
 65 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
 66 **Behavior in Fire:** Vapors may travel a considerable distance and ignite.
 67 **Ignition Temperature:** 854°F
 68 **Electrical Hazard:** Class I, Group D
 69 **Burning Rate:** Data not available

8. WATER POLLUTION

- 81 **Aquatic Toxicity:** Data not available
 82 **Waterway Toxicity:** Data not available
 83 **Block Total Oxygen Demand (BOD):** (theor.) 1.8%, 0.5 day, (theor.) 12%, 5 days
 84 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

- 1 Exxon Chemical Co.
Houston, Tex. 77001
 2 Shell Chemical Co.
Industrial Chemicals Division
Houston, Tex. 77001
 3 Union Carbide Corp.
Chemicals & Plastics Division
270 Park Ave.
New York, N.Y. 10017

7. CHEMICAL REACTIVITY

- 71 **Reactivity with Water:** No reaction
 72 **Reactivity with Common Materials:** No reaction
 73 **Stability During Transport:** Stable
 74 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 75 **Polymerization:** Not pertinent
 76 **Inhibitor of Polymerization:** Not pertinent

10. SHIPPING INFORMATION

- 101 **Grades or Purity:** 99+%
 102 **Storage Temperature:** Ambient
 103 **Inert Atmosphere:** No requirement
 104 **Venting:** Open (flame arrester) or pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 448-3)
 A-P-Q-T-U

13. PHYSICAL AND CHEMICAL PROPERTIES

- 131 **Physical State at 15°C and 1 atm:** Liquid
 132 **Molecular Weight:** 100.16
 133 **Boiling Point at 1 atm:** 241.2°F = 116.2 = 389.4°K
 134 **Freezing Point:** -119°F = -84°C = 189°K
 135 **Critical Temperature:** 568.9°F = 298.3°C = 571.5°K
 136 **Critical Pressure:** 475 psia = 32.3 atm = 3.27 MN/m²
 137 **Specific Gravity:** 0.802 at 20°C (liquid)
 138 **Liquid Surface Tension:** 23.6 dyne/cm = 0.0236 N/m at 20°C
 139 **Liquid-Water Interfacial Tension:** 15.7 dyne/cm = 0.0157 N/m at 22.7°C
 1310 **Vapor (Gas) Specific Gravity:** Not pertinent
 1311 **Ratio of Specific Heats of Vapor (Gas):** 1.061
 1312 **Latent Heat of Vaporization:** 149 Btu/lb = 82.5 cal/g = 3.45×10^4 J/kg
 1313 **Heat of Combustion:** (est.) -10,400 Btu/lb = -5,800 cal/g = -242×10^3 J/kg
 1314 **Heat of Decomposition:** Not pertinent
 1315 **Heat of Solution:** (est.) -9 Btu/lb = -5 cal/g = -0.2×10^3 J/kg
 1316 **Heat of Polymerization:** Not pertinent

(Continued on pages 7 and 8)

NOTES

REVISED 1978

MPK

METHYL ISOPROPENYL KETONE, INHIBITED

Common Synonyms 2 Methyl-1-butene-3-one	Liquid Colorless Sweet pleasant odor Floats on water. Flammable irritating vapor is produced.
Shut off ignition sources. Call fire department. Stop discharge if possible. Keep people away. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Control at fires from safe distance in protected location. Extinguish with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	Call for medical aid. VAPOR Irritating to eyes, nose and throat. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eye closed and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water. If milk and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CON- VULSIONS, do not induce vomiting. Keep victim warm.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability, water contaminant. Restrict access. Mechanical containment should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: Isopropenyl methyl ketone 2 Methyl-1-butene-3-one 32 Coast Guard Compatibility Classification: Not applicable. 33 Chemical Formula: $\text{CH}_3\text{COC}(\text{CH}_3)=\text{CH}_2$ 34 IMCO/United Nations Numerical Designation: 32/1246	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Very pungent, pleasant sweet
5. HEALTH HAZARDS 51 Personal Protective Equipment: Goggles or face shield, rubber gloves. 52 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Liquid may cause severe damage to eyes, resulting possibly in some permanent impairment of vision; vapor produces tears. If not removed promptly from skin, liquid may cause delayed pain and blistering. Ingestion causes irritation of mouth and stomach. 53 Treatment for Exposure: INHALATION: remove victim from exposure, give artificial respiration if needed, call physician. EYES: immediately irrigate with copious amounts of water for 15 min; call physician. SKIN: wash off skin with large volumes of water for 15 min; call physician if burn has occurred. INGESTION: induce vomiting, call physician. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: (acute) oral LD_{50} = 180 mg/kg (rat). 57 Late Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 59 Liquid or Solid Irritant Characteristics: Causes smarting and first degree burns on short exposure; may cause second degree burns on long exposure. 610 Odor Threshold: Data not available.	

6. FIRE HAZARDS 61 Flash Point: <73°F (C) 62 Flammable Limits in Air: 1.8% - 9.0% 63 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide. 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 65 Special Hazards of Combustion Products: Not pertinent. 66 Behavior in Fire: May polymerize and explode. 67 Ignition Temperature: Data not available. 68 Electrical Hazard: Data not available. 69 Burning Rate: 4 in/min.	8. WATER POLLUTION 81 Aquatic Toxicity: Data not available. 82 Waterfowl Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): Data not available. 84 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: No reaction. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Not pertinent. 75 Polymerization: Will polymerize in the absence of inhibitor, especially when heated. 76 Inhibitor of Polymerization: Up to 1% hydroquinone.	9. SELECTED MANUFACTURERS 1 Eastern Chemical Division 230 Marcus Boulevard Hauppauge, L.I., N.Y. 11787 2 Pfaltz and Bauer, Inc. 126-04 Northern Boulevard Flushing, N.Y. 11368																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U-V-W	10. SHIPPING INFORMATION 101 Grade or Purity: Commercial. 102 Storage Temperature: Ambient. 103 Inert Atmosphere: No requirement. 104 Venting: Pressure/vacuum.																																				
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable liquid. 122 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="939 1419 1144 1681"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>3</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td>Poison</td><td>4</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td></td></tr> <tr> <td>Aquatic Toxicity</td><td></td></tr> <tr> <td>Acute Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>0</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 123 NFPA Hazard Classifications: <table data-bbox="939 1703 1144 1790"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td></td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	3	Liquid or Solid Irritant	2	Poison	4	Water Pollution		Human Toxicity		Aquatic Toxicity		Acute Effect	2	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)		Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid. 132 Molecular Weight: 84.1. 133 Boiling Point at 1 atm: $70.8^\circ\text{F} = 21^\circ\text{C} = 273^\circ\text{K}$ 134 Freezing Point: $-65.8^\circ\text{F} = -43^\circ\text{C} = 219^\circ\text{K}$ 135 Critical Temperature: Not pertinent. 136 Critical Pressure: Not pertinent. 137 Specific Gravity: 0.85 at 20°C (found). 138 Liquid Surface Tension: (cal/cm) $26 \text{ dynes/cm} = 0.026 \text{ N/m at } 20^\circ\text{C}$ 139 Liquid-Water Interfacial Tension: (cal/cm) $30 \text{ dynes/cm} = 0.030 \text{ N/m at } 20^\circ\text{C}$ 1310 Vapor (Gas) Specific Gravity: 2.9. 1311 Ratio of Specific Heats of Vapor (Gas): $1.076 \text{ at } 20^\circ\text{C} (68^\circ\text{F})$ 1312 Latent Heat of Vaporization: (cal/g) $132 \text{ Btu/lb} = 101 \text{ cal/g}$ $= 4.23 \times 10^3 \text{ J/kg}$ 1313 Heat of Combustion: (cal/g) $-15,500 \text{ Btu/lb} = -8,600 \text{ cal/g}$ $= -360 \times 10^3 \text{ J/kg}$ 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: Not pertinent. 1316 Heat of Polymerization: (cal/g) = 180 Btu/lb $= -210 \text{ cal/g} = -8.8 \times 10^3 \text{ J/kg}$
Category	Rating																																				
Fire	1																																				
Health																																					
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NOTES Continued on pages 5 and 6.																																					

MMC

METHYL MERCAPTAN

Common Synonyms Methanethiol Mercaptomethane Thiomethyl alcohol Methyl sulfide	Liquefied compressed gas Colorless Strong garlic odor Floats and boils on water Poisonous flammable vapor is produced
AVOID CONTACT WITH LIQUID AND VAPOR. KEEP PEOPLE AWAY. Wear goggles, self-contained breathing apparatus and rubber overclothing (including gloves). Shut off ignition sources. Call fire department. Stop discharge if possible. Evacuate area upwind. If area discharge, notify local health and industrial safety agencies.	
Fire	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Let fire burn. Stop flow of gas if possible. Cool exposed containers and protect me. effect use of water with water.
 Exposure	CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED. Irritating to eyes, nose and throat. Move victim to fresh air. If in eyes, hold eyes closed, pour and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED. Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyes closed and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water. IF SWALLOWED and victim is UNCONSCIOUS, do not give anything by mouth. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and safety officials. Notify proper authorities in water zone.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Issue warning: high flammability, water contaminant, air contaminant. Restrict access. Evacuate area. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Mercaptomethane, Methanethiol, Methyl sulfide, Thiomethyl alcohol. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: CH ₃ SH. 3.4 IMCO/United Nations Numerical Designation: 271064.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied compressed gas. 4.2 Color: Colorless. 4.3 Odor: Garlic, foul, strong, offensive.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, goggles or face shield, air line or self-contained breathing apparatus. 5.2 Symptoms Following Exposure: Inhalation causes irritation of respiratory system, cough, paralysis, unconsciousness, death may follow respiratory paralysis. Contact with liquid causes eyes and skin. Ingestion causes irritation of mouth and stomach, plus symptoms described for inhalation. 5.3 Treatment for Exposure: INHALATION: remove patient immediately from the contaminated area, keep him warm and at complete rest; if necessary give artificial respiration until medical assistance can be obtained; oxygen or oxygen CO ₂ inhalation is recommended; continuing after spontaneous breathing has returned. EYES: for exposure to vapor, apply hot and cold compresses to reduce pain of conjunctivitis; for exposure to liquid, wash with water and obtain medical assistance. SKIN: wash with water. INGESTION: induce vomiting and follow with gastric lavage. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0 ppm. 5.5 Short-Term Inhalation Limit: 20 ppm for 5 min. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: 0.0021 ppm.	

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (flammable, liquefied compressed gas). 6.2 Flammable Limits in Air: 3.9% - 21.8%. 6.3 Fire Extinguishing Agents: Preferably let fire burn, stop gas flow. Fires may be extinguished with dry chemical, foam or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Irritating sulfur dioxide is produced. 6.6 Behavior in Fire: Containers may explode. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: 3.8 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 1.0 ppm/105 min/white bass, death/fresh water. 8.2 Waterlevel Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerizations: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Amoco Chemicals Corporation 130 East Randolph Drive Chicago, Ill. 60601 2. Pennwalt Corporation Chemical Division Three Parkway Philadelphia, Pa. 19102 3. Matheson Gas Products Co. East Rutherford, N. J. 07073.								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3.) A B C D E F M S	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.5+%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Safety relief.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications. <table data-bbox="940 1441 1192 1528"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>1</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	4	Reactivity (Yellow)	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas. 13.2 Molecular Weight: 48.1. 13.3 Boiling Point at 1 atm: 43.2°F = 6.2°C = 279.4°K. 13.4 Freezing Point: -189°F = -123°C = 150°K. 13.5 Critical Temperature: 186.2°F = 196.5°C = 479.0°K. 13.6 Critical Pressure: 1050 psia = 71.4 atm = 7.25 MPa. 13.7 Specific Gravity: 0.492 at 6°C (liquid). 13.8 Liquid Surface Tension: 31 dynes/cm = 0.041 N/m at 5°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 1.66. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1935. 13.12 Latent Heat of Vaporization: 220 Btu/lb = 122 cal/g = 5.10 x 10 ³ J/kg. 13.13 Heat of Combustion: -11,054 Btu/lb = -6,141 cal/g = -257.0 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	2								
Flammability (Red)	4								
Reactivity (Yellow)	1								
NOTES (Continued on pages 2 and 3)									

MMH

METHYL METHACRYLATE

Common Synonyms: Methacrylic acid methyl ester Liquid Colorless Pleasant sharp odor Floats on water. Flammable, irritating vapor is produced.	
Fire FLAMMABLE: Flashback along vapor trail may occur. Containers may explode when heated. Vapor may explode if ignited in an enclosed area. May polymerize under heat, pressure, and other conditions. Can burn from flameless combustion (e.g., in a hot surface or in a hot liquid). May burn in the presence of oxygen. May burn in the presence of air. May burn in the presence of water. May burn in the presence of other liquids.	
Exposure FORMER MEDICAL: VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness, headache, difficult breathing, or loss of consciousness. Nausea, vomiting. If absorbed through skin, may cause irritation, redness, or blisters. If swallowed, may cause irritation, redness, or blisters. If swallowed, may cause irritation, redness, or blisters. If swallowed, may cause irritation, redness, or blisters.	
Water Pollution Dangerous to aquatic life in high concentrations. Tending to bioaccumulate. May be dangerous if it enters water intakes. Not a hazardous material under the law. Not a hazardous material under the law.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-1.) Issue warning: High flammability. Evacuate area. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Methacrylate monomer; Methacrylic acid, methyl ester; Methyl α-methylacrylate; Methyl 2-methyl 2-propenoate. 3.2 Coast Guard Compatibility Classification: Acrylate. 3.3 Chemical Formula: CH₂=C(CH₃)COOCH₃. 3.4 IMCO/United Nations Numerical Designation: 3.2/1247.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Sharp, fragrant, pleasant smelling pungent ester.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air mask, plastic gloves, goggles. 5.2 Symptoms Following Exposure: Irritation of eyes, nose, and throat. Nausea and vomiting. Liquid may cause skin irritation. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, apply artificial respiration and oxygen if needed, refer to physician. SKIN OR EYES: flush with plenty of water for 15 min., refer to physician for eye exposure. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade I, LD50 to 15 g/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure, may cause secondary burns on long exposure. 5.10 Odor Threshold: 0.05 ppm.	

6. FIRE HAZARDS 6.1 Flash Point: 50°F O.C. 6.2 Flammable Limits in Air: 2.1% - 12.5%. 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. Containers may explode in fire or when heated because of polymerization. 6.7 Ignition Temperature: 790°F. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 2.5 mm/min.																																					
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Corrosives: Not pertinent. 7.5 Polymerization: Heat, oxidizing agents, and ultraviolet light may cause polymerization. 7.6 Inhibitor of Polymerization: Hydroquinone, 22-65 ppm; hydroquinone methyl ether, 22-120 ppm; dimethyl tert-butylperoxide, 45-65 ppm.																																					
8. WATER POLLUTION 8.1 Aquatic Toxicity: 250 ppm (96 hr) bluegill/TLM in fresh water. 8.2 Waterfront Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): (theoretical) 4%, 10 days. 8.4 Food Chain Concentration Potential: None.																																					
9. SELECTED MANUFACTURERS 1. American Cyanamid Co. Industrial Chemicals & Plastic Division, Wayne, N. J. 07470. 2. E. I. du Pont de Nemours & Co. Inc. Industrial and Biochemicals Dept., Wilmington, Del. 19898. 3. Rohm and Haas Co. Independence Mall West, Philadelphia, Pa. 19105.																																					
10. SHIPPING INFORMATION 10.1 Grade or Purity: 99.8%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Ventilating: Pressure/vacuum.																																					
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3.) A-P-Q-T-U-V-W-X-Z																																					
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table> <tr> <th>Category</th><th>Rating</th></tr> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>3</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td>Poisons</td><td>3</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxics</td><td>2</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Acute Toxic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>3</td></tr> </table> 12.3 NIHA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </table>		Category	Rating	Fire	3	Health		Vapor Irritant	3	Liquid or Solid Irritant	2	Poisons	3	Water Pollution		Human Toxics	2	Aquatic Toxicity	2	Acute Toxic Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	3	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	2
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Flammability (Red)	3																																				
Reactivity (Yellow)	2																																				
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 100.12. 13.3 Boiling Point at 1 atm: 214°F = 101°C = 374°K. 13.4 Freezing Point: -54°C = -65°C = 225°K. 13.5 Critical Temperature: 561°F = 294°C = 567°K. 13.6 Critical Pressure: 485 psia = 33 atm = 3.3 MN/m². 13.7 Specific Gravity: 0.945 at 20°C (liquid). 13.8 Liquid Surface Tension: 28 dynes/cm = 0.028 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 14.3 dynes/cm = 0.0143 N/m at 22.7°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.059. 13.12 Latent Heat of Vaporization: 140 Btu/lb = 77 cal/g = 3.2 × 10⁵ J/kg. 13.13 Heat of Combustion (cal): -11,400 Btu/lb = -6,310 cal/g = -264 × 10³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: -248 Btu/lb = -138 cal/g = -5.76 × 10³ J/kg.																																					
NOTES																																					

MPT

METHYL PARATHION

Common Synonyms Metron MPT Fardol Althos Naron Maltaron	Solid crystals or liquid or solution White solid or brown liquid Rotten eggs or garlic odor Solid and liquid mixt in water, solution floats on water Melting (freezing) point is 65° F
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED Containers may explode in fire
 Exposure	LIQUID OR SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to eyes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Solution is feeding to shoreline May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Issue warning - poison, water contaminant Restrict access Should be removed Chemical and physical treatment	2. LABEL  3. CHEMICAL DESIGNATIONS 3.1 Synonyms: MPT, O O Dimethyl O (p-Nitrophenyl) Phosphorothioate, O O-Dimethyl O-p-Nitrophenylthiophosphate, Parathion dimethyl 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $(CH_3O)_2PSOCH_2NO_2$ 3.4 IMCO/United Nations Numerical Designation: 6.1, 1668
4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or liquid 4.2 Color: Colorless solid or brownish liquid 4.3 Odor: Characteristic, like rotten eggs or garlic 5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved mask or respirator, natural rubber gloves, over shoes, protective clothing, goggles 5.2 Symptoms Following Exposure: Exposure to fumes from a fire, or to the liquid, causes headache, blurred vision, constricted pupils of the eyes, weak neck, nausea, cramps, diarrhea, and tightness in the chest. Muscle twitch and convulsions may follow. Symptoms may develop over a period of 8 hrs. 5.3 Treatment for Exposure: <i>Speed to external INGESTION</i> call a doctor. If victim is not breathing, immediately initiate artificial respiration by mouth-to-mouth, mouth-to-nose, or mouth-to-oropharyngeal method, when victim is conscious, give milk, water, or salt water and induce vomiting repeatedly. <i>SKIN OR EYES</i> flood and wash exposed areas thoroughly with water. Remove contaminated clothing and go to a shower. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.2 mg/m ³ (solid); 100 ppm (solution) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 LD ₅₀ below 50 mg/kg (rat) 5.7 Lethal Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Penetrates when absorbed through skin 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS

- 3.1 Flash Point: 115°F O C
 6.2 Flammable Limits in Air: Data not available
 6.3 Fire Extinguishing Agents: Water
 5.4 Fire Extinguishing Agents Not to be Used: Not pertinent
 6.5 Special Hazards of Combustion Products: Toxic gases are produced in fires
 6.6 Behavior in Fire: Drums rupture violently
 6.7 Ignition Temperature: Data not available
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: Data not available

8. WATER POLLUTION

- 8.1 Aquatic Toxicity:
 1.9 ppm/96 hr/swamp/TL₅₀/fresh water
 2.3 ppm/96 hr/fish/TL₅₀/fresh water
 8.2 Wastewater Toxicity: LD₅₀ = 10 mg/kg
 8.3 Biological Oxygen Demand (BOD): Data not available
 8.4 Food Chain Concentration Potential: Data not available

9. SELECTED MANUFACTURERS

1. Hercules, Inc.
 Synthetics Dept.
 Plaquemine, La. 70764
2. Monsanto Co.
 Agricultural Division
 800 N. Lindbergh Blvd.
 St. Louis, Mo. 63166
3. Stauffer Chemical Co.
 Agricultural Chemicals Division
 Green Farms Rd.
 Westport, Conn. 06880

10. SHIPPING INFORMATION

- 10.1 Grades or Purities: Pure (solid); technical (liquid); 80% in xylene
 10.2 Storage Temperature: Below 5°
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Pressure-vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 448-3)
 A-X-Y

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Poisonous liquid or solid, Class B
 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed
 12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	4 5
Flammability (Red)	3 1
Reactivity (Yellow)	2 2

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid or solid
 13.2 Molecular Weight: 263.2
 13.3 Boiling Point at 1 atm: Very high
 13.4 Freezing Point: 65°F = 18°C = 291°K
 13.5 Critical Temperature: Not pertinent
 13.6 Critical Pressure: Not pertinent
 13.7 Specific Gravity: 1.360 at 20°C (liquid)
 13.8 Liquid Surface Tension: Data not available
 13.9 Liquid-Water Interfacial Tension: Data not available
 13.10 Vapor (Gas) Specific Gravity: Not pertinent
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
 13.12 Latent Heat of Vaporization: Not pertinent
 13.13 Heat of Combustion: Data not available
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

CG based on pages 5 and 61

NOTES

REVISED 1978

MPD

**METHYL PHOSPHONOTHIOIC DICHLORIDE
(ANHYD)**

Common Synonym MPID		Liquid	Colorless	Sharp Unpleasant Odor
		Sinks and mixes violently with water		
1. Physical State (as shipped): Liquid 2. Color: Clear 3. Odor: Acid				
4. Fire Combustible Irritating gases may be produced when heated. If swallowed will cause coughing or difficulty breathing. If inhaled will cause coughing or difficulty breathing. If breathed in, remove person to fresh air.				
5. Exposure VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficulty breathing. If swallowed will cause coughing or difficulty breathing. If breathed in, remove person to fresh air. LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting. If on skin, wash with plenty of water. If in eyes, flush with plenty of water for at least 15 minutes. If on skin, wash with plenty of water for at least 15 minutes. If on clothing, remove clothing and wash skin with plenty of water for at least 15 minutes.				
6. Water Pollution Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.				
1. RESPONSE TO DISCHARGE See Response Methods Handbook CG 646-4 Issue warning: continue water contamination. Restrict access. Dispense and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: MPID 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: CH ₃ NO 3.4 IMCO/United Nations Material Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Clear 4.3 Odor: Acid		
5. HEALTH HAZARDS Use extreme care when handling this compound. Avoid skin contact with liquid or vapor.				
5.1 Personal Protective Equipment: Rubber or neoprene gloves, respiratory protection, goggles. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat; effects are quite similar to those of phosgene. Ingestion causes irritation of mouth and stomach. Delayed, painful eye irritation may occur from exposure to vapor. Liquid causes severe irritation. Contact with skin causes irritation and burns. 5.3 Treatment for Exposure: Get medical attention after all exposures to this compound. INHALATION: remove victim to fresh air; alert physician to delayed effects similar to those of phosgene. INGESTION: give large amount of water and induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxic (L) by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation - Lethal: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 61 Flash Point: >122°F (3°C) 62 Flammable Limits in Air: Data not available 63 Fire Extinguishing Agents: Dry chemical or carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Water or foam 65 Special Hazards of Combustion Products: Irritating hydrogen chloride vapor and dioxide and other fumes may be formed in fire 66 Behavior in Fire: 67 Ignition Temperature: Data not available 68 Electrical Hazard: Data not available 69 Burning Rate: Data not available	8. WATER POLLUTION 81 Aqueous Toxicity: Data not available 82 Waterway Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 71 Reactivity with Water: Reacts with water to form hydrogen bloom, acid and/or hydrogen chloride vapor. The reaction may be violent 72 Reactivity with Common Materials: Corrosive to metals because of its high acidity 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Bases: Flush with water or mix with dilute sodium bicarbonate or soda ash solution 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS East Corporation Industrial Chemicals Div. 451 Florida Riverside, La. 70500
11. HAZARD ASSESSMENT CODE Use Hazard Assessment Worksheet (E-606) in A-11	10. SHIPPING INFORMATION 101 Grade or Purity: Technical 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Corrosive liquid 122 RAS Hazard Rating for Bulk Water Transportation: Not listed 123 HFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: 124 133 Boiling Point at 1 atm: Data not available 134 Freezing Point: -14.1°F = -25.6°C = -24.6°C 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.42 at 20°C, liquids 138 Liquid Surface Tension: Data not available 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Rate of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: rest: 1210 Btu/lb = 60 cal/g = 2.4 x 10⁵ J/kg 1313 Heat of Combustion: Data not available 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Data not available 1316 Heat of Polymerization: Not pertinent

Continued on pages 7 and 8

NOTES

MPY

1-METHYLPYRROLIDONE

Common Synonyms N-Methylpyrrolidone 1-Methyl-2-pyrrolidone N-Methylpyrrolidone N-Methylalpha-pyrrolidone	Liquid White Mild Fishy odor May float or sink in water	
Avoid contact with liquid. Keep people away. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health and safety authorities.		
Fire	Combustible POISONOUS GASES MAY BE PRODUCED WHEN HEATED. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.	
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, victim drink water, or milk and have victim relax until help arrives. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. No toxic health or wildlife effects. No other indicators of early water intakes.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning, water contaminant. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Methyl-2-pyrrolidone, N-Methylpyrrolidone, N-Methylpyrrolidone, N-Methyl alpha-pyrrolidone. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: C ₄ H ₇ NO. 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Mild amine like.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation of hot vapors can irritate nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes causes irritation. Repeated and prolonged skin contact produces a mild, transient irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water and induce vomiting. EYES: flush with water for at least 15 min. SKIN: remove from skin and eyes by flooding the affected tissues with water, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, oral LD ₅₀ = 3.5 mg/kg (rabbit). 5.7 Late Toxicity: Causes blood abnormalities in rats. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS 6.1 Flash Point: 204°F (90°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, alcohol, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may be formed in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233 2. Eastman Organic Chemicals Rochester, N. Y. 14650 3. Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902									
		10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)									
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P Q		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 99 13.3 Boiling Point at 1 atm: 396°F = 202°C = 475°K 13.4 Freezing Point: 1°F = -17°C = 256°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.03 at 25°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.4 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: -13,000 Btu/lb = -7,220 cal/g = -302 × 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><td>Category</td><td>Classification</td></tr><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0		
Category	Classification										
Health Hazard (Blue)	2										
Flammability (Red)	1										
Reactivity (Yellow)	0										

11 (continued on pages 1 and 6)

NOTES

(Continued on pages 5 and 6)

MSR

alpha-METHYLSTYRENE

Common Synonyms Isopropenylbenzene Phenylpropylene 1-Methyl-1-phenylethylene	Liquid Colorless Floats on water.
Avoid contact with liquid. Keep away from eyes. Stop discharge if possible. Call department. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	Combustible Flammable with dry chemicals, foam or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting. A. Remove contaminated clothing and shoes. B. If swallowed, flush with plenty of water. C. If IN EYES, flush with water open and hold with front of water. D. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. E. If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do not induce vomiting. Call for medical aid. DO NOT INDUCE VOMITING.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and pollution control agencies. Notify operators of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Isopropenylbenzene 1-Methyl-1-phenylethylene Phenylpropylene 3.2 Coast Guard Compatibility Classification: Oil-film 3.3 Chemical Formula: $C_9H_8(CH_3)=CH_2$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Characteristic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Neoprene gloves, splashproof goggles or face shield 5.2 Symptoms Following Exposure: Inhalation causes irritation of respiratory tract, headache, dizziness, light-headedness, and breathlessness. Ingestion causes irritation of mouth and stomach. Contact with liquid irritates eyes. Prolonged skin contact can cause severe rashes, swelling, and blistering. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, if he is not breathing, give artificial respiration; contact a physician; keep victim quiet and warm. INGESTION: do NOT induce vomiting; call physician. EYES: flush with water for at least 15 min; get medical attention. SKIN: wash area with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: 100 ppm, 30 min 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: <10 ppm	

6. FIRE HAZARDS

- 6.1 Flash Point: 137°F C.C.
 6.2 Flammable Limits in Air: 1.9% - 6.1%
 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide
 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective
 6.5 Special Hazards of Combustion Products:
 6.6 Behavior in Fire:
 6.7 Ignition Temperature: 1065°F
 6.8 Electrical Hazard: Data not available
 6.9 Burning Rate: Data not available

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: 10 ppm, 96 hr/fathead minnow/LC₅₀
 8.2 Waterway Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD): Data not available
 8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

- 1 Allied Chemical Corp.
 Plastics Division
 P.O. Box 265R
 Morristown, N.J. 07960
 2 United States Steel Co.
 Chemicals Division
 600 Grant St.
 Pittsburgh, Pa. 15230
 3 Dow Chemical Co.
 2030 Dow Center
 Midland, Mich. 48640

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
 7.2 Reactivity with Common Materials: May attack some forms of plastics
 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
 7.5 Polymerization: Hazardous polymerization unlikely to occur except when in contact with alkali metals or metallo-organic compounds
 7.6 Inhibitor of Polymerization: 10-20 ppm tert-butylcatechol

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Commercial
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 T-U

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
 12.3 NFPA Hazard Classifications.
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 2 |
| Reactivity (Yellow) | 1 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 118.17
 13.3 Boiling Point at 1 atm: 329°F = 165°C = 438°K
 13.4 Freezing Point: -9.8°F = -23.2°C = 250.0°K
 13.5 Critical Temperature: 719.1°F = 381.7°C = 654.9°K
 13.6 Critical Pressure: 494 psia = 33.6 atm = 3.41 MN/m²
 13.7 Specific Gravity: 0.91 at 20°C (liquid)
 13.8 Liquid Surface Tension: 31.88 dynes/cm = 0.03346 N/m at 20°C
 13.9 Liquid-Water Interfacial Tension: Data not available
 13.10 Vapor (Gas) Specific Gravity: 4.0X
 13.11 Ratio of Specific Heats of Vapor (Gas): 1.060 at 27°C
 13.12 Latent Heat of Vaporization: 140.4 Btu/lb = 78.0 cal/g = 3.26 X 10⁵ J/kg
 13.13 Heat of Combustion: -17,690 Btu/lb = -9,830 cal/g = -411 X 10³ J/kg
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Data not available

(Continued on pages 5 and 6)

NOTES

MTS

METHYLTRICHLOROSILANE

Common Synonyms Liquid Colorless Sharp irritating odor Reacts violently with water. Irritating gas is produced on contact with water.	
ASCAUTION: FUEL WITH FROID AND VAPOR KEEPT OFF AN OPEN FLAME. If it enters breathing apparatus, immediately remove it and use self-contained breathing apparatus. Wear goggles and self-contained breathing apparatus. Flush affected areas with plenty of water. If in EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.	
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Flush affected areas with plenty of water. If in EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
Exposure	Call for medical aid. VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. Move victim to fresh air. If breathing has stopped, have artificial respiration. If breathing is difficult, give oxygen. LIQUID Will burn skin and eyes. Harmful if swallowed. Remove victim from hot liquid and steam. Flush affected areas with plenty of water. If in EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify water authority if two liter spill occurs. Notify appropriate authority if water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3) Issue warning - high flammability, air contaminant. Restrict access. Evacuate area. Disperse and flush with care.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Trichloromethylsilane 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CH₃SiCl₃ 3.4 IMCO/United Nations Numerical Designation: 3.2/1250	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Acid, sharp, hydrochloric acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Full protective clothing, acid vapor type respiratory protection, rubber gloves, chemical worker's goggles, other protective equipment as necessary to protect skin and eyes. 5.2 Symptoms Following Exposure: Inhalation causes irritation of mucous membrane. Contact with liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach. 5.3 Treatment for Exposure: Get medical attention at once following all exposures to this compound. INHALATION: remove victim from exposure, give artificial respiration if breathing has ceased. EYES: flush with water for 15 min. SKIN: flush with water. INGESTION: do NOT induce vomiting, give large amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 LD₅₀ 50 to 60 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Decomposes in moist air, creating HCl with odor threshold of 1 ppm.	

6 FIRE HAZARDS 6.1 Flash Point: 45°F O.C., 15°F C.C. 6.2 Flammable Limits in Air: 5.1% - 20% 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water, foam 6.5 Special Hazards of Combustion Products: Toxic hydrogen chloride and phosgene gases may form in fire. 6.6 Behavior in Fire: Difficult to extinguish. Re-ignition may occur. Contact with water applied to adjacent fires produces irritating hydrogen chloride. 6.7 Ignition Temperature: >760°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 1.9 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently to form hydrogen chloride (hydrochloric acid). 7.2 Reactivity with Common Materials: Reacts with surface moisture to evolve hydrogen chloride, which is corrosive to metals. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flood with water, rinse with sodium bicarbonate or lime solution. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Union Carbide Corporation Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017 2. Dow Corning Corporation P.O. Box 592 Midland, Mich. 48640 3. General Electric Company Silicone Products Department Waterford, N.Y. 12188																																				
10 SHIPPING INFORMATION 10.1 Grades or Purity: 98+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief																																					
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-0	12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>4</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td>Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>1</td></tr> <tr> <td>Aquatic Toxicity</td><td>1</td></tr> <tr> <td>Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>4</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	4	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	2
Category	Rating																																				
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Reactivity (Yellow)	2																																				
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 149.5 13.3 Boiling Point at 1 atm: 151.5°F = 66.4°C = 139.6°F 13.4 Freezing Point: -130°F = -90°C = 183°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.27 at 25°C (liquid) 13.8 Liquid Surface Tension: 20.3 dynes/cm = 0.0203 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 5.16 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available 13.12 Latent Heat of Vaporization: 89.1 Btu/lb = 49.6 cal/g = 208 x 10³ J/kg 13.13 Heat of Combustion: (est.) -11000 Btu/lb = -1,700 cal/g = -70 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent																																					
NOTES (Continued on pages 5 and 6)																																					

METHYL VINYL KETONE

Common Synonyms	Liquid	Colorless to light yellow	Strong irritant
3 Buten 2-one	Mixes with water. Irritating vapor is produced.		
AVOID CONTACT WITH FLammable PEOPLE AWAY Wear other over-protective clothing, gloves. Notify fire department in case of fire. Notify local health and pollution control agencies.			
Fire	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may ignite if ignited in an enclosed area. Extinguish with dry chemical, alcohol foam, or carbon dioxide. Water may be ineffective in fire. Do not use containers with water.		
	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Move victim to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, flush eyes separately with copious quantities of water. If SWALLOWED and victim is CONSCIOUS, give 1 cup of milk or water. DO NOT INDUCE VOMITING.		
Exposure			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not biodegradable in fresh water. Not biodegradable in salt water.		
1. RESPONSE TO DISCHARGE	2. LABEL		
(See Response Methods Handbook CG 446-4) Issue warning: high flammability. water contaminant. Restrict access. Evacuate area. Dispose and flush.			
3. CHEMICAL DESIGNATIONS	4. OBSERVABLE CHARACTERISTICS		
31 Synonyms: 3 Buten 2-one 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: CH₃COCH=CH₂ 34 IMCO/United Nations Numerical Designation: 32, 1251	41 Physical State (as shipped): Liquid 42 Color: Colorless to light yellow 43 Odor: Powerfully irritating		
5. HEALTH HAZARDS			
51 Personal Protective Equipment: Self contained breathing apparatus with full face piece, rubber gloves, chemical goggles or face piece of breathing apparatus. 52 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Vapor causes tears, contact with liquid can burn eyes. Liquid irritates skin and will cause burn if not removed at once. Ingestion causes irritation of mouth and stomach. 53 Treatment for Exposure: Get medical attention for all exposures to this compound. INHALATION: move victim to fresh air, administer artificial respiration if necessary. EYES OR SKIN: flush with copious quantity of water for 15 min. INGESTION: do NOT induce vomiting. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade 4 LD₅₀ <50 mg/kg 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 59 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third-degree burns on short contact and is very injurious to the eyes. 510 Odor Threshold: 0.5 mg/m³			

6 FIRE HAZARDS 6.1 Flash Point: 30-1 O.C. 20-1 C.C. 6.2 Flammable Limits in Air: 2.1 - 15.6% 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. At elevated temperatures (fire conditions) polymerization may take place in containers, causing violent rupture. Unburned vapors are very irritating. 6.7 Ignition Temperature: 915-1 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 4.5 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Polymerizes spontaneously upon exposure to heat or sunlight 7.6 Inhibitor of Polymerization: Up to 1% hydroquinone	9 SELECTED MANUFACTURERS 1. Pfizer, Incorporated Pfizer Chemical Division 235 East 42nd Street New York, N.Y. 10017 2. Aldrich Chemical Co. 940 West Saint Paul Ave. Milwaukee, Wis. 53233 3. Platts and Bauer, Inc. 126-04 Northern Boulevard Flushing, N.Y. 11368																																				
	10. SHIPPING INFORMATION 10.1 Grades or Purity: 98.5+% 10.2 Storage Temperature: No requirement 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, C-446-3) A P Q R S	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 70.1 13.3 Boiling Point at 1 atm: 178.5°F = 81.4°C = 354.6 K 13.4 Freezing Point: 20.1 = -7°C = 266.6 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.864 at 20°C (liquid) 13.8 Liquid Surface Tension (est.): 24 dyne/cm = 0.024 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 2.4 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1053 13.12 Latent Heat of Vaporization (est.): 201 Btu/lb = 47.3 cal/g = 4.73 x 10³ J/kg 13.13 Heat of Combustion (est.): -14,600 Btu/lb = -8,100 cal/g = -340 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: -455 Btu/lb = -253 cal/g = 10.6 x 10³ J/kg																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAC Hazard Rating for Bulk Water Transportation <table border="1"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>4</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td> Poison</td><td>4</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>4</td></tr> <tr> <td> Aquatic Toxicity</td><td>2</td></tr> <tr> <td> Aesthetic Effect</td><td>5</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>5</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications <table border="1"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poison	4	Water Pollution		Human Toxicity	4	Aquatic Toxicity	2	Aesthetic Effect	5	Reactivity		Other Chemicals	5	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	2	(Continued on pages 5 and 6)
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	4																																				
Liquid or Solid Irritant	4																																				
Poison	4																																				
Water Pollution																																					
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Flammability (Red)	1																																				
Reactivity (Yellow)	2																																				

MNS

MINERAL SPIRITS

Common Synonyms Petroleum spirits Naphtha	Watery liquid Colorless Gasoline-like odor Floats on water
No discharge if possible Call for help if needed Wash skin with copious amount of water If in eyes, flush with copious amount of water If swallowed, do not induce vomiting	Combustible Extinguish with water dry chemical or foam. Do not use water on burning containers with water.
Fire	Call for Medical Aid LIQUID Irritating to skin and eyes Harmful if swallowed. Known irritant to skin, eyes, and lungs. Flash point: 105-140°F (40-60°C) If IN EYES, flush with copious amount of water. If SWALLOWED, do not induce vomiting. Do not drink water. Do NOT induce vomiting.
Exposure	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes No known health and safety hazard No known effect on the environment
Water Pollution	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3 1 Synonyms: Naphtha Petroleum spirits 3 2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3 3 Chemical Formula: Not applicable 3 4 IMCO/United Nations Numerical Designation: 3 3/1300	4. OBSERVABLE CHARACTERISTICS 4 1 Physical State (as shipped): Liquid 4 2 Color: Colorless 4 3 Odor: Like gasoline
5. HEALTH HAZARDS 5 1 Personal Protective Equipment: Plastic gloves, goggles or face shield (as for gasoline) 5 2 Symptoms Following Exposure: INHALATION: mild irritation of respiratory tract ASPIRATION: severe lung irritation and rapidly developing pulmonary edema: central nervous system excitement followed by depression INGESTION: irritation of stomach 5 3 Treatment for Exposure: INHALATION: remove victim to fresh air ASPIRATION: enforce bed rest, give oxygen call a doctor INGESTION: do NOT induce vomiting, guard against aspiration into lungs EYES: wash with copious amounts of water SKIN: wipe off and wash with soap and water 5 4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm 5 5 Short-Term Inhalation Limits: 4000 - 7000 ppm for 60 min 5 6 Toxicity by Ingestion: Grade 2, LD ₅₀ 0.5 to 5 g/kg 5 7 Late Toxicity: Data not available 5 8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat 5 9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin 5 10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6 1 Flash Point: 105-140°F C.C., depending on grade 6 2 Flammable Limits in Air: 0.8% - 5.0% 6 3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical 6 4 Fire Extinguishing Agents Not to be Used: Do not use straight hose water stream 6 5 Special Hazards of Combustion Products: Not pertinent 6 6 Behavior in Fire: Not pertinent 6 7 Ignition Temperature: 540°F 6 8 Electrical Hazard: Not pertinent 6 9 Burning Rate: 4 mm/min	8. WATER POLLUTION 8 1 Aquatic Toxicity: Data not available 8 2 Waterlow Toxicity: Data not available 8 3 Biological Oxygen Demand (BOD): 8%, 5 days 8 4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7 1 Reactivity with Water: No reaction 7 2 Reactivity with Common Materials: No reaction 7 3 Stability During Transport: Stable 7 4 Neutralizing Agents for Acids and Caustics: Not pertinent 7 5 Polymerization: Not pertinent 7 6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Atlantic Richfield Co 717 Fifth Ave New York, N.Y. 10022 2 Phillips Petroleum Bartlesville, Okla. 74004 3 Shell Oil Co 1 Shell Plaza Houston, Tex. 77001								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 445-3) A-T-U 12. HAZARD CLASSIFICATIONS 12 1 Code of Federal Regulations: Combustible liquid 12 2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12 3 NFPA Hazard Classifications: <table data-bbox="958 1468 1205 1553"> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>0</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0	10. SHIPPING INFORMATION 10 1 Grades or Purities: Various grades available. 70-100% of the materials are derived from petroleum, and 0-30% are aromatic hydrocarbons like benzene and toluene. Flash points vary with the exact composition but are usually above 100°F 10 2 Storage Temperature: Ambient 10 3 Inert Atmosphere: No requirement 10 4 Venting: Open (flame arrester) 13. PHYSICAL AND CHEMICAL PROPERTIES 13 1 Physical State at 15°C and 1 atm: Liquid 13 2 Molecular Weight: Not pertinent 13 3 Boiling Point at 1 atm: 310 - 395°F = 154 - 202°C = 428 - 475°K 13 4 Freezing Point: Not pertinent 13 5 Critical Temperature: Not pertinent 13 6 Critical Pressure: Not pertinent 13 7 Specific Gravity: 0.78 at 20°C (liquid) 13 8 Liquid Surface Tension: Data not available 13 9 Liquid-Water Interfacial Tension: Data not available 13 10 Vapor (Gas) Specific Gravity: Not pertinent 13 11 Ratio of Specific Heats of Vapor (Gas): (estimated) 1.030 13 12 Latent Heat of Vaporization: Data not available 13 13 Heat of Combustion: Data not available 13 14 Heat of Decomposition: Not pertinent 13 15 Heat of Solution: Not pertinent 13 16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	2								
Reactivity (Yellow)	0								
NOTES (Continued on pages 5 and 6)									

REVISED 1978

MCA

MONOCHLOROACETIC ACID

Common Synonyms Chloroacetic acid Chloroacetic acid	Solid or heated liquid Cloudy white solid, liquid is colorless to light yellow Strong vinegar-like odor Mixes with water
Avoid contact with liquid. Keep people away. No inhalation. If solid, wash with water. If liquid, flush with water. If swallowed, give large amount of water.	
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. If discharged into water
Exposure	Call for medical aid. LIQUID OR SOLID Will burn skin and eyes. Harmful if swallowed. Run water into and flush face. Flush skin or area with plenty of water. IF IN EYES, hold eye open and flush with plenty of water. IF SWALLOWED, give large amount of water. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local authority of any spills. Notify local authority of water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: corrosive Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Chloroacetic acid Chloroacetic acid 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: <chem>ClCH2COOH</chem> 3.4 IMCO/United Nations Numerical Designation: Liquid 8/1750 Solid 8/1751	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid or solid 4.2 Color: Solid: translucent white Liquid: clear to light amber 4.3 Odor: Characteristic penetrating odor similar to vinegar
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, vinyl or neoprene rubber gloves, goggles and protective face shield, rubberized or acid resistant clothing. 5.2 Symptoms Following Exposure: Inhalation causes mucous membrane irritation. Contact with liquid causes severe irritation and burns of the eyes and irritation and burns of skin. Ingestion causes burns of mouth and stomach. 5.3 Treatment for Exposure: Get medical attention for all exposures to this compound. INHALATION: remove victim to fresh air and encourage rest until medical attention is obtained. EYES: flush with running water for 15 min. SKIN: flush with water. Get treatment for burns. INGESTION: give large amount of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 4 oral LD_{50} = 762 mg/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: 0.15 mg/m ³	

6. FIRE HAZARDS 6.1 Flash Point: (almost nonflammable) 250°F (121°C) 6.2 Flammable Limits in Air: 8% (LFL) 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide, water. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Hydrogen chloride and phosgene may be generated. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. difficult to ignite. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Causes mild corrosion of common metals. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water; rinse with sodium bicarbonate or lime solution. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Hercules Incorporated Coatings & Specialty Products Dept. 910 Market Street Wilmington, Del. 19899 2. Dow Chemical Co. Midland, Mich. 48640 3. McKesson Chemical Co. Crocker Plaza One Post St. San Francisco, Calif. 94104																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P	10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial 97%+ 10.2 Storage Temperature: Solid: ambient Liquid: 70°F (18°F) 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arrester.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation <table data-bbox="956 1441 1212 1834"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>1</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>4</td></tr> <tr><td>Liquid or Solid Irritant</td><td>4</td></tr> <tr><td>Poisons</td><td>4</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>1</td></tr> <tr><td>Aquatic Toxicity</td><td>2</td></tr> <tr><td>Aesthetic Effect</td><td>4</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>4</td></tr> <tr><td>Water</td><td>2</td></tr> <tr><td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="956 1725 1212 1834"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>2</td></tr> <tr><td>Flammability (Red)</td><td>1</td></tr> <tr><td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	4	Water Pollution		Human Toxicity	1	Aquatic Toxicity	2	Aesthetic Effect	4	Reactivity		Other Chemicals	4	Water	2	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 94.5 13.3 Boiling Point at 1 atm: 172°F = 78°C = 462 K 13.4 Freezing Point: 140°F = 60°C = 333 K 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.54 at 20°C (solid). 13.8 Liquid Surface Tension: 33 dynes/cm = 0.033 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 240 Btu/lb = 139 cal/g = 582 J/kg 13.13 Heat of Combustion: (solid) -1.814 Btu/lb = -1.00 cal/g = -42.17 J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: -64 Btu/lb = -35 cal/g = -147 J/kg 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	4																																				
Liquid or Solid Irritant	4																																				
Poisons	4																																				
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Health Hazard (Blue)	2																																				
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Reactivity (Yellow)	0																																				
NOTES																																					

(continued on pages 2 and 4)

MEA

MONOETHANOLAMINE

Common Synonyms beta-Aminoethyl alcohol 2-Hydroxyethylamine Ethanolamine 2-Aminoethanol	Only liquid Colorless Slight ammonia odor Sinks and mixes with water. Freezing point is 51°F.
	
Fire	Combustible Flammable liquid and vapor.
Exposure	LIQUID OR SOLID Irritating to skin and eyes. Harmful if swallowed. May cause drowsiness or dizziness. May cause respiratory irritation. May cause skin irritation.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. Not recommended for use in water.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Aminoethanol beta-Aminoethyl alcohol Ethanolamine 2-Hydroxyethylamine 3.2 Coast Guard Competibility Classification: Alkanolamines 3.3 Chemical Formula: HOCH ₂ CH ₂ NH ₂ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mildly ammoniacal
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Full face shield, goggles, eye wash facility. 5.2 Symptoms Following Exposure: Vapor irritates eyes and nose. Liquid causes local injury to mouth, throat, digestive tract, skin, and eyes. 5.3 Treatment for Exposure: INGESTION: induce vomiting by giving large volumes of warm salt water (2 tablespoons per glass); call a doctor. EYES: flush with water for at least 15 min.; call a doctor. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 3 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: (Grade 2) LD ₅₀ 5 to 5 g/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first-degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 185°F C.C., 200°F O.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water spray, alcohol foam, dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating vapors generated when heated 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: 7100 ppm/48 hr/shrimp/LC ₅₀ /salt water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 78%, 5 days, (theor) 10%, 5 days, 64% 20 days 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. Jefferson Chemical Co. 3336 Richmond Ave. Houston, Tex. 77052 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N. Y. 10017																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P Q	10. SHIPPING INFORMATION 10.1 Grades or Purity: N1 85% (15% water), commercial 99+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive Material 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="957 1441 1209 1703"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>2</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td> Poisons</td><td>-</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>2</td></tr> <tr> <td> Aquatic Toxicity</td><td>1</td></tr> <tr> <td> Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> (Other Chemicals)</td><td>3</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="957 1725 1209 1812"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	2	Liquid or Solid Irritant	2	Poisons	-	Water Pollution		Human Toxicity	2	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		(Other Chemicals)	3	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 61.08 13.3 Boiling Point at 1 atm: 338°F = 170°C = 443°K 13.4 Freezing Point: 50.4°F = 10.2°C = 283.4°K 13.5 Critical Temperature: 646°F = 341°C = 614°K 13.6 Critical Pressure: 647 psia = 44 atm = 4.45 MN/m ² 13.7 Specific Gravity: 1.016 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 160 Btu/lb = 200 cal/g = 5.12 x 10 ⁵ J/kg 13.13 Heat of Combustion: 10,710 Btu/lb = 5950 cal/g = 249 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: (exptl) 17 Btu/lb = 10 cal/g = 0.4 x 10 ⁵ J/kg 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	2																																				
Liquid or Solid Irritant	2																																				
Poisons	-																																				
Water Pollution																																					
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Reactivity (Yellow)	0																																				
NOTES (Continued on pages 4 and 5)																																					

Common Synonyms - Isopropanolamine 1-Amino-2-propanol 2-Hydroxypropylamine	Thick liquid Floats and mixes with water. Freezing point is 35° F.	Colorless Slight ammonia odor
Fire	Combustible Mixtures with air are flammable over a wide range of concentrations. Extinguish with carbon dioxide or dry chemical agents.	
Exposure	CALL FOR MEDICAL AID LIQUID OR SOLID Irritating to skin and eyes Harmful if swallowed Respiratory irritation may occur from vapors. Repeated exposure may cause dermatitis. Ingestion may cause severe burns to mouth and throat. Eye contact may cause severe burns. Swallowing may cause severe burns to digestive tract. Severe irritation of respiratory tract may result from prolonged exposure to vapors. Death has resulted from inhalation of large quantities of vapor. Death has resulted from ingestion of large quantities of liquid. Death has resulted from eye contact with large quantities of liquid.	
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not known to be toxic to fish	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 648-4) Disperse and flush	2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 31 Synonyms: 1-Amino-2-propanol 2-Hydroxypropylamine Isopropanolamine 32 Coast Guard Competibility Classification: Alkanolamines 33 Chemical Formula: CH₃CHOHCH₂NH₂ 34 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Mildly ammoniacal	
5 HEALTH HAZARDS 51 Personal Protective Equipment: Full face shield, goggles, eye wash facility 52 Symptoms Following Exposure: Vapor irritates eyes and nose. Liquid causes local injury to mouth, throat, digestive tract, skin, and eyes. 53 Treatment for Exposure: "INGESTION" Induce vomiting by giving large volumes of warm salt water. (2 tablespoons per glass) call a doctor. EYES: Flush with water for at least 15 min. and call a doctor. SKIN: Flush with water. 54 Toxicity by Inhalation (Threshold Limit Value): 5 ppm 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade 2 LD₅₀'s to 5 g/kg rats 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 59 Liquid or Solid Irritant Characteristics: Causes stinging of the skin and first-degree burns on short exposure and may cause secondary burns on long exposure. 510 Odor Threshold: Data not available		

6. FIRE HAZARDS 6.1 Flesh Point: 165°F O.C. 171°F C.C. 6.2 F. Variable Limits in Air: 2.2% (calc.) 1.2% (test) 6.3 Fire Extinguishing Agents: Dry chemical, water spray, alk. sol foam or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating vapors generated when heated 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 706°F (est.) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 1.1 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): (theor) 5.1% 5 days 46%, 20 days 8.4 Food Chain Concentration Potential: None																										
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Dow Chemical Co Midland, Mich 48640 2 Union Carbide Corp Chemicals and Plastics Division 270 Park Ave New York, N.Y. 10017																										
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Manual, Vol. CG 446-3) A P Q	10. SHIPPING INFORMATION 10.1 Grade or Purity: 98.5+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open																										
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td>1</td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td>Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td>1</td></tr> <tr> <td>Human Toxicity</td><td>2</td></tr> <tr> <td>Aquatic Toxicity</td><td>1</td></tr> <tr> <td>Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity (Other Chemicals)</td><td>1</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	1	Water Pollution	1	Human Toxicity	2	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity (Other Chemicals)	1	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 75.11 13.3 Boiling Point at 1 atm: 320°F = 160°C = 433°K 13.4 Freezing Point: 35.4°F = 1°K = 275.1°K 13.5 Critical Temperature: 622°F = 328°C = 601°K 13.6 Critical Pressure: 550 psia = 38 atm = 3.9 MN/m² 13.7 Specific Gravity: 0.941 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 272 Btu/lb = 151 cal/g = 6.32 × 10³ J/kg 13.13 Heat of Combustion: (est.) -13,900 Btu/lb = -7,700 cal/g = -322 × 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: (est.) -17 Btu/lb = -10 cal/g = -0.4 × 10³ J/kg 13.16 Heat of Polymerization: Not pertinent
Category	Rating																										
Fire	1																										
Health	1																										
Vapor Irritant	1																										
Liquid or Solid Irritant	2																										
Poisons	1																										
Water Pollution	1																										
Human Toxicity	2																										
Aquatic Toxicity	1																										
Aesthetic Effect	2																										
Reactivity (Other Chemicals)	1																										
Water	0																										
Self Reaction	0																										

MPL

MORPHOLINE

Common Synonyms Tetrahydro-2H-1,4-oxazine 1,4-Tetrahydropyridine	Odor: liquid Colorless Fishy, ammonia odor Floats and mixes with water. Irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Ext. with water. Do not use water on fire.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, headache, or difficult breathing. LIQUID Irritating to skin and eyes. If swallowed, may cause nausea, headache, or difficult breathing. If swallowed, may cause nausea, headache, or difficult breathing.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO D'SCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Diethyleneimide oxide Diethylene imidoxide Diethylene oximide Tetrahydro-2H-1,4-oxazine Tetrahydro-pyridine 3.2 Coast Guard Compatibility Classification: Aliphatic amine 3.3 Chemical Formula: <chem>C4H8N2O</chem> 3.4 IMCO/United Nations Numerical Designation: 3.3/2054	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Fishy, ammoniacal
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organs, vapor canister or self-contained breathing apparatus, rubber boots and gloves, goggles or face shield. 5.2 Symptoms Following Exposure: Liquid causes skin and eye burns. Breathing vapors or absorption through skin may cause nausea and headache. 5.3 Treatment for Exposure: INHALATION: If all effects occur, move patient to fresh air, keep him quiet and warm, and call a physician. If breathing stops, start artificial respiration. INGESTION: Force milk or water, then immediately induce vomiting. Treat symptomatically. NO KNOWN ANTIDOTE. SKIN OR EYES: Immediately flush with plenty of water for at least 15 min for eyes; get medical attention promptly. 5.4 Toxicity by Inhalation (Threshold Limit Value): 20 ppm 5.5 Short Term Inhalation Limits: 20 ppm for 15 min 5.6 Toxicity by Ingestion: Grade 2.1 D ₅₀ 0.5 to 5 g/kg (guinea pig, rat) 5.7 Lethal Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.01 ppm.	

6. FIRE HAZARDS

- 6.1 Flash Point: 100°F O.C.
 6.2 Flammable Limits in Air: 1.8% - 10.8%
 6.3 Fire Extinguishing Agents: Water, fog, alcohol foam, dry chemical, or carbon dioxide.
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent.
 6.5 Special Hazards of Combustion Products: Irritating vapors are generated when heated.
 6.6 Behavior in Fire: Vapor is heavier than air and may travel some distance to source of ignition and flash back.
 6.7 Ignition Temperature: 590°F
 6.8 Electrical Hazard: Not pertinent.
 6.9 Burning Rate: 1.9 mm/min.

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
 7.2 Reactivity with Common Materials: No reaction.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: Flush with water.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): (theor) 0.9%, 5 days 5.1%, 20 days.
 8.4 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

1. Dow Chemical Co.
 Midland, Mich 48640
 2. Jefferson Chemical Co., Inc.
 3336 Richmond Ave.
 P.O. Box 53300
 Houston, Tex 77052
 3. Union Carbide Corp.
 Chemicals and Plastics Division
 270 Park Ave.
 New York, N.Y. 10017

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Several grades available, most above 99%
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 A-P-O

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable Liquid
 12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Fire | + |
| Health | |
| Vapor Irritant | 1 |
| Liquid or Solid Irritant | 1 |
| Poisons | 1 |
| Water Pollution | |
| Human Toxicity | 2 |
| Aquatic Toxicity | 2 |
| Aesthetic Effect | 2 |
| Reactivity | |
| Other Chemicals | 1 |
| Water | 0 |
| Self Reaction | 0 |
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 3 |
| Reactivity (Yellow) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
 13.2 Molecular Weight: 87.12
 13.3 Boiling Point at 1 atm: 262.8°F = 128.2°C = 401.4°K
 13.4 Freezing Point: 23.4°F = -4.8°C = 268.4°K
 13.5 Critical Temperature: 653°F = 345°C = 618°K
 13.6 Critical Pressure: 794 psia = 54 atm = 5.47 MN/m²
 13.7 Specific Gravity: 1.00 at 20°C (liquid)
 13.8 Liquid Surface Tension: Not pertinent
 13.9 Liquid-Water Interfacial Tension: Not pertinent
 13.10 Vapor (Gas) Specific Gravity: Not pertinent
 13.11 Ratio of Specific Heats of Vapor (Gas): (est) 1.091
 13.12 Latent Heat of Vaporization: 182.9 Btu/lb = 101.6 cal/g = 4.254 x 10³ J/kg
 13.13 Heat of Combustion: Data not available
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Data not available
 13.16 Heat of Polymerization: Not pertinent

NOTES

(Continued on pages 5 and 6)

MFA

MOTOR FUEL ANTI-KNOCK COMPOUNDS CONTAINING LEAD ALKYL

Common Synonyms	Only liquid Dyed red, orange or blue Sweet fruity odor
	Sinks in water
AVOID CONTACT WITH EYES AND SKIN Avoid contact with eyes. If contact occurs, flush eyes with water for at least 15 minutes. Seek medical attention. Avoid contact with skin. If contact occurs, wash skin with soap and water. If irritation occurs, seek medical attention.	
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE Container may explode when heated. Welding, brazing, or cutting should not be performed on this container. If fire occurs, use dry chemical, carbon dioxide, or foam extinguishers. Do not use water. If fire occurs in a confined space, evacuate the area and call the fire department.
Exposure	CALL FOR MEDICAL AID LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Will burn eyes. Rinse thoroughly with water. If in eyes, flush with water for at least 15 minutes. If swallowed, do not induce vomiting. Drink water. If swallowed, do not induce vomiting. Drink water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not recommended for use in waterways.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4)	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Motor fuel antiknock compound 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: 6.1/1649	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Red, orange, or blue 4.3 Odor: Sweet, musty, fruity odor
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor cartridge type face mask for emergency or short duration, fresh air mask for longer duration, impervious protective gloves, goggles as required, boots and light-colored clothing. 5.2 Symptoms Following Exposure: Increased urinary output of lead. Large degree of absorption from inhalation or skin contact may cause insomnia, excitability, delirium, coma and death. 5.3 Treatment for Exposure: Call a physician for any exposure. INHALATION: remove from exposure. INGESTION: no specific antidote. EYES: flush with plenty of water for about 15 min. SKIN: flush with kerosene, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1-0.15 mg/m³ (as lead) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Lethal Toxicity: Lead poisoning 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. Toxic absorption through skin may occur. 5.10 Odor Th.: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 89°F - 265°F O.C. 6.2 Flammable Limits in Air: None established 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic, lead-containing gases are generated in fires. 6.6 Behavior in Fire: Containers may explode. 6.7 Ignition Temperature: Begins to decompose above 212°F. 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: See Tetraethyl Lead 8.2 Waterborne Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Reacts with oxidizing materials, active metals and rust, but not considered hazardous. 7.3 Stability During Transport: A self-sustaining decomposition occurs if the temperature of the bulk liquid is above 212°F and a flame or hot metal surface serves to ignite the mass. The presence of ethylene dichloride may in the compound stable at 300°F for 15 hrs. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. E. I. duPont de Nemours & Co., Inc. Petroleum Chemicals Division Wilmington, Del. 19898 2. Ethyl Corp. Industrial Chemical Division 651 Florida St. Baton Rouge, La. 70801 3. PPG Industries, Inc. Houston Chemical Co. Division One Gateway Center Pittsburgh, Pa. 15222
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A X-Y	10. SHIPPING INFORMATION 10.1 Grades or Purities: 50-60% mixed lead alkyl 18-36% ethylene dichloride 0-19% ethylene dibromide 7-12% toluene, other solvents dyes 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure-vacuum
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous liquid or solid, Class B 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: >200°F = >93°C = >367°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.5-1.7 at 15°C (liquid) 13.8 Liquid Surface Tension: (est.) 20 dynes/cm = 0.020 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (est.) 45 dynes/cm = 0.045 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.040 13.12 Latent Heat of Vaporization: (est.) 101 Btu/lb = 46.2 cal/g = 3.35 x 10 ⁵ J/kg 13.13 Heat of Combustion: (est.) -18,200 Btu/lb = -10,130 cal/g = -424 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NO123	

REVISED 1978

NAB

NABAM

Common Synonyms EBDK sodium salt Ethylenebis(dithiocarbamate) or [[, 6 sodium salt Disodium ethylenebis (dithiocarbamate) Chem. Res. Inchem		Solid or solution	Colorless to light amber	Slight odor
NOTE: CONTAINING SOLUTION AND SOLID KEEP PEOPLE AWAY Aqueous solution without odor or light No odor when dry No odor when wet No odor when dry or wet				
Fire		Not flammable Poisonous and flammable gases are produced if the solution boils (See paragraph 6.1 for details)		
 Exposure		CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Irritating to eyes, nose and throat Move to fresh air If in eyes, flush with water for 15 minutes If in mouth, spit out and swallow water If inhaled, get fresh air LIQUID OR SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes Remove contaminated clothing Flush skin with water for 15 minutes If in eyes, flush with water for 15 minutes If swallowed, get medical attention If swallowed, get medical attention If swallowed, get medical attention If swallowed, get medical attention		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes No odor when dry or wet No odor when dry or wet		
1. RESPONSE TO DISCHARGE (See Response Methods Manual, CG 446-4) Issue warning: poison water Contaminant Restrict access Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Chem. Res. Disodium ethylenebis(dithiocarbamate), Disodium EBDK sodium salt, Ethylenebis (dithiocarbamate) acid, disodium salt 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $C_2H_4N_4S_4$ 3.4 IMCO/United Nations Numerical Designation: 6.1 (XN)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or 22 solution in water 4.2 Color: Colorless to light amber 4.3 Odor: Slight sulfide		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles, and hand breathing apparatus, and impervious rubber gloves, rubber gloves 5.2 Symptoms Following Exposure: Contact with liquid irritates eyes and may cause mild burning evidence of such as well as severe irritation 5.3 Treatment for Exposure: INHALATION: remove person to fresh air, give artificial respiration and oxygen. If in eyes, flush with water for 15 minutes. If in mouth, spit out and swallow water. INGESTION: induce vomiting and follow with gastric lavage per medical direction 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Irritant to oral tissues, irritating agent 5.7 Late Toxicity: Derradation by ingestion and skin contact is highly irritant and toxic 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: If water solution boils, poisonous hydrogen sulfide and methyl flammable carbon disulfide vapors form. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aquatic Toxicity: 10 ppm 14 hr. (infectious stages) 10 ppm 14 hr. (infectious stages) 10 ppm 14 hr. (infectious stages) 10 ppm 14 hr. (infectious stages) 10 ppm 14 hr. (infectious stages) 8.2 Waterflow Toxicity: 10 ppm (acute exposure) 8.3 Biological Oxygen Demand (BOD) Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction unless water is boiling hot, when poisonous hydrogen sulfide and flammable carbon disulfide vapors form. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Penn & Teller Company Independence Mall West Philadelphia, PA 19106 10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 22% solution in water. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not required. 10.4 Venting: None.
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 446-3 XX 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous, Class B. 12.2 NAS Hazard Rating for BuC Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13 PHYSICAL AND CHEMICAL PROPERTIES* 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 164. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.4 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent. *Data are in the unit indicated.
NOTES	

NCT

NAPHTHA: COAL TAR

Common Synonyms Mixture of coal tar solvent systems	Watery liquid Colorless to pale yellow Capable of odor Flammable liquid Irritating vapor is produced
No data available for this material No data available for this material No data available for this material No data available for this material No data available for this material	
Fire	Combustible Flammable liquid (NTP) Flammable solid (NTP)
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled, will cause dizziness, headache, difficult breathing or loss of consciousness LIQUID Irritating to skin and eyes If swallowed, will cause nausea or vomiting If absorbed, will cause irritation of the skin If absorbed, will cause irritation of the skin If absorbed, will cause irritation of the skin If absorbed, will cause irritation of the skin
Water Pollution	Effect of low concentrations on aquatic life is unknown Toxic to fish May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Appendix B for details) CG 404.41 Mechanical containment Should be contained Chemical and physical treatment	2. LABELS No hazard label required by Federal Hazard Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonym: Mixture of benzene, toluene, and xylene 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 42 0000	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Like benzene, toluene, and xylene
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Heavy rubber vapor protection suit, gloves, goggles, and shoe coverings 5.2 Symptoms Following Exposure: Primarily a narcotic, causing drowsiness, in high concentrations. The symptoms of acute benzene poisoning are not observed in this material. 5.3 Treatment for Exposure: Remove from exposure. Support respiration. For physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 5.5 Short-Term Inhalation Limits: 10 ppm for 15 min 5.6 Toxicity by Ingestion: 1 g/kg (1 lb/1000 kg) 5.7 Late Toxicity: 1 g/kg 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging in the eyes in persons with low lacrimal flow rate. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause a skin tingling and reddening of the skin. 5.10 Odor Threshold: 10 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 117°F 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Maximum 1 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 4 in./min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS C. I. Industries, Inc. 22 Madison Ave. New York, N.Y. 10016 Koppers Co. Organic Materials Division Koppers Bldg. Pittsburgh, Pa. 15204 Nucleo Chemical Co. Nucleo Island Pittsburgh, Pa. 15204
11. HAZARD ASSESSMENT CODE (See Appendix A for details) CG 404.41 A T C V W	10. SHIPPING INFORMATION 10.1 Grades or Purity: Purity varies with use and distribution range taken 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Check flame arrester
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 HAS Hazard Rating for Bulk Water Transport, 1st: Not listed 12.3 ICAO Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: 205.0°F (90.6°C) (NTP) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.86 at 15°C (liquid) 13.8 Liquid Surface Tension: 27.0 dyne/cm at 15°C (NTP) 13.9 Liquid-Water Interfacial Tension: 10.0 dyne/cm at 15°C (NTP) 13.10 Vapor (Gas) Specific Gravity: Data not available 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available 13.12 Latent Heat of Vaporization: 40.0 Btu/lb (116.3 kJ/kg) 13.13 Heat of Combustion: 18,000 Btu/lb (41,840 kJ/kg) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES (continued on page 104)	

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NTM

NAPHTHALENE, MOLTEN

Common Synonyms Naphthalene Tar camphor	Molten solid Colorless Mothballs odor Soluble and floats or sinks in water
See description of product. Keep in place as available for department. Avoid contact with food and water. Remove and store in airtight container. See also health and safety information.	
Fire	Combustible Molten naphthalene is highly flammable. Extinguish with water from dry chemical surface and from above. Extinguish with water.
Exposure	CALL FOR MEDICAL AID SOLID OR LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush contaminated areas with plenty of water. If IN EYES, hold solid open and flush with plenty of water.
Water Pollution	HAZARDOUS TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline May be dangerous if it enters water intakes. Notify local health and water officials. Notify proper authorities with intake.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Naphthalene Tar Camphor 3.2 Coast Guard Compatibility Classification: Aromatic hydrocarbon 3.3 Chemical Formula: C ₁₀ H ₈ 3.4 IMCO/United Nations Numerical Designation: 4.1.1334	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Coal tar, moth balls
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: U.S. Bureau of Mines approved organic vapor canister unit (U.S.M. Type "B") rubber gloves, chemical safety goggles, face shield, overalls and/or rubber apron, rubber shoes or boots. 5.2 Symptoms Following Exposure: Vapors or fumes are irritating to eyes, nose, and throat and may cause headaches, dizziness, nausea, etc. Solid may be irritating to skin. 5.3 Treatment for Exposure: INHALATION: remove to fresh air. SKIN DRYES: flush with plenty of water for at least 15 min; remove contaminated clothing immediately; call a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 16 ppm 5.5 Short-Term Inhalation Limits: 15 ppm for 5 min 5.6 Toxicity by Ingestion: Grade 2, oral rat LD ₅₀ = 1780 mg/kg 5.7 Site Toxicity: Data not available 5.8 Vapors (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Hot liquids can cause severe burn. The solid may irritate the skin. 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 174°F C.C., 190°F O.C. 6.2 Flammable Limits in Air: 0.9% - 5.9% 6.3 Fire Extinguishing Agents: Water fog, carbon dioxide dry chemical or foam. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic vapors given off in a fire. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 979°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 4.3 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 150 mg/l: 96 hr. sunfish/TM, fresh water 1.8 ppm: 72 hr. fingerling salmon/critical salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): (theor) 159.5% 6 days 8.4 Frod Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Molten naphthalene splatters and foams in contact with water. No chemical reaction is involved. 7.2 Reactivity with Common Materials: None 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Industrial Chemicals Division Morrisston, N. J. 07960 2. Ashland Oil, Inc. Ashland Chemical Co. Division Columbus, Ohio 43216 3. United States Steel Corp. USS Chemicals Division 525 William Penn Place, Pittsburgh, Pa. 15230																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-T-U-X 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: ORM-A 12.2 NAS Hazard Rating for Fresh Water Transportation: <table data-bbox="925 1433 1181 1714"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>3</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>1</td></tr> <tr> <td>Aquatic Toxicity</td><td>3</td></tr> <tr> <td>Aesthetic Effect</td><td>3</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>6</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 MFPA Hazard Classifications: <table data-bbox="925 1735 1181 1821"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	3	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	3	Reactivity		Other Chemicals	1	Water	6	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 128.18 13.3 Boiling Point at 1 atm: 424°F = 218°C = 491°K 13.4 Freezing Point: 177.4°F = 80.2°C = 353.4°K 13.5 Critical Temperature: 557.2°F = 275.2°C = 748.4°K 13.6 Critical Pressure: 588 psia = 40.0 atm = 3.05 MPa (abs) 13.7 Specific Gravity: 1.145 at 20°C (solid) 13.8 Liquid Surface Tension: 31.8 dynes/cm = 0.0318 N/m at 100°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.068 13.12 Latent Heat of Vaporization: 145 Btu/lb = 80.7 cal/g = 3.4 x 10 ³ J/kg 13.13 Heat of Combustion: -16,720 Btu/lb = -9257 cal/g = 388 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	3																																				
Liquid or Solid Irritant	1																																				
Poisons	2																																				
Water Pollution																																					
Human Toxicity	1																																				
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Category	Classification																																				
Health Hazard (Blue)	2																																				
Flammability (Red)	3																																				
Reactivity (Yellow)	0																																				
NOTES (Continued on page 5404)																																					

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NSV

NAPHTHA: SOLVENT

Common Synonyms Petroleum solvent		Watery liquid	Colorless	Gasoline-like odor
Floats on water. Vapor is produced				
May be toxic if swallowed. Keep away from children. Avoid contact with liquid and vapor. For more information, see the following: NIOSH Publication #100-110 (4-1-78)				
Fire		Combustible Extinction: with water, foam, carbon dioxide, or dry chemical. Do not spray directly on person.		
Exposure		ALL FOR MEDICAL USE VAPOR Not irritating to eyes, nose or throat If inhaled, will cause dizziness or loss of consciousness May be fatal if inhaled in high concentrations If inhaled, remove person to fresh air. If symptoms persist, call a doctor. LIQUID Irritating to skin and eyes Harmful if swallowed If swallowed, do not induce vomiting. If eyes are affected, flush with plenty of water. If in eyes, flush with water for 15 minutes. If on skin, wash with soap and water. If swallowed, do not induce vomiting. Call a doctor. Do not have person drink water. Do NOT INDUCE VOMITING.		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Do not discharge into water bodies.		
1. RESPONSE TO LEAKAGE (See Response Manual Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Light naphtha, Petroleum solvent 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: 12.1250		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like kerosene and gasoline		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, as for gasoline 5.2 Symptoms Following Exposure: Higher concentrations of vapors may cause intoxication. If liquid is swallowed, it may get into lungs by aspiration, not very irritating to skin or eyes. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, treat symptoms. INGESTION: do NOT induce vomiting, call a doctor. EYES: flush with water for 15 min. SKIN: wipe off, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm 5.5 Short-Term Inhalation Limits: 500 ppm for 30 min 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause staining and reddening of skin. 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: >100°F (44°C) 6.2 Flammable Limits in Air: 0.8% - 8.0% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 444°F 6.8 Electrical Hazard: Class I, Group D 6.9 Burning Rate: 4 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Pennsylvania Refining Co. Butler, Pa. 16001 2. Sun Oil Co. St. Davids, Pa. 19087 3. Union Oil Co. Amoco Division 3100 S. Meacham Rd. Palatine, Ill. 60067
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Refined solvent, crude light solvent, crude heavy solvent 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester) or pressure vacuum
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A 4 U	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: 266 - 311°F = 130 - 155°C = 403 - 428°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.85 - 0.87 at 20°C (liquid) 13.8 Liquid Surface Tension: 19 - 23 dynes/cm = 0.019 - 0.023 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 19 - 21 dynes/cm = 0.019 - 0.021 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): (test 1104) 13.12 Latent Heat of Vaporization: 130 - 180 Btu/lb = 71 - 81 cal/g = 3.0 - 3.4 × 10⁵ J/kg 13.13 Heat of Combustion: (test 1) = 18,200 Btu/lb = -10,100 cal/g = -424 × 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

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NSS

NAPHTHA:STODDARD SOLVENT

Common Synonyms Petroleum solvent Drycleaner naphtha Spotting naphtha	Watery liquid Colorless Gasoline-like odor Floats on water
See Section 5 for health hazard information. Contains no halogens. Not a flammable liquid. Not a flammable solid. Not a highly flammable liquid. Not a highly flammable solid.	
Fire	Combustible Flammable with heat of combustion 40,000 Btu/lb (187 kJ/kg). Combustible.
Exposure	CAUTION: MIDDLE ALKYL LIQUID Irritating to skin and eyes. Harmful if swallowed. Runny nose, irritation of throat. Pain, burning, redness, swelling of water. IF IN EYES: Flush with water for 15 min. IF SWALLOWED: Do not induce vomiting. Give oral drink water. Do NOT induce vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Not a health hazard. Not a pollutant.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Mechanical containment. Should be removed. Chemical and physical treatment.	2. LABELS No hazard label is required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Drycleaner naphtha, Petroleum solvent, Spotting naphtha. 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures. 3.3 Chemical Formula: Not applicable. 3.4 IMCO/United Nations Numerical Designation: 33.1265.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Like gasoline.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield (as for gasoline). 5.2 Symptoms Following Exposure: High concentration of vapors may cause intoxication. If liquid is swallowed, it may get into lungs by aspiration, not very irritating to skin or eyes. 5.3 Treatment for Exposure: INHALATION: remove patient from exposure, treat symptoms. INGESTION: do NOT induce vomiting. Call a doctor. EYES: flush with water for 15 min. SKIN: wipe off and wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm. 5.5 Short-Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 5 to 8 g/kg. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 110°F (43°C). 6.2 Flammable Limits in Air: 0.8% - 8.0%. 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 540°F (est.). 6.8 Electrical Hazard: Class I Group D. 6.9 Burning Rate: 4 mm/min.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Pennsylvania Refining Co., Butler, Pa. 16001. 2. Sun Oil Co., St. Davids, Pa. 19087. 3. Union Oil Co., Amoco Division, 3100 S. Meacham Rd., Palatine, Ill. 60067.								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3). A-T-U.	10 SHIPPING INFORMATION 10.1 Grades or Purity: Data not available. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arrester).								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>0</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: Not pertinent. 13.3 Boiling Point at 1 atm: 120.380°F = 100.199°C = 433.472°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.75 at 20°C (liquid). 13.8 Liquid Surface Tension: 19.23 dynes/cm = 0.019 023 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 39.51 dynes/cm = 0.039 0051 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: Data not available. 13.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.030. 13.12 Latent Heat of Vaporization: 130 150 Btu/lb = 71 813 cal/g = 3.034 X 10 ⁵ J/kg. 13.13 Heat of Combustion: (est.) 15 200 Btu/lb = 10 100 cal/g = 424 X 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	2								
Reactivity (Yellow)	0								
(continued on pages 4 and 5)									

NOTES

NVM

NAPHTHA: VM & P

(75% NAPHTHA)

Common Synonyms: Petroleum solvent Light naphtha	Watery liquid Colorless Gasoline-like odor
Floats on water. Flammable, irritating vapor is produced.	
Stop discharge if possible. Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to knock down vapor. Avoid contact with liquid and vapor. Isolate and remove discharged material. Notify local health and pollution control agencies.	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with foam, dry chemical or carbon dioxide. Cool exposed containers with water.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: Have victim drink water. IF UNCONSCIOUS: Do not induce vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and welfare officials. Notify personnel of nearby water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability. Evacuate area. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Light naphtha Painter's naphtha Petroleum solvent 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: 3.2, 1255	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like gasoline
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield (as for gasoline). 5.2 Symptoms Following Exposure: Vapor irritates respiratory tract, causes coughing and mild depression. Aspiration causes severe lung irritation with coughing, gagging and rapidly developing pulmonary edema. Ingestion irritates mouth and stomach, causes nausea, vomiting, swelling of abdomen, cardiac arrhythmias. 5.3 Treatment for Exposure: INHALATION: maintain respiration if required. INGESTION: do NOT induce vomiting; observe for pneumonia; support if central nervous system depression occurs. ASPIRATION: enforce rest; administer oxygen; call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off; wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: 500 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade I, 1.5 to 15 g/kg. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and red tanning of the skin. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 20.55°C (69°F) 6.2 Flammable Limits in Air: 0.9% - 6.7% 6.3 Fire Extinguishing Agents: Foam, carbon dioxide or dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Vapor is heavier than air and may travel long distances to a source of ignition and flash back. 6.7 Ignition Temperature: 450°F 6.8 Electrical Hazard: Class I, Group D. 6.9 Burning Rate: 4 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Pennsylvania Refining Co. Butler, Pa. 16001 2. Sun Oil Co. St. Davids, Pa. 19087 3. Union Oil Co. Amoco Division 3100 S. Meacham Rd. Palatine, Ill. 60067
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U A W	10. SHIPPING INFORMATION 10.1 Grades or Purity: Petroleum hydrocarbons (90%) plus aromatic hydrocarbons such as benzene and toluene (10%). 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arrester) or pressure vacuum.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: Not pertinent. 13.3 Boiling Point at 1 atm: 200.36°F = 93.14°C = 366.422°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.75 at 20°C (liquids). 13.8 Liquid Surface Tension: 19.23 dynes/cm = 0.019 0027 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 19.51 dynes/cm = 0.019 0051 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: Data not available. 13.11 Ratio of Specific Heats of Vapor (Gas): (test) 1.030. 13.12 Latent Heat of Vaporization: 330 x 50 Btu/lb = 71.81 cal/g = 3.034 x 10 ⁵ J/kg. 13.13 Heat of Combustion, test 1 = 18 200 Btu/lb = 10 100 cal/g = 424 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on pages 5 and 6)	

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(continued on pages 1 and A1)

NAO

1-NAPHTHYLAMINE

Common Synonyms 1-Aminonaphthalene alpha-Naphthylamine		Solid	Light to dark brown	Weak ammonia-like odor
Sinks in water				
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear face shield and gloves when handling solid. Wash face and gloves after use. Isolate and remove discharged material. Notify health authorities if spill occurs.				
Fire		Combustible POISONOUS GASES ARE PRODUCED IN FIRE. Irritating gases are produced when heated. Extinguish with water.		
 Exposure		CALL FOR MEDICAL AID. DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED Irritating to eyes. Wash face and gloves after use. If IN EYES: Flush with plenty of water. If SWALLOWED: Do not induce vomiting. Get medical attention. If SWALLOWED and skin is in contact: Get medical attention. If SWALLOWED and skin is in contact: Get medical attention.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify health authorities if spill occurs. Notify water treatment plant.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison water contaminant. Restrict access. Should be removed. Chemical and physical treatment.		2. LABELS None required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Aminonaphthalene alpha-Naphthylamine 3.2 Coast Guard Compatibility Classification Not applicable 3.3 Chemical Formula: C ₁₀ H ₉ NH 3.4 IMCO/United Nations Numerical Designation: 6.1 1650		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Tan to brown; darkens on storage. 4.3 Odor: Characteristic amine.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Complete protection for respiratory system, eyes, and skin 5.2 Symptoms Following Exposure: Inhalation may cause cyanosis (blue color in lips and under finger nails). Contact with liquid causes local irritation of eyes. Neither ingestion nor contact with skin produces any recognized immediate effects. 5.3 Treatment for Exposure: Persons undergoing severe exposure to this compound should have continuing medical attention for possible development of cancer. INHALATION: obtain medical attention for cyanosis. EYES: flush with water for at least 15 min. SKIN: wash carefully with soap and water. INGESTION: get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 770 mg/kg (rat); 4,060 mg/kg (mammals) 5.7 Late Toxicity: Considered cancer-producing, particularly since it may contain up to 0.5% of 2-naphthylamine 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS

- 6.1 **Flash Point:** (combustible solid) 115°F (40°C) (molten solid).
 6.2 **Flammable Limits in Air:** Not pertinent.
 6.3 **Fire Extinguishing Agents:** Water, dry chemical, carbon dioxide, foam.
 6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing.
 6.5 **Special Hazards of Combustion Products:** Toxic nitrogen oxides are produced in a fire.
 6.6 **Behavior in Fire:** Not pertinent.
 6.7 **Ignition Temperature:** Data not available.
 6.8 **Electrical Hazard:** Not pertinent.
 6.9 **Burning Rate:** Not pertinent.

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available.
 8.2 **Waterfowl Toxicity:** Data not available.
 8.3 **Biological Oxygen Demand (BOD):** Data not available.
 8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

1. Aldrich Chemical Co.
 940 West Saint Paul Ave.
 Milwaukee, Wis. 53233.
 2. Eastman Kodak Co.
 Eastman Organic Chemicals
 Rochester, N. Y. 14650.
 3. E. I. duPont de Nemours & Co.
 Organic Chemicals Dept.
 Dyes and Chemicals Division
 Wilmington, Del. 19895.

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** Pure Technical.
 10.2 **Storage Temperature:** Cool ambient.
 10.3 **Inert Atmosphere:** No requirement.
 10.4 **Venting:** Open. Store containers in well ventilated area.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3).
 II

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed.
 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.
 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 1 |
| Reactivity (Yellow) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

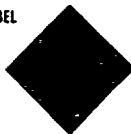
- 13.1 **Physical State at 15°C and 1 atm:** Solid.
 13.2 **Molecular Weight:** 143.2.
 13.3 **Boiling Point at 1 atm:** 271°F = 133°C = 406°K.
 13.4 **Freezing Point:** 115°F = 46°C = 321°K.
 13.5 **Critical Temperature:** Not pertinent.
 13.6 **Critical Pressure:** Not pertinent.
 13.7 **Specific Gravity:** 1.12 at 25°C (solid).
 13.8 **Liquid Surface Tension:** Not pertinent.
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
 13.12 **Latent Heat of Vaporization:** Not pertinent.
 13.13 **Heat of Combustion:** -45,290 Btu/lb = -8,495 cal/g = -355.4 × 10³ J/kg.
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** Not pertinent.
 13.16 **Heat of Polymerization:** Not pertinent.

(continued on pages 3 and 4)

NOTES

NHX

NEOHEXANE

Common Synonyms 2,2-Dimethylbutane		Liquid	Colorless	Gasoline like odor
		Floats on water. Flammable. Irritating vapor is produced.		
Note: The following information is for the liquid phase only. The gas phase is not covered by this section. Note: The following information is for the liquid phase only. The gas phase is not covered by this section.				
Fire	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Do not use open flame or other sources of ignition. Do not breathe vapors.			
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled will cause dizziness, coughing, or difficult breathing. May cause drowsiness. Do not breathe vapors. LIQUID Irritating to skin and eyes. If swallowed will cause nausea or vomiting. Runny nose, irritated throat, and coughing. Irritation of eyes may occur. If in eyes, flush with water for 15 min. If on skin, wash with soap and water. If swallowed, do not induce vomiting. Call a doctor. Do not induce vomiting.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. Do not discharge into water.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: high flammability. Restrict access. Evacuate area. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,2-Dimethylbutane 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CH3C(CH3)2CH2CH3 3.4 IMCO/United Nations Numerical Designation: 3.1, 1255		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like gasoline		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supplied apparatus or organic vapor cartridge, goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes dizziness, nausea, and vomiting. Concentrated vapor may cause unconsciousness and collapse. Contact with liquid causes irritation of eyes. Repeated contact may produce irritation of skin. Ingestion causes irritation of stomach. Aspiration causes severe lung irritation, rapidly developing pulmonary edema, and central nervous system excitement followed by depression. 5.3 Treatment for Exposure: INHALATION: remove from exposure. If breathing has stopped, begin artificial respiration, call a physician. EYES: flush with water for 15 min., call physician if needed. SKIN: flush well with water, then wash with soap and water. INGESTION: do NOT induce vomiting, give adequate aspiration into lungs, call a doctor. ASPIRATION: entice bed rest, give oxygen, get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: -54°F (-48°C)	8.1	Aquatic Toxicity: Data not available
6.2	Flammable Limits in Air: 1.2% - 7.7%	8.2	Waterway Toxicity: Data not available
6.3	Fire Extinguishing Agents: Dry chemical foam, carbon dioxide	8.3	Biological Oxygen Demand (BOD): Data not available
6.4	Fire Extinguishing Agents Not to be Used: Water may be ineffective	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: Not pertinent		
6.6	Behavior in Fire: Not pertinent		
6.7	Ignition Temperature: 792°F		
6.8	Electrical Hazard: Data not available		
6.9	Burning Rate: 9.2 mm/min		
		9. SELECTED MANUFACTURERS	
		1	Phillips Petroleum Company Chemical Department Special Products Division Bartlesville, Okla. 74004
		2	Aldrich Chemical Co. 940 West Saint Paul Ave. Milwaukee, Wis. 53233
		3	Pfaltz and Bauer, Inc. 12644 Northern Boulevard Flushing, N.Y. 11358
7. CHEMICAL REACTIVITY			
7.1	Reactivity with Water: No reaction		
7.2	Reactivity with Common Materials: No reaction		
7.3	Stability During Transport: Stable		
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent		
7.5	Polymerization: Not pertinent		
7.6	Inhibitor of Polymerization: Not pertinent		
		10 SHIPPING INFORMATION	
		10.1	Grade or Purity: Research 99.98% Pure 99.9% Technical 96.4%
		10.2	Storage Temperature: Ambient
		10.3	Inert Atmosphere: No requirement
		10.4	Venting: Open flame arresters
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A T C A W		13 PHYSICAL AND CHEMICAL PROPERTIES	
		13.1	Physical State at 15°C and 1 atm: Liquid
		13.2	Molecular Weight: 72.2
		13.3	Boiling Point at 1 atm: 121.5°F = 49.7°C = 322.9°K
		13.4	Freezing Point: -142.5°F = -96.9°C = 173.3°K
		13.5	Critical Temperature: 420.1°F = 215.6°C = 488.8°K
		13.6	Critical Pressure: 44.7 psia = 3.02 atm = 3.08 MPa
		13.7	Specific Gravity: 0.649 at 20°C , liquid
		13.8	Liquid Surface Tension: 16.3 dynes/cm = 0.0163 N/m at 20°C
		13.9	Liquid-Water Interfacial Tension, dynes/cm = 0.0055 N/m at 20°C
		13.10	Vapor (Gas) Specific Gravity: 1.0
		13.11	Ratio of Specific Heats of Vapor (Gas): 1.064 at 18°C
		13.12	Latent Heat of Vaporization: 141 Btu/lb = 72 kcal/g = 305 kJ/kg
		13.13	Heat of Combustion: $-19,410\text{ Btu/lb}$ = $-10,740\text{ kcal/g}$ = $-44,940\text{ kJ/kg}$
		13.14	Heat of Decomposition: Not pertinent
		13.15	Heat of Solution: Not pertinent
		13.16	Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS			
12.1	Code of Federal Regulations: Flammable liquid		
12.2	NAS Hazard Rating for Bulk Water Transportation: Not listed		
12.3	NFPA Hazard Classifications:		
	Category	Classification	
	Health Hazard (Blue)	1	
	Flammability (Red)	3	
	Reactivity (Yellow)	0	
		<i>(continued on page 1 and 2)</i>	

NOTES

(Continued on page 1 and 2)

NKA

NICKEL ACETATE

Common Synonyms: Nickel acetate tetrahydrate Acetic acid Nickel (II) salt Nickelous acetate		Solid: Dull green Odorless Sinks and mixes slowly with water
Avoid contact with skin and eyes. Keep people away. No prolonged exposure. Isolate and remove discharged material. Notify local health and pollution control agencies.		
Fire	Not flammable	
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If eyes, nose or skin are irritated with particles of water. If breathing apparatus and gloves are not available, use mouthpiece and breathing device over nose. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove from mouth with gloved fingers. Flush affected area with plenty of water. IF IN EYES: Flush with copious amounts of water. IF SWALLOWED: Do not induce vomiting. Give person 1 quart of water. IF SWALLOWED: Do not induce vomiting. Give person 1 quart of water. IF SWALLOWED: Do not induce vomiting. Give person 1 quart of water. IF SWALLOWED: Do not induce vomiting. Give person 1 quart of water.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and pollution control agencies.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-1. Disperse and flush.		2. LABELS No hazard label required by Codes of Federal Regulations.
3. CHEMICAL DESIGNATIONS 31 Synonyms: Acetic acid Nickel(II) salt Nickel acetate tetrahydrate Nickelous acetate 32 Coast Guard Compatibility Classification: Not listed. 33 Chemical Formula: Ni(CH ₃ COO) ₂ ·4H ₂ O 34 IMCO/United Nations Numerical Designation: Not used.		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: Dull green 43 Odor: None
5. HEALTH HAZARDS 51 Personal Protective Equipment: Bu. Mines approved respirator, rubber gloves, safety goggles, protective clothing. 52 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Throat irritation causes vomiting. Contact with eyes causes irritation. May cause dermatitis on contact with skin. 53 Treatment for Exposure: INHALATION: remove to fresh air, get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with water 15 min. consult physician if irritation persists. SKIN: wash with soap and water. 54 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m ³ as nickel. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 g/kg. 57 Late Toxicity: Possible lung cancer. 58 Vapor (Gas) Irritant Characteristics: Data not available. 59 Liquid or Solid Irritant Characteristics: Data not available. 510 Odor Threshold: Data not available.		

6. FIRE HAZARDS 61 Flash Point: Not flammable. 62 Flammable Limits in Air: Not flammable. 63 Fire Extinguishing Agents: Not pertinent. 64 Fire Extinguishing Agents Not to be Used: Not pertinent. 65 Special Hazards of Combustion Products: 66 Behavior in Fire: 67 Ignition Temperature: Not pertinent. 68 Electrical Hazard: Not pertinent. 69 Burning Rate: Not pertinent.		8. WATER POLLUTION 81 Aquatic Toxicity: Data not available. 82 Waterlow Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): Data not available. 84 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Not pertinent. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. American Hoechst Corp. Chemicals and Plastics Div. Somerset, N.J. 08857. 2. The Harshaw Chemical Co. 1945 E. 97th St. Cleveland, Ohio. 3. J. T. Baker Chemical Co. Phillipsburg, N.J. 08865.
10. SHIPPING INFORMATION 101 Grade or Purity: Commercial 99% Reagent. 102 Storage Temperature: Ambient. 103 Inert Atmosphere: Not required. 104 Venting: Open.		
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3). SS		13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid. 132 Molecular Weight: 248.56. 133 Boiling Point at 1 atm: Not pertinent (decomposes). 134 Freezing Point: Not pertinent. 135 Critical Temperature: Not pertinent. 136 Critical Pressure: Not pertinent. 137 Specific Gravity: 1.74 at 20°C (solid). 138 Liquid Surface Tension: Not pertinent. 139 Liquid-Water Interfacial Tension: Not pertinent. 1310 Vapor (Gas) Specific Gravity: Not pertinent. 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 1312 Latent Heat of Vaporization: Not pertinent. 1313 Heat of Combustion: Not pertinent. 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: Not pertinent. 1316 Heat of Polymerization: Not pertinent.
NOTES		

NAS

NICKEL AMMONIUM SULFATE

Common Synonyms: Ammonium nickel sulfate Ammonium nickel hexahydrate (II) Nickel ammonium sulfate hexahydrate	Solid Dark green blue Odorless Sinks and moves slowly with water
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED
Exposure	CAUTION: Vapors Harmful DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficulty breathing. If swallowed will cause nausea and vomiting. If swallowed will cause diarrhea. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. If swallowed will cause diarrhea. IF SWALLOWED: Give large amount of water. IF IN EYES: Flush with water for at least 15 minutes. IF ON SKIN: Wash with soap and water.
Water Pollution	Effect of low concentrations on aquatic life unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4. Disperse and flush.	2. LABELS See Hazard Label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium nickel sulfate hexahydrate (II); Ammonium nickel sulfate hexahydrate; Nickel ammonium sulfate hexahydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$ 3.4 I/MCO/United Nations Chemical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Dark blue-green 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Bu. Minc. prompt respiratory; rubber gloves; face shield or safety goggles; protective clothing 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Ingestion causes vomiting. Contact with eyes causes irritation. Contact with skin may cause dermatitis. 5.3 Treatment for Exposure: INHALATION: move to fresh air; get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with water for at least 15 minutes; get medical attention if irritation persists. SKIN: wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Time-weighted average 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2.1 (DANGER) 5.7 Late Toxicity: Possible lung cancer 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may be formed in fire 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazards: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 6 ppm as Ni²⁺ daphnia magna; deleterious effect; fresh water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Not pertinent 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. J. T. Baker Chemical Co. Phillipsburg, N. J. 08865 2. McGraw Chemical Co. 1250 Terminal Tower Cleveland, Ohio 44113 3. Gradar-Schleunger Chemical Mfg. Co. 584 Minnesota Ave. Carle Place, N. Y. 11514
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3. NN	10. SHIPPING INFORMATION 10.1 Grades or Purities: Reagent Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 262.00 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.92 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

NBR

NICKEL BROMIDE

Common Synonyms Nickel bromide trihydrate		Solid Yellowish-green Odorless Sinks and mixes with water
Fire		Not flammable Irritating gases may be produced when heated
Exposure		DUST Irritating to eyes, nose and throat If inhaled will cause coughing and difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Toxic warning - water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Nickel bromide trihydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{NiBr} \cdot 3\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellowish green 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Full Mines approved respirator, rubber gloves, face shield or safety goggles, protective clothing 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Large amounts swallowed and not thrown up, it can cause drowsiness and other symptoms of bromide poisoning. Dust irritates eyes and may cause dermatitis in contact with skin. 5.3 Treatment for Exposure: INHALATION: move to fresh air, get medical attention. Exposure has been severe: INGESTION: give large amounts of water. EYES: flush with water for at least 15 min. SKIN: wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m (as nickel) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 950 mg/kg 5.7 Late Toxicity: Possible lung cancer 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		
6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating hydrogen bromide vapors may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		7. WATER POLLUTION 7.1 Aquatic Toxicity: Data not available 7.2 Waterfowl Toxicity: Data not available 7.3 Biological Oxygen Demand (BOD): Data not available 7.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. D. J. Goldsmith Chemical and Metal Co. 900 Pitkin Ave. Evanston, Ill. 60202 2. Gairland-Niesinger Chemical Mfg. Co. 84 Mineola Ave. Carle Place, N. Y. 11554 Ventron Corp. P.O. Box 159 Beverly, Mass. 01915
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 NN		10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 272.6 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: tested at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES		

NKC

NICKEL CARBONYL

Common Synonyms: Nickel tetracarbonyl	Liquid Colorless to yellow Musty, stale odor Sinks in water. Poisonous, flammable vapor is produced.
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Will burn skin and eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it covers water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning: poison, high flammability a. Contaminant: water contaminant Restrict access Evacuate area Should be removed Chemical and physical treatment	2. LABELS 
2. CHEMICAL DESIGNATIONS 3.1 Synonyms: Nickel tetracarbonyl 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: Ni(CO)₄ 3.4 IMCO/United Nations Numerical Designation: 1.1, 1.2, 4	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to yellow 4.3 Odor: Musty characteristic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, complete protective clothing 5.2 Symptoms Following Exposure: Inhalation causes piddiness, headache, shortness of breath, vomiting, if victim is removed from exposure, symptoms may disappear, but recur 12-36 hours later, along with blue pallor of skin, fever, and cough; death may occur. Ingestion or contact with skin may also produce these symptoms. Abnormal nickel content of urine and blood is a measure of the severity of exposure. Contact of liquid with eyes causes severe irritation. 5.3 Treatment for Exposure: Medical help must be obtained following any exposure to vapor or liquid. INHALATION: oral administration of sodium diethyldithiocarbamate trihydrate (Dithiocarbamate) complete bed rest and positive pressure oxygen are indicated for pulmonary edema; treatment otherwise is symptomatic. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: do NOT induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.001 ppm 5.5 Short-Term Inhalation Limits: 0.04 ppm for 5 min 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: May produce cancer 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: 1-1 ppm	

6. FIRE HAZARDS 6.1 Flash Point: <-4°F (-20°C) 6.2 Flammable Limits in Air: 2% (LFL) 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Data not available 6.5 Special Hazards of Combustion Products: Unusually toxic gases formed by incomplete combustion 6.6 Behavior in Fire: Containers may explode when heated 6.7 Ignition Temperature: <200°F (vapors) 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 2.7 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable below 100°F 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Pressure Chemical Company 419 Smallman Street Pittsburgh, Pa. 15201 2. Gallard Schlessinger Chemical Mfg. Co. Atomergic Chemicals Division 584 Mineola Ave. Carle Place, L.I.N.Y. 11514 3. Matheson Gas Products Co. East Rutherford, N.J. 07073																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) XXX	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.99% 10.2 Storage Temperature: Cool ambient 10.3 Inert Atmosphere: Carbon monoxide at 15 psi carbon dioxide 10.4 Venting: Cylinders must be stored in a well ventilated area																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="959 1425 1207 1683"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>4</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td> Poison</td><td>4</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td></td></tr> <tr> <td> Aquatic Toxicity</td><td>3</td></tr> <tr> <td> Aesthetic Effect</td><td>1</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>4</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>4</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poison	4	Water Pollution		Human Toxicity		Aquatic Toxicity	3	Aesthetic Effect	1	Reactivity		Other Chemicals	4	Water	0	Self Reaction	4	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 170 13.3 Boiling Point at 1 atm: 100°F = 43°C = 316°K 13.4 Freezing Point: -13°F = -25°C = 248°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.322 at 17°C (liquid) 13.8 Liquid Surface Tension: 15.9 dynes/cm = 0.0159 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: 4.9 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available 13.12 Latent Heat of Vaporization: 72 Btu/lb = 40 cal/g = 1.7 x 10⁵ J/kg 13.13 Heat of Combustion: -2970 Btu/lb = -1650 cal/g = -69.0 x 10³ J/g 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	1																												
Health																													
Vapor Irritant	4																												
Liquid or Solid Irritant	4																												
Poison	4																												
Water Pollution																													
Human Toxicity																													
Aquatic Toxicity	3																												
Aesthetic Effect	1																												
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Other Chemicals	4																												
Water	0																												
Self Reaction	4																												
12.3 NFPA Hazard Classifications: <table data-bbox="959 1705 1207 1791"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>4</td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	4	NOTES (Continued on pages 5 and 6)																				
Category	Classification																												
Health Hazard (Blue)	1																												
Flammability (Red)	1																												
Reactivity (Yellow)	4																												

NCL

NICKEL CHLORIDE

Common Synonyms Nickel chloride hexahydrate		Solid	Green	Odorous
		Sinks and mixes with water		
Avoid contact with skin and eyes. If contact occurs, wash thoroughly with water. If swallowed, do not induce vomiting. Seek medical attention if symptoms persist.				
Fire	Not flammable			
Exposure	ACUTE TOXICITY DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If swallowed will cause nausea and vomiting If swallowed will cause diarrhea and vomiting SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting If swallowed will cause diarrhea and vomiting EYES Irritating to eyes If swallowed will cause nausea and vomiting If swallowed will cause diarrhea and vomiting SKIN Irritating to skin and eyes If swallowed will cause nausea and vomiting If swallowed will cause diarrhea and vomiting			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Do not discharge into water bodies			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Nickel chloride hexahydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Green 4.3 Odor: None		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Goggles or face shield, protective gloves, full body protective clothing				
5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Dust irritates eyes and may cause dermatitis in contact with skin.				
5.3 Treatment for Exposure: INHALATION: move to fresh air, get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with plenty of water for at least 15 min. SKIN: flush with water.				
5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m ³ as nickel				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade 2 ED ₀₁ 5 g/kg				
5.7 Late Toxicity: Possible lung cancer				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: 259 mg/l 14 minnow fundulus survived salt water 518 ppm/96 hr fathead minnow - 11% soft water 42.4 ppm/96 hr fathead minnow - 11% hard water *Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Tesco Chemicals, Inc. Intermediates Div. Turner Place, P.O. Box 2 Procataway, N.J. 08054 2. The Harshaw Chemical Co. 1945 East 97 Street Cleveland, Ohio 44106 3. Allied Chemical Corp. Specialty Chemicals Div. P.O. Box 1687R Morristown, N.J. 07960									
		10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 99+ 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open									
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NS		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 231.7 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.55 at 15°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 44.8 kJ/mol = 4.9 cal/g = 0.21 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>0</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	0	Reactivity (Yellow)	0		
Category	Classification										
Health Hazard (Blue)	1										
Flammability (Red)	0										
Reactivity (Yellow)	0										
NOTES											

(continued on pages 5 and 6)

NCN

NICKEL CYANIDE

Common Synonyms	Solid Light green or yellow-brown Weak almond odor Sinks in water
AVOID CONTACT WITH SKIN. IF CONTACT OCCURS, WASH IMMEDIATELY WITH WATER. IF CONTACT OCCURS WITH EYES, WASH IMMEDIATELY WITH WATER. IF CONTACT OCCURS WITH CLOTHING, REMOVE CLOTHING IMMEDIATELY.	
Fire	Not flammable
 Exposure	POISONOUS IF INHALED Irritating to eyes, nose and throat. May cause respiratory irritation. May cause dizziness and headache. May cause nausea and vomiting. POISONOUS IF SWALLOWED Irritating to skin and eyes. May cause nausea and vomiting. May cause dizziness and headache. May cause respiratory irritation.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 666-4) Issue warning: poison water Contain spillage. Remove excess. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Competibility Classification: Not applicable. 3.3 Chemical Formula: $\text{Ni(CN)}_2 \cdot 2\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: 1503	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Anhydrous yellow-brown, hydrates pale green. 4.3 Odor: Weak characteristic cyanide.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, rubber gloves, goggles. 5.2 Symptoms Following Exposure: Inhalation of dust or ingestion can produce irritation, salivation, numbness of throat, anxiety, irregular respiration, rapid pulse, convulsions, loss of consciousness, paralysis, death. 5.3 Treatment for Exposure: Get medical help; first aid and treatment must be prompt. The compound is very soluble in water. If swallowed, induce vomiting. If inhaled, get fresh air. If on skin, flush with water. Avoid getting solution in mouth. IF INGESTION, start artificial respiration if breathing has stopped. Inhalation of amyl nitrite and intravenous doses of sodium nitrite and sodium thiosulfate should be administered by physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limit: 5 mg/m ³ for 30 min (as cyanide). 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: $>100 \text{ mg/l}$ Fish: Moderately moderate to alkaline water. In acid water releases hydrogen cyanide which is fatal to all species. *Time period not specified. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Feed Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Pfaltz and Bauer, Inc. 120-164 Northern Boulevard Flushing, N.Y. 11354 2. Vortek and Chemical Co. 666 N. Front Street Elizabeth, N.J. 07202 Fieding Chemical Co. Forrest and Halladay Streets Jersey City, N.J. 07305
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 666-2) II	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial. 10.2 Storage Temperature: Not specified. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Sealed containers in well-ventilated area.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous, Class B. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: Mixture. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.4 at 25°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES (Continued on page 2 and 3)	

NFB

NICKEL FLUOROBORATE

Common Synonyms: Nickel (II) Fluoroborate Nickel fluoroborate solution		Liquid Green Sink and mixes with water
VAPOR Irritating to eyes, nose and throat Harmful if inhaled		
Fire	Not flammable	
Exposure	LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting	
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes	
1. RESPONSE TO DISCHARGE See Response Summary Handbook, CG 446-4 Issue warning - water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Nickel (II) Fluoroborate Nickel fluoroborate solution 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{NiF}_2 \cdot 6\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: light green 4.3 Odor: Data not available
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety glasses and face shield; rubber gloves; rubber apron 5.2 Symptoms Following Exposure: Irritation causes irritation of nose, throat, eyes, and skin and may cause dermatitis 5.3 Treatment for Exposure: INGESTION: give large amount of water; induce vomiting; get medical attention. IF ON SKIN: flush with water for at least 15 min. SKIN: flush with water 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m ³ as dust 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 (LD ₅₀ 1.4 g/kg) 5.7 Late Toxicity: Possible lung cancer 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS

- 6.1 Flash Point: Not flammable
- 6.2 Flammable Limits in Air: Not flammable
- 6.3 Fire Extinguishing Agents: Not pertinent
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
- 6.5 Special Hazards of Combustion Products: Not pertinent
- 6.6 Behavior in Fire:
- 6.7 Ignition Temperature: Not pertinent
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials:
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Bases: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor or Polymerization: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

- 1 Allied Chemical Corp.
P.O. Box 12676
Morristown, N.J. 07960
- 2 The Harshaw Chemical Co.
1845 East 97th
Cleveland, Ohio 44106
- 3 Harstan Chemical Corp.
1247 W. Street
Brooklyn, N.Y. 11215

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: 44.2 - 45.2% in water
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3

A F

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
- 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
- 13.2 Molecular Weight: 264.08
- 13.3 Boiling Point at 1 atm: Not pertinent
- 13.4 Freezing Point: Not pertinent
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.34 at 20°C (liquid)
- 13.8 Liquid Surface Tension: Data not available
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: Not pertinent
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

1 continuing on page 1 of 2

NOTES

NFM

NICKEL FORMATE

Common Synonyms Nickel formate dihydrate		Solid	Green	Odorless
		Sinks and mixes with water		
ACUTE TOXICITY: LD₅₀ (Oral Rat) = 1.1 g/kg SKIN IRRITATION: Positive EYE IRRITATION: Positive Not irritating to fish or other aquatic life.				
Fire		Not flammable		
Exposure		CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing Dust causes eye irritation with watery discharge Rubbing may hasten passage of dust from eye Breathing is difficult if in vapor SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting Rubbing may hasten removal of solid If IN EYES, add copious amounts of water flush immediately If SWALLOWED, do not induce vomiting. Give victim drink water or milk If SWALLOWED, DO NOT INDUCE VOMITING UNLESS ADVISED BY PHYSICIAN		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not classified as pollutant Not subject to regulation		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Nickel formate dihydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: Ni(HCOO) ₂ · 2H ₂ O 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Greenish 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Bu Mines approved respirator; rubber gloves; face shield or safety goggles; protective clothing 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Dust irritates eyes and may cause dermatitis in contact with skin 5.3 Treatment for Exposure: INHALATION: move to fresh air; get medical attention if exposure has been severe. INGESTION: give large amounts of water. EYE: Flush with water for at least 15 min. SKIN: flush with water 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m ³ (as nickel) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ > 5 g/kg 5.7 Late Toxicity: Possible lung cancer 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				
6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating formic acid vapors may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent				
8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None				
9. SELECTED MANUFACTURERS McGraw Chemical Co. 1750 Terminal Tower Cleveland Ohio 44115				
10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) S+		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 194.8 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.15 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent		
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NEPA Hazard Classifications: "Not listed"		(continued on pages 1 and 2)		
NOTES				

NNT

NICKEL NITRATE

Common Synonyms Nickel nitrate hexahydrate		Solid	Green	Odorless										
		Sinks and mixes with water												
Avoid contact with solid and dust. Keep people away. Stop dust and fumes. Isolate area if dust is released. Notify local health and pollution control agencies.														
Fire	Not flammable Will increase the intensity of a fire POISONOUS GASES MAY BE PRODUCED WHEN HEATED Toxic fumes are given off when heated or in contact with water													
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If on face, hold eyes closed and flush with plenty of water If on skin, has stopped, use artificial respiration if breathing is difficult, give oxygen SOLID Irritating to eyes If swallowed, use nausea and vomiting Repeat contact with plenty of water Flush throat with plenty of water If on skin, hold hands open and flush with plenty of water If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk If SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS Do not induce vomiting except on doctor's order													
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Notify local water and wildlife agencies Notify petries of water intakes													
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-1) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations												
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Nickel nitrate hexahydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: Ni(NO ₃) ₂ ·6H ₂ O 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Green 4.3 Odor: None												
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Buy Mines approved respirator, rubber gloves, face shield or safety goggles, protective clothing 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes vomiting. Dust irritates eyes and may cause dermatitis in contact with skin 5.3 Treatment for Exposure: INHALATION: move to fresh air, get medical attention if exposure has been severe. INGESTION: give large amount of water. EYES: flush with water for at least 15 min. SKIN: wash with soap and water 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m ³ (as nickel) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, LD ₅₀ 0.5 g/kg 5.7 Late Toxicity: Possible lung cancer 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available														
6. FIRE HAZARDS 6.1 Flash Point: Not flammable but may intensify fire 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire 6.6 Behavior in Fire: May increase intensity of fire if in contact with combustible material 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent														
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Contact of solid with acid or paper may cause fires 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent														
8. WATER POLLUTION 8.1 Aquatic Toxicity: 2.44 ppm/96 hr stickleback/threshold concn. / tap water 0.8 ppm/10 days stickleback/11 mg/l fresh water * Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None														
9. SELECTED MANUFACTURERS 1. The Hartshaw Chemical Co. 1945 East 97 St. Cleveland, Ohio 44106 2. Allied Chemical Corp. Specialty Chemicals Div. P. O. Box 1087R Morristown, N. J. 07960 3. McGee Chemical Co. 1250 Terminal Tower Cleveland, Ohio 44113														
10. SHIPPING INFORMATION 10.1 Grades or Purity: Purified 99.1% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open														
11. HAZARD ASSESSMENT CODE (See HAZARD ASSESSMENT Handbook CG 446-3) SS														
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification*</th></tr><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>0</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr><tr><td></td><td>000 000</td></tr></table> *First column refers to no fire situation					Category	Classification*	Health Hazard (Blue)	0	Flammability (Red)	0	Reactivity (Yellow)	0		000 000
Category	Classification*													
Health Hazard (Blue)	0													
Flammability (Red)	0													
Reactivity (Yellow)	0													
	000 000													
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 290.8 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.95 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heat* of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 47 Btu/lb = 26 cal/g = 1.1 x 10 ⁵ J/kg 13.16 Heat of Polymerization: Not pertinent														
NOTES														

(Continued on pages 5 and 6)

NKS

NICKEL SULFATE

Common Synonyms Nickelous sulfate		Solid crystals	Pale green	Odorless
		Sinks and mixes slowly with water		
Isolate and remove discharged material Notify local health and pollution control agencies				
Fire	Not flammable			
Exposure	CALL FOR MEDICAL AID SOLID Irritating to skin and eyes Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES: Flush with plenty of water			
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes Notify local health and pollution control agencies Notify appropriate regulatory agency			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Nickelous sulfate 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: NiSO ₄ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Pale green 4.3 Odor: Odorless		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, gloves 5.2 Symptoms Following Exposure: Dermatitis 5.3 Treatment for Exposure: Wash all affected parts with plenty of water 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m ³ 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None and lung cancer 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: Repeated contact can cause dermatitis 5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: 400 ppm/48 hr rainbow trout/TL₅₀ fresh water 139 ppm/48 hr rainbow trout 10% salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Chemetron Corp. Inorganic Chemicals Division 1290 Terminal Tower Cleveland, Ohio 44113 2 Mallinkrodt Chemicals Works Industrial Chemicals Division Second and Mallinkrodt Sts. St. Louis, Mo. 63109 3 Shepherd Chemical Co. 4900 Beech St. Cincinnati, Ohio 45212
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical reagent 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 154.78 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 3.65 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
(Continued on pages 5 and 6)	
NOTES	

NIC

NICOTINE

Common Synonyms 1 Methyl 2 (3 pyridyl) pyridine 3 (1-acetyl 2 pyridyl) pyridine	Liquid Colorless to brown Fishy odor Mixes with water
Fire Combustible POISONOUS GASES ARE PRODUCED WHEN BURNED Irritating to eyes Irritating to skin Irritating to respiratory tract Water of foam may cause frothing	
 Exposure	LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to eyes Irritating to skin Irritating to respiratory tract If swallowed, drink plenty of water If swallowed, induce vomiting If swallowed, do not induce vomiting if unconscious
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water makes
1 RESPONSE TO DISCHARGE (See Response Manual Handbook CG 446-3) Issue warning: Poisonous water contaminant Restrict access Disperse and flush	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1 Methyl 2 (3 pyridyl) pyridine; 3 (1-acetyl 2 pyridyl) pyridine 3.2 Corrosion Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₁₁ H ₈ N ₂ 3.4 IMC/United Nations Numerical Designation: 6.1 1654	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to brown 4.3 Odor: Fishy; develops apridine or tobacco like odor on exposure to air
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield; rubber gloves; protective clothing 5.2 Symptoms Following Exposure: Inhalation: Cough, burning sensation in mouth and throat, nausea, headache, conjunctivitis, vomiting, dizziness. Contact with liquid irritates eyes and causes local irritation of skin. Can be absorbed through skin in small amounts. Ingestion causes burning of mouth and stomach, vomiting, excitement, faintness, paralysis of lungs. 5.3 Treatment for Exposure: Speed of treatment is important following exposure to this compound. Ingestion of as little as 40 mg can be fatal. EYES: Flush with water for at least 15 min. SKIN: Wash thoroughly and immediately with cold water. INGESTION: Call for physician at once. Give 6-8 tablepoons of activated charcoal slurry in water. Give artificial respiration if breathing has stopped. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m ³ 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 - oral LD ₅₀ = 52 mg/kg (rat); 1 mg/kg (human) 5.7 Late Toxicity: Birth defects (skeletal) in rats 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically nonirritant to the skin 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: 0.7% - 4.0% 6.3 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Smoke may contain toxic vapors of unburned compound 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 471°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: 3.29 ppm/* fish/toxic/fresh water *Time period not specified 8.2 Waterfowl Toxicity: 1 D ₅₀ = 58 mg/kg 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Chemical Formulators Inc. Box 26 Nitro, W. Va. 25143 2 Eastman Kodak Co. Eastman Organic Chemicals Rochester, N. Y. 14650 3 Pfaltz and Bauer, Inc. 26-04 Northern Boulevard Flushing, N. Y. 11368																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A P Q	10 SHIPPING INFORMATION 10.1 Grades or Purity: 93-98% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="929 1468 1168 1712"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>4</td> </tr> <tr> <td>Water Pollution</td> <td>1</td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Aesthetic Effect</td> <td>1</td> </tr> <tr> <td>Reactivity</td> <td>0</td> </tr> <tr> <td>Other Characteristics</td> <td>0</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications <table data-bbox="929 1756 1168 1822"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>1</td> </tr> </tbody> </table>	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	4	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity	0	Other Characteristics	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 162.2 13.3 Boiling Point at 1 atm (decomposes): 482°F = 250°C = 523°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.016 at 20°C (liquid) 13.8 Liquid Surface Tension: 35.61 dynes/cm = 0.0361 N/m at 20°C 13.9 Liquid-Water Interfacial Tension (est.): 20 dynes/cm = 0.020 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -15.5 kJ/mol = -3.75 kcal/g = -15.5 kJ/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	1																																				
Health	1																																				
Vapor Irritant	1																																				
Liquid or Solid Irritant	1																																				
Poisons	4																																				
Water Pollution	1																																				
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Aquatic Toxicity	1																																				
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Reactivity	0																																				
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Water	0																																				
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Category	Classification																																				
Health Hazard (Blue)	1																																				
Flammability (Red)	1																																				
Reactivity (Yellow)	1																																				
NOTES																																					

NCS

NICOTINE SULFATE

Common Synonyms Neutral nicotine sulfate Black Leaf 40 (40% water solution)		Solid or solution	White to light brown solid or colorless solution	Odorless solid or tobacco odored solution
Mixes with water				
AVOID CONTACT WITH CHILDREN. KEEP FLOTT AWAY FROM CHILDREN. DO NOT INGEST. DO NOT SMOK. DO NOT USE IN FOODS.				
Fire		Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED		
		ALL FORMS OF VAPOR OR DUST POISONOUS IF INHALED. May cause irritation of nose and throat. Liquid irritates eyes. LIQUID OR SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to eyes. If in eyes, flush with water. If on skin, wash with water. If swallowed, drink water. If inhaled, move to fresh air. IF SWALLOWED, DO NOT INDUCE VOMITING. IF INHALED, MOVE TO FRESH AIR.		
Exposure				
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. DO NOT DISPOSE OF IN WATER.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 444-4) Issue warning, poison, water contaminant. Restrict access. Disperse and flush.		2. LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Black Leaf 40 (40% water solution); Neutral nicotine sulfate. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $(C_{10}H_{14}N)_2 \cdot H_2SO_4$. 3.4 IMCO/United Nations Numerical Designation: 6.1/1658.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or water solution. 4.2 Color: Solid is off white to yellow tan; darkens on exposure to light. Water solution may be colorless. 4.3 Odor: Solid is odorless; water solution has odor of tobacco.		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat. Liquid irritates eyes and (on prolonged contact) skin. Ingestion causes burning of mouth and stomach, vomiting, excitement, faintness, paralysis of lungs. 5.3 Treatment for Exposure: EYES: flush with water. SKIN: wash thoroughly and immediately with water. INGESTION: call for medical aid; induce immediate and repeated vomiting; perform gastric lavage with dilute (1:10,000) solution of potassium permanganate or activated charcoal in water. If milk, apply artificial respiration if breathing has stopped. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3 oral LD ₅₀ = 55 mg/kg rats. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.				

6 FIRE HAZARDS 6.1 Flash Point: Nonflammable as solid or water solution 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic decomposition products are released in a fire 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 1.29 ppm/* fish toxic, fresh water (for nicotine) *Time period not specified 8.2 Waterlow Toxicity: LD₅₀ = 587 mg/kg (for nicotine) 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Chemical Formulators, Inc. Box 26 Nitro, W. Va. 25143 2. Prentiss Drug and Chemical Co. 363 Seventh Ave. New York, N. Y. 10001 3. Plazano Bauer, Inc. 12644 Norvelt Boulevard Flushing, N. Y. 11368
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 444-3) NS	10 SHIPPING INFORMATION 10.1 Grades or Purity: Solid (Commercial Solution 40%) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous, Class B 12.2 IAS Hazard Rating for Bulk Water Transport: 4, Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 422.5 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.15 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

NOTES

NTL

NITRALIN

Common Synonyms 4-(Methylsulfonyl)-2,6-dinitro-N,N-dipropylamine Planavim		Solid Sinks in water	Light yellow to orange Mild odor
AVOID CONTACT WITH SOLID AND DUST. KEEP PEOPLE AWAY. Wear clothes self-contained breathing apparatus and gloves. Wash thoroughly after use. No discharge to water. Do not eat, drink, or smoke. Life and limb are threatened if swallowed. No oral LD ₅₀ and no other data.			
Fire	Combustible Irritating gases are produced when heated Containers may explode in fire Gases may be toxic if inhaled Gases may be irritating if inhaled		
	CAUTION FOR MEDICAL AID DUST POISONOUS IF INHALED May irritate eyes, nose, and throat. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes Wash thoroughly with soap and water. Do not eat, drink, or smoke. Life and limb are threatened if swallowed. No oral LD ₅₀ and no other data.		
Exposure	POISONOUS IF SWALLOWED Irritating to skin and eyes Wash thoroughly with soap and water. Do not eat, drink, or smoke. Life and limb are threatened if swallowed. No oral LD ₅₀ and no other data.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. No data available.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison water contaminant Restrict access Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 4-(methylsulfonyl)-2,6-dinitro-N,N-dipropylamine; Planavim 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₁₁ H ₁₄ N ₂ O ₄ S 3.4 IMCO/United Nations Numerical Designation: 6.1 1699		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Light yellow to orange 4.3 Odor: Mild chemical	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, rubber gloves 5.2 Symptoms Following Exposure: Dust irritates eyes. Other forms of exposure produce no observable symptoms. 5.3 Treatment for Exposure: No cases of clinical toxicity on record. Supportive and symptomatic medical treatment recommended if massive overexposure occurs. EYES: flush with water if irritation occurs. SKIN: wash with soap and water. INGESTION: induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 2, oral LD ₅₀ > 2,000 mg/kg (rat) 5.7 Late Toxicity: None observed 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Data not available 6.5 Special Hazards of Combustion Products: Irritating oxides of sulfur and nitrogen are formed in fire 6.6 Behavior in Fire: Decomposes vigorously in a self-sustaining reaction at or above 225°C 6.7 Ignition Temperature: 435 °F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 27 ppm 96 hr rainbow trout LC₅₀ (fresh water) 1 ppm 96 hr oysters, no effect (salt water) 8.2 Waterfowl Toxicity: Not toxic after 2,000 mg/kg (ducks) 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Shell Chemical Company Agricultural Division 2401 Crow Canyon Road San Ramon, Calif. 94583
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 94%+ Wettable powder 75%+ Emulsifiable concentrate 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not Listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 345.2 13.3 Boiling Point at 1 atm: (decomposes) >417°C = >225°C = >498°F 13.4 Freezing Point: 304°F = 151°C = 424 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity (ext): >1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: -450 Btu/lb = -260 cal/g = -10.5 x 10³ J/kg 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES (Continued on pages 5 and 6)	

NAC

NITRIC ACID

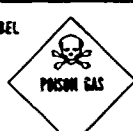
Common Synonyms	Watery liquid Colorless to light brown Choking odor
	Sinks and mixes with water. Harmful vapor is produced.
AVOID CONTACT WITH FLAMMABLE AND TOXIC SUBSTANCES	
Fire	Not flammable May cause fire on contact with combustibles. Flammable gas may be formed on contact with metals. Poisonous gases are produced when heated.
Exposure	GAS VAPOR Will burn eyes, nose and throat. If inhaled, will cause difficult breathing or loss of consciousness. May cause pulmonary edema. LIQUID Will burn skin and eyes. Harmful if swallowed. Reacts with organic materials. HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. If swallowed, drink large volume of water. Do NOT induce vomiting.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water makes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Toxic, watery, not corrosive. Restrict access. Evacuate area. Disperse and flush.	2. LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Nitric acid. 3.3 Chemical Formula: HNO_3 (4.0) 3.4 IMCO United Nations Numerical Designation: N.O. 2031	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Acid, sweet to acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air mask, rubber acid suit, hood, boots and gloves, chemical goggles, safety shower and eye bath. 5.2 Symptoms Following Exposure: Vapors irritate eyes and respiratory tract. Lung injury may not become apparent for several hours following exposure. Liquid may cause severe burns to eyes and skin. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, administer artificial respiration if required. INGESTION: drink large volume of water, do NOT induce vomiting. EYES: flush with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 2 ppm 5.5 Short-Term Inhalation Limits: 15 ppm for 5 min 5.6 Toxicity by Ingestion: Grade 3.1 Dose 500 mg/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: 5.8% Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 95% Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Use water on adjacent fires. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: May give off poisonous oxides of nitrogen and acid fumes when heated in fires. 6.6 Behavior in Fire: Decomposes and gives off poisonous oxides of nitrogen. 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: 22 ppm 96 hr LC50 to fish. 11 mg/l fresh water. 500 (100) ppm 48 hr LC50 to EC50 salt water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: May heat up on mixing, but explosion or formation of steam unlikely. 7.2 Reactivity with Common Materials: Very corrosive to wood, paper, cloth and most metals. Toxic red oxides of nitrogen are formed. 7.3 Stability During Transport: When heated may give off toxic red oxides of nitrogen. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Agricultural Division Morristown, N.J. 07960 2. E. I. duPont de Nemours & Co., Inc. Explosives Dept. Wilmington, Del. 19898 3. Hercules Inc. Explosives & Chemical Production Dept. Bessemer, Ala. 35020																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) A P	10. SHIPPING INFORMATION 10.1 Grades or Purity: Various grades. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open or pressure-vacuum.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizer 12.2 NAS Hazard Rating for Bulk Water Transportation: <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>0</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>3</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td> Toxicity</td><td>3</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>3</td></tr> <tr> <td> Aquatic Toxicity</td><td>3</td></tr> <tr> <td> Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Organic Chemical</td><td>2</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	0	Health		Vapor Irritant	3	Liquid or Solid Irritant	4	Toxicity	3	Water Pollution		Human Toxicity	3	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Organic Chemical	2	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: 80.1°C or 355.2°F or 362.1°K 13.4 Freezing Point: -50.1°C or -58°F or 223.1°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.49 at 20°C (liquids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.174 13.12 Latent Heat of Vaporization: 214 Btu/lb or 47.1 cal/g or 4.98 x 10 ⁵ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -205 Btu/lb or -114 cal/g or -4.76 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	0																												
Health																													
Vapor Irritant	3																												
Liquid or Solid Irritant	4																												
Toxicity	3																												
Water Pollution																													
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12.3 NFPA Hazard Classifications: <table> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	0	Reactivity (Yellow)	0	NOTES																				
Category	Classification																												
Health Hazard (Blue)	2																												
Flammability (Red)	0																												
Reactivity (Yellow)	0																												

REVISED 1978

NTX

NITRIC OXIDE

Common Synonyms Mononitrogen monoxide Nitrogen monoxide		Compressed gas Colorless Sharp unpleasant odor Reacts with water. Poisonous red brown vapor cloud is produced.
SAFETY DATA SHEET SECTION 1 - IDENTIFICATION SECTION 2 - HAZARDS SECTION 3 - COMPOSITION SECTION 4 - FIRST AID SECTION 5 - PREVENTION SECTION 6 - CONTROL SECTION 7 - PROTECTION SECTION 8 - STORAGE SECTION 9 - DISPOSAL SECTION 10 - INFORMATION		
Fire	Not flammable	
	VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat	
Exposure		
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Issue warning: poison, air contaminant Restrict access Evacuate area		2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Mononitrogen monoxide Nitrogen monoxide 3.2 Corrosion/Compatibility Classification: Not applicable 3.3 Chemical Formula: NO 3.4 IMCO/United Nations Numerical Designation: 2.1NF0		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Compressed gas 4.2 Color: Colorless, but becomes red brown on contact with air because of formation of nitrogen tetroxide 4.3 Odor: (nitrogen tetroxide) Pungent, acid, mildly irritating
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus or gas mask with universal canister 5.2 Symptoms Following Exposure: Continued inhalation of low concentrations causes chronic irritation, cough, headache, corrosion of teeth, loss of strength. Symptoms from overexposure to higher concentrations (which may be delayed for 6-24 hours) include irritation of nose and throat, tightness in chest, difficult breathing, pallor, loss of consciousness, and death. Pulmonary edema occurs. If patient recovers, pneumonia may develop. 5.3 Treatment for Exposure: Get medical attention at once following inhalation of this gas. INHALATION: If breathing has stopped, give artificial respiration with 100% oxygen, keep victim quiet and warm, keep head and chest lower than hips, to aid in drainage from lungs; alert physician to possibility of delayed pulmonary edema during 6-24 hours. 5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm 5.5 Short-Term Inhalation Limits: <100 ppm 60 min.; <150 ppm 30 min.; <200 ppm 15 min. 5.6 Toxicity by Ingestion: Not pertinent (gas at normal temperatures) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent (nonflammable compressed gas) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Supports combustion; small fires burn more vigorously 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Not pertinent 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts with water to form nitric acid. The reaction is not violent. 7.2 Reactivity with Common Materials: Reacts rapidly with air to form nitrogen tetroxide (see this compound) 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flood with water; mix with sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Matheson Gas Product P.O. Box 333 2400 Rutledge, N.J. 07073 2 Union Carbide Corporation Linde Division Morristown, N.J. 08652 3 Air Products and Chemicals, Inc. Specialty Gas Department P.O. Box 535 Allentown, Pa. 18105
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A (	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm. (Gas) 13.2 Molecular Weight: 30.0 13.3 Boiling Point at 1 atm: -241.1°F = -151.7°C = 121.5°K 13.4 Freezing Point: -262.1°F = -163.4°C = 109.8°K 13.5 Critical Temperature: 547°F = 453°C = 180°K 13.6 Critical Pressure: 940 psia = 64 atm = 6.5 MN/m ² 13.7 Specific Gravity: Not pertinent 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.5 (nitrogen dioxide) 13.11 Ratio of Specific Heats of Vapor (Gas) 1.400 at 15°C 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 25° Btu/lb = 143 cal/g = 598 kJ/kg 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous Class A 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 MFPA Hazard Classification: Not listed	(Continued on pages 5 and 6)
NOTES	

NAA

NITRILOTRIACETIC ACID AND SALTS

Common Synonyms Triglycine NTA Disodium nitriiotriacetate Trisodium nitriiotriacetate		Solid	White	Odorless
		Sinks and mixes with water		
Fire		Not flammable		
Exposure		DUST Irritating to eyes, nose and throat SOLID Irritating to skin and eyes ENVIRONMENTAL Slightly toxic to aquatic life in high concentrations		
Water Pollution		Dangerous to aquatic life in high concentrations May be dangerous for stream water intakes		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Disodium nitriiotriacetate, NTA, Triglycine, Trisodium nitriiotriacetate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_3H_5O_3N_3Na_2$, $C_3H_4O_3NNa$, $C_3H_4O_3N$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, rubber gloves, chemical safety goggles 5.2 Symptoms Following Exposure: Toxicity and health hazard of these compounds are low. Contact with eyes causes irritation. 5.3 Treatment for Exposure: EYES: flush with plenty of water, treat as mild alkaline irritant with boric acid solution, if eyes are irritated, get medical attention. SKIN: flush with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 g/kg; Disodium Grade 2 LD ₅₀ 2.2 g/kg (rats); Trisodium Grade 2 LD ₅₀ 4 g/kg (rats) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 340 ppm 24 hr guppy lethality, fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0% 5 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS W. R. Grace and Co. Hampshire Chemical Div. Pawson Avenue Nashua, N. H. 03061
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 99.5% in a water solution of trisodium salt containing 43% solids is also shipped 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) (Ved)H (Salt)SS	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: Acid 191; Disodium 253; Trisodium 275 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: >1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

NTA

2-NITROANILINE

Common Synonyms: o-Nitroaniline 1-Amino-2-nitrobenzene o-Nitroaniline Azo-Diazo Compound 6	Solid Orange Musty odor Sinks and mixes slowly with water
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause headache, dizziness, or loss of consciousness SOLID Irritating to skin and eyes If swallowed will cause headache, dizziness, nausea, vomiting or loss of consciousness HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
Water Pollution	
1 RESPONSE TO DISCHARGE See Response Methods Handbook (CG 446-4) Issue warning: poison water contaminant Restrict access Should be removed Chemical and physical treatment	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Amino-2-nitrobenzene Azo-Diazo Compound 6 o-Nitroaniline o-Nitroaniline, ONA 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_6H_6N_2O_2$ 3.4 IMCO/United Nations Numerical Designation: 6.1 160	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Orange 4.3 Odor: Musty
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, neoprene gauntlets, safety goggles, rubber or neoprene sealed tongue work shoes and apron, close weave cotton coveralls capable of closing at wrist and ankle 5.2 Symptoms Following Exposure: Inhalation or ingestion causes headache, nausea, methemoglobinemia, vomiting, weakness, and stupor; cyanosis caused by contact; usually develops in 4-6 hrs; prolonged and excessive exposures may also cause liver damage; Contact with eyes or skin causes irritation; continued exposure may cause same symptoms as inhalation or ingestion 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; administer oxygen if required; get medical attention; INFESTION: induce vomiting; get medical attention; Flush with water for at least 15 min; SKIN: flush with water; wash with soap and water; be careful to remove under fingernails; if in hair, wash hair 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1 120-250 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS

- 6.1 Flash Point: Not pertinent
 Combustible solid 3
 6.2 Flammable Limits in Air: Not pertinent
 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide
 6.4 Fire Extinguishing Agents Not to be Used:
 6.5 Special Hazards of Combustion Products:
 Toxic oxides of nitrogen may form in fire
 6.6 Behavior in Fire:
 6.7 Ignition Temperature: 470°F
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity:
 24 ppm * 48-hour threshold toxicity
 fresh water
 * Time period not specified
 8.2 Waterway Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD):
 Data not available
 8.4 Food Chain Concentration Potential:
 None

9. SELECTED MANUFACTURERS

1. American Aniline Products, Inc.
 Mount Vernon St.
 Lucas Haven, Pa. 17045
 2. Monsanto Company
 800 North Lindbergh Blvd.
 St. Louis, Mo. 63166
 3. Eastman Organic Chemicals
 Rochester, N.Y. 14650

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
 7.2 Reactivity with Common Materials:

 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
 7.5 Polymerization: Not pertinent
 7.6 Inhibitor of Polymerization:
 Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purities: Commercial 100%
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook (CG 446-3))
 II

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm:
 Solid
 13.2 Molecular Weight: 123.1
 13.3 Boiling Point at 1 atm:
 247°F = 244°C = 557°K
 13.4 Freezing Point:
 160°F = 71°C = 326°K
 13.5 Critical Temperature: Not pertinent
 13.6 Critical Pressure: Not pertinent
 13.7 Specific Gravity: 1.44 at 20°C (solid)
 13.8 Liquid Surface Tension: Not pertinent
 13.9 Liquid-Water Interfacial Tension:
 Not pertinent
 13.10 Vapor (Gas) Specific Gravity:
 Not pertinent
 13.11 Ratio of Specific Heats of Vapor (Gas):
 Not pertinent
 13.12 Latent Heat of Vaporization:
 Not pertinent
 13.13 Heat of Combustion: -10,000 Btu/lb
 = -5,540 cal/g = -232 x 10³ J/kg
 13.14 Heat of Decomposition: Not pertinent
 13.15 Heat of Solution: Not pertinent
 13.16 Heat of Polymerization: Not pertinent

(continued on pages 4 and 6)

NOTES

NAL

4-NITROANILINE

Common Synonyms p-Nitroaniline 1-Amino-4-nitrobenzene Arac Datas Component 37 Fast Red G base Fast Red G base PNA	Solid Yellow Mild Odor Insoluble in water
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Waxes, resins, and other materials may be produced in fire.
Exposure	ALL FOR MEDICAL USE DUST POISONOUS IF INHALED If inhaled will cause headache, coughing, difficult breathing, or loss of consciousness. SOLID Irritating to skin and eyes. If swallowed will cause headache, coughing, or loss of consciousness.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See "Emergency Response Procedures" CG 446-4) Issue warning: poison, water contaminant. Restrict access. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Amino-4-nitrobenzene, Arac Datas Component 37, Fast Red G base, Fast Red G base, p-Nitroaniline, PNA. 3.2 Coast Guard Competibility Classification: Not listed. 3.3 Chemical Formula: $C_6H_5NO_2$. 3.4 IM/O/United Nations Numerical Designation: 6.1 (601).	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Yellow. 4.3 Odor: Faint ammonia, slightly pungent.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Re: Mines duty, canister, rubber gloves, chemical safety goggles, face shield, rubber safety shoes. 5.2 Symptoms Following Exposure: Inhalation or ingestion causes headache, drowsiness, shortness of breath, nausea, methemoglobinemia, and unconsciousness. Fingernails, lips, and ears become bluish; prolonged and excessive exposures may also cause liver damage. Contact with eyes causes irritation and possible corneal damage. Contact with skin causes irritation; continued exposure may cause same symptoms as inhalation or ingestion. 5.3 Time to Act for Exposure: INHALATION: remove victim to fresh air, administer oxygen if received, get medical attention. INGESTION: induce vomiting, get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water, be sure that no compound remains in the hair or under the fingernails. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, LD ₅₀ 0.5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

- 6. FIRE HAZARDS**
- 6.1 **Flash Point:** 329°F (160°C) (molten solid).
 - 6.2 **Flammable Limits in Air:** Not pertinent.
 - 6.3 **Fire Extinguishing Agents:** Water, foam, dry chemical or carbon dioxide.
 - 6.4 **Fire Extinguishing Agents Not to be Used:**
 - 6.5 **Special Hazards of Combustion Products:** Toxic oxides of nitrogen may form in fire.
 - 6.6 **Behavior in Fire:** Melts and burns.
 - 6.7 **Ignition Temperature:** Data not available.
 - 6.8 **Electrical Hazard:** Not pertinent.
 - 6.9 **Burning Rate:** Not pertinent.

- 7. CHEMICAL REACTIVITY**
- 7.1 **Reactivity with Water:** No reaction.
 - 7.2 **Reactivity with Common Materials:**
 - 7.3 **Stability During Transport:** Stable.
 - 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
 - 7.5 **Polymerization:** Not pertinent.
 - 7.6 **Inhibitor of Polymerization:** Not pertinent.

- 8. WATER POLLUTION**
- 8.1 **Aquatic Toxicity:** 24 ppm * (daphnia) threshold toxicity fresh water.
*Time period not specified.
 - 8.2 **Waterfowl Toxicity:** Data not available.
 - 8.3 **Biological Oxygen Demand (BOD):** Data not available.
 - 8.4 **Food Chain Concentration Potential:** None.

- 9. SELECTED MANUFACTURERS**
- 1. Moehan & Company
800 North Lindbergh Blvd.
St. Louis, Mo. 63106.
 - 2. American Aniline Products, Inc.
Mount Vernon St.
Lock Haven, Pa. 17245.
 - 3. Eastman Organic Chemicals
Rochester, N.Y. 14650.

- 10. SHIPPING INFORMATION**
- 10.1 **Grade or Purity:** Technical 100%.
 - 10.2 **Storage Temperature:** Ambient.
 - 10.3 **Inert Atm. Sphere:** No requirement.
 - 10.4 **Venting:** Open.

- 11. HAZARD ASSESSMENT CODE**
(See "Hazard Assessment Handbook" CG 446-3)
11

- 12. HAZARD CLASSIFICATIONS**
- 12.1 **Code of Federal Regulations:** Poisonous solid, Class B.
 - 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.
 - 12.3 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	0

- 13. PHYSICAL AND CHEMICAL PROPERTIES**
- 13.1 **Physical State at 15°C and 1 atm:** Solid.
 - 13.2 **Molecular Weight:** 123.1.
 - 13.3 **Boiling Point at 1 atm:** 346°F = 176°C = 449°K.
 - 13.4 **Freezing Point:** 205°F = 146°C = 419°K.
 - 13.5 **Critical Temperature:** Not pertinent.
 - 13.6 **Critical Pressure:** Not pertinent.
 - 13.7 **Specific Gravity:** 1.44 at 20°C (solid).
 - 13.8 **Liquid Surface Tension:** Not pertinent.
 - 13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
 - 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
 - 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
 - 13.12 **Latent Heat of Vaporization:** Not pertinent.
 - 13.13 **Heat of Combustion:** -9,920 Btu/lb = -5,410 cal/g = -221 x 10³ J/kg.
 - 13.14 **Heat of Decomposition:** Not pertinent.
 - 13.15 **Heat of Solution:** Not pertinent.
 - 13.16 **Heat of Polymerization:** Not pertinent.

(continued on pages 5 and 6)

NOTES

NTB

NITROBENZENE

Common Synonyms: Nitrobenzol	Oils liquid. Light yellow to brown. Almond or shoe polish odor. Sinks in water. Freezing point is 41°F.
Fire	Combustible. POISONOUS VAPOR IS PRODUCED WHEN HEATED.
 Exposure	LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Will burn eyes.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-1. Issue warning: poison. Restrict access. Should be removed. Chemical and physical treatment.	2. LABEL 
3 CHEMICAL DESIGNATIONS 31 Synonyms: Essence of Mirbane. Nitrobenzol. Oil of Mirbane. 32 Coast Guard Compatibility Classification: Nitrocompounds. 33 Chemical Formula: C ₆ H ₅ NO. 34 IMCO United Nations Numerical Designation: 6.1-1662.	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid. 42 Color: Light greenish yellow. 43 Odor: Sweet, shoe polish.
5. HEALTH HAZARDS 51 Personal Protective Equipment: Respirator approved by U.S. Bureau of Mines for organic vapors; rubber gloves; splashproof goggles; eye wash fountain; safety shower; and medical oxygen supply. 52 Symptoms Following Exposure: If phosgene when absorbed through the skin, inhalation vapor swallowed. First symptoms are a blue discoloration of the face and skin. Swelling of the face produces headache, giddiness, weakness, nausea, vomiting and diarrhea. 53 Treatment for Exposure: Remove to fresh air and call physician at once. In case of small amount, flush with copious amounts of water for at least 15 min. If vomiting (blue foam) is present, follow with copious and warm water, with special attention to stomach and large intestine. Administer oxygen until physician arrives. 54 Toxicity by Inhalation (Threshold Limit Value): 1 ppm. 55 Short-Term Inhalation Limits: 10 ppm for 15 min. 56 Toxicity by Ingestion: Grade 3. Moderate toxicity. 57 Late Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating to the skin but perfume will not usually irritate mucous membranes at concentrations. 59 Liquid or Solid Irritant Characteristics: Causes smarting on the skin and first degree burns on short exposure; may cause secondary burns on long exposure. 510 Odor Threshold: 1.94 ppm.	

6 FIRE HAZARDS 61 Flash Point: 171°F (77°C) (190°F (88°C)) 62 Flammable Limits in Air: 1.4-11.1 (LFL not available) 63 Fire Extinguishing Agents: Water, foam, carbon dioxide or dry chemical. 64 Fire Extinguishing Agents Not to be Used: Not pertinent. 65 Special Hazards of Combustion Products: Not pertinent. 66 Behavior in Fire: Not pertinent. 67 Ignition Temperature: 924°F. 68 Electrical Hazard: Not pertinent. 69 Burning Rate: 2.9 mm/min.	8 WATER POLLUTION 81 Aquatic Toxicity: 20 ppm 6-hr. minimum lethal, fresh water. 82 Waterfowl Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): 0% in 5 days. 84 Food Chain Concentration Potential: None.																										
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: No reaction. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Not pertinent. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS American Cyanamid Co. Organic Chemical Division Bound Brook, N.J. 08805 2. E. I. du Pont de Nemours & Co., Inc. Explosives Dept. Wilmington, Del. 19880 3. First Chemical Corp. 606 North State St. Jackson, Miss. 39201																										
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3. 000	10 SHIPPING INFORMATION 101 Grades or Purity: Technical, 99.5-100%. 102 Storage Temperature: Ambient. 103 Inert Atmosphere: No requirement. 104 Venting: Open flame arresters.																										
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Poisonous liquid, Class B. 122 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="930 1470 1169 1736"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Water Pollution</td><td>1</td></tr> <tr> <td>Human Toxicity</td><td>3</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Volatility Effect</td><td>4</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>1</td></tr> </tbody> </table> 123 NFPA Hazard Classifications: <table data-bbox="930 1769 1169 1847"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Water Pollution	1	Human Toxicity	3	Aquatic Toxicity	2	Volatility Effect	4	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid. 132 Molecular Weight: 123.11. 133 Boiling Point at 1 atm: 411.6°F = 210.9°C = 484.1°K. 134 Freezing Point: 41.2°F = 5.1°C = 278.1°K. 135 Critical Temperature: 547°F = 287°C = 720°K. 136 Critical Pressure: 50.9 atm = 47.62 atm = 4,824 MN/m ² . 137 Specific Gravity: 1.204 at 20°C (liquid). 138 Liquid Surface Tension: 43.9 dynes/cm = 0.0439 N/m at 20°C. 139 Liquid-Water Interfacial Tension: 25.66 dynes/cm = 0.02566 N/m at 20°C. 140 Vapor (Gas) Specific Gravity: Not pertinent. 141 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 142 Latent Heat of Vaporization: 150 Btu/lb = 35.21 kJ/g = 3.521 x 10 ³ J/kg. 143 Heat of Combustion: -10,450 Btu/lb = -24,200 kJ/kg = -24,200 x 10 ³ J/kg. 144 Heat of Decomposition: Not pertinent. 145 Heat of Solution: Not pertinent. 146 Heat of Polymerization: Not pertinent.
Category	Rating																										
Water Pollution	1																										
Human Toxicity	3																										
Aquatic Toxicity	2																										
Volatility Effect	4																										
Reactivity																											
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Flammability (Red)	2																										
Reactivity (Yellow)	0																										
NOTES (continued on page 2 of 2)																											

REVISED 1978

NTE

NITROETHANE

Common Synonyms		Liquid	Colorless	Fruity Odor
		May float or sink in water		
Fire		Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.		
Exposure		VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. Toxic to shoreline. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning: high flammability. Restrict access. Disperse and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: CH_3CHNO 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Mild, fruity, somewhat disagreeable, acetone-like.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Supplied air or self-contained respiratory, goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes moderate irritation of respiratory tract. Ingestion causes irritation of mouth and stomach. Contact with liquid causes irritation of eyes and mild irritation of skin. 5.3 Treatment for Exposure: INHALATION: in case of pulmonary symptoms, give bed rest and oxygen; obtain medical attention at once. INGESTION: give large amount of water. EYES: wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral LD_{50} (mice) 1.5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irrit. even such that personnel with first high concentration unpleasant. The effect is respiratory. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause irritating and reddening of skin. 5.10 Odor Threshold: 100 ppm.				

6 FIRE HAZARDS

- 6.1 Flash Point: 105°F (40.5°C) (CC)
- 6.2 Flammable Limits in Air: 1.4 - 11.1%
- 6.3 Fire Extinguishing Agents: foam, carbon dioxide, or dry chemical
- 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective; foam may be ineffective.
- 6.5 Special Hazards of Combustion Products: Toxic oxides; nitrogen may form nitric
- 6.6 Behavior in Fire:
- 6.7 Ignition Temperature: 775°F
- 6.8 Electrical Hazard: Data not available
- 6.9 Burning Rate: Data not available

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Invertebrate Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

- Commercial Solvents Corp.
245 Park Avenue
New York, N.Y. 10017
- Andrich Chemical
400 W. Saint Paul Ave.
Milwaukee, Wis. 53219
- Platt and Bauer, Inc.
475 Fairfield Ave.
Stamford, Conn. 06902

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials: May attack some forms of plastics
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Commercial 99.5%
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open flame arresters

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3
A P O T I A

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable liquid
- 12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Fire | 1 |
| Health | 1 |
| Vapor Irritant | 2 |
| Liquid or Solid Irritant | 1 |
| Poisons | 1 |
| Water Pollution | 1 |
| Harmful Toxicity | 2 |
| Aquatic Toxicity | 2 |
| Acute Effect | 2 |
| Reactivity | 1 |
| Other Chemicals | 1 |
| Water | 1 |
| Self Reaction | 1 |
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 1 |
| Reactivity (Yellow) | 1 |

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
- 13.2 Molecular Weight: 73.07
- 13.3 Boiling Point at 1 atm: 27.1°C (80.8°F)
- 13.4 Freezing Point: -107.4°C (-161.3°F)
- 13.5 Critical Temperature: Data not available
- 13.6 Critical Pressure: Data not available
- 13.7 Specific Gravity: 1.04 at 20°C (liquids)
- 13.8 Liquid Surface Tension: 27.1 dynes/cm at 20°C (liquids)
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: 2.6
- 13.11 Ratio of Specific Heats of Vapor (Gas): 1.115 at 20°C
- 13.12 Latent Heat of Vaporization: 2.1 Btu/lb = 4.94 kJ/kg
- 13.13 Heat of Combustion: -1720 Btu/lb = -4.26 kJ/g = -14.6 kJ/mol
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

NOTES

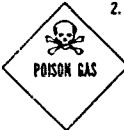
NXX

NITROGEN, LIQUEFIED

Common Synonyms		Liquefied gas	Colorless	Odorless
		Floats and boils on water		
Fire		Not flammable		
Exposure		VAPOR Not harmful In high concentrations may cause dizziness, difficult breathing, or loss of consciousness LIQUID Will cause frostbite		
Water Pollution		Not harmful to aquatic life		
1 RESPONSE TO DISCHARGE		2 LABEL		
See Response Material Handbook, CG 445.4 Refrigerant				
3 CHEMICAL DESIGNATIONS		4 OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: Liquid nitrogen		4.1 Physical State (as shipped): Liquefied gas		
3.2 Coast Guard Compatibility Classification: Not applicable		4.2 Color: Colorless, color of steel		
3.3 Chemical Formula: N ₂		4.3 Odor: None		
3.4 IMCO/United Nations Numerical Designation: N/A				
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Safety glasses or face shield, insulated gloves, heavy boots, heavy pants, hood or over head protection, shoe and hand protection, and head breathing apparatus where area temperature is low				
5.2 Symptoms Following Exposure: Inhalation: anoxia, asphyxiation, if a membrane does not contain oxygen; dizziness, unconsciousness, severe frostbite, and death if contact of liquid with skin or mucous membranes occurs; frostbite				
5.3 Treatment for Exposure: INHALATION: remove person from exposure and give respiration. If breathing has stopped call physician. EYES: treat as frostbite; flush with liquid water. SKIN: treat as frostbite; wash with lukewarm water				
5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent				
5.5 Short-Term Inhalation Limits: Not pertinent				
5.6 Toxicity by Ingestion: Not pertinent				
5.7 Oral Toxicity: None				
5.8 Vapor (Gas) Irritant Characteristics: None				
5.9 Liquid or Solid Irritant Characteristics: Frostbite				
5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent nonflammable compressed gas 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Contains liquid which may explode when heated 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Heat of water will vigorously vaporize liquid nitrogen 7.2 Reactivity with Common Materials: No chemical reaction. Low temperature may cause brittleness in rubber and plastic 7.3 Stability During Transport: None 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Liquid Carbonic Corporation Liquid Division MacArthur, N. J. 07033 2. Airco, Inc. 375 Mountain Ave. Murray Hill, N. J. 07974 3. Liquid Carbonic Corporation 1555 LaSalle Street Chicago, IL 60607
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 445.3 N.E. 2014	10. SHIPPING INFORMATION 10.1 Grades or Purity: none 10.2 Storage Temperature: -196°C 10.3 Inert Atmosphere: Not required 10.4 Venting: none
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not pertinent. Not compressed gas 12.2 NAS Hazard Rating for Bulk Water Transportation: Not used 12.3 NFPA Hazard Classifications: Not used	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 28.0 13.3 Boiling Point at 1 atm: -195.8°C (-320.4°F) 13.4 Freezing Point: -210°C (-346°F) 13.5 Critical Temperature: -146.9°C (-232.4°F) 13.6 Critical Pressure: 33.5 atm (3350 kPa or 486.9 psi) 13.7 Specific Gravity: 0.808 (at 15°C and 1 atm) 13.8 Liquid Surface Tension: 0.014 dynes/cm (at 15°C and 1 atm) 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 0.808 13.11 Rate of Specific Heats of Vapor (Gas): none 13.12 Latent Heat of Vaporization: 199.1 kJ/kg (44.9 Btu/lb) 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Continued on pages 7 and 8 NOTES	

NOX	NITROGEN TETROXIDE
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Common Synonyms Nitrogen peroxide Nitrogen dioxide Red oxide of nitrogen Oxides of nitrogen Dinitrogen tetroxide	Liquefied compressed gas Red-brown Sharp unpleasant chemical odor Sinks and reacts with water. Poisonous brown vapor is produced.
AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away from gaseous or liquid material breathing apparatus and full body protective clothing (including a SCBA). Notify fire department if large fire occurs. Notify local health and pollution control authorities.	
Fire	Not flammable. May cause fire and explode on contact with combustible. POISONOUS GASES ARE PRODUCED IN FIRE AND WHEN HEATED. Wear goggles, self-contained breathing apparatus and full body protective clothing in fire. Do not direct water stream with water. Stop flow of gas if liquid. Do not use water on fires with water.
 Exposure	CALL FOR MEDICAL AID. VAPOR POISONOUS IF INHALED. Irritating to eyes. May cause blindness. If in eyes, flush with plenty of water. If in mouth, do not swallow. Rinse with water. LIQUID Will burn skin and eyes. POISONOUS IF SWALLOWED. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, give first aid as recommended for acids and alkalis. DO NOT INDUCE VOMITING.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Notify local health and pollution authorities. Notify port and coastal authorities.
1. RESPONSE TO DISCHARGE (See Response Methods Manual, U.S. 446-41) Toxic warning, poison or contaminant, water contamination, corrosive. Restrict access. Evacuate area.	2. LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dinitrogen tetroxide, Nitrogen peroxide, Nitrogen dioxide, Oxide of nitrogen, Red oxide of nitrogen. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: N₂O₄. 3.4 IMCO/United Nations Numerical Designation: 2.1067.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Red-brown at ambient temperatures, colorless below about 14°F. 4.3 Odor: Pungent, acid, mildly irritating.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, safety goggles and face shield, protective clothing, acid gas, mist respirator or self-contained breathing apparatus. 5.2 Symptoms Following Exposure: Very concentrated fumes produce coughing, choking, headache, nausea, pain in chest and abdomen; otherwise, few symptoms appear at time of exposure. After symptoms free period of 5-72 hours, pulmonary edema gradually develops, causing fatigue, restlessness, coughing, difficulty in breathing, frothy expectoration, mental confusion, labored, bluish skin and weak, rapid pulse. Since NOX interferes with gas exchange in lungs, unconsciousness and death by asphyxiation can result, usually within a few hours after onset of pulmonary edema. 5.3 Treatment for Exposure: INHALATION: remove patient to fresh air and have him breathe as deeply as possible until a doctor enforces complete rest for 24-48 hours. Keep warm, give oxygen, coughing of mucus may administer morphine (10 mg.). EYES AND SKIN: flush with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm. 5.5 Short-Term Inhalation Limits: 25 ppm for 5 min. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third degree burns on skin contact and is very injurious to the eyes. 5.10 Odor Threshold: 5 ppm.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Stop flow of gas. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Produces toxic gas when heated. 6.6 Behavior in Fire: Does not burn, but supports combustion of combustible materials, such as wood. May cause fire or explosion on contact with other materials. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Not flammable.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 72 ppm/96 hr. toxic to fish. 11 mg. fresh water. 130-1,000 ppm. 48 hr. toxic to LC₅₀ salt water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Dissolves to form nitric acid and nitrous oxide. Nitric oxide reacts with air to form more nitrogen tetroxide. 7.2 Reactivity with Common Materials: Very corrosive to metals when wet. Reacts vigorously with combustible materials, such as wood. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, then use soda ash or lime. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.																																					
9. SELECTED MANUFACTURERS Hercules Inc. Explosives and Chemical Propulsion Dept. Hercules Co. 194547																																					
10. SHIPPING INFORMATION 10.1 Grades or Purity: 10.2 Storage Temperature, Ambient: Storage and transfer structures shall be equipped with mechanical ventilation systems. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure relief valves on containers.																																					
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG-46-3) A110	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid or gas. 13.2 Molecular Weight: 92.02. 13.3 Boiling Point at 1 atm: 79.7°F = 21.2°C = 294 K. 13.4 Freezing Point: 11.4°F = -11.2°C = 262°K. 13.5 Critical Temperature: 317.0°F = 158.2°C = 431.4°K. 13.6 Critical Pressure: 1470 psia = 107 atm = 10.7 MN/m². 13.7 Specific Gravity: 1.45 at 20°C (liquids). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 3.2. 13.11 Ratio of Specific Heats of Vapor (Gas): (test value). 13.12 Latent Heat of Vaporization: 178 Btu/lb = 99.1 cal/g = 4.15 x 10³ J/kg. 13.13 Heat of Combustion: Not applicable. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous gas or liquid, Class A. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>4</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td> Poisons</td><td>4</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>3</td></tr> <tr> <td> Aquatic Toxicity</td><td></td></tr> <tr> <td> Aesthetic Effect</td><td>3</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>4</td></tr> <tr> <td> Water</td><td>2</td></tr> <tr> <td> Self React</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>		Category	Rating	Fire	1	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	4	Water Pollution		Human Toxicity	3	Aquatic Toxicity		Aesthetic Effect	3	Reactivity		Other Chemicals	4	Water	2	Self React	0	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	0
Category	Rating																																				
Fire	1																																				
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Flammability (Red)	0																																				
Reactivity (Yellow)	0																																				
NOTES																																					

NMT

NITROMETHANE

Common Synonyms Nitrocarbol	Waters Insol. Colorless Strong odor Sinks and mixes slowly with water. Irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Exposure VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. LIQUID No appreciable harm to skin or eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. 1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Dispose and flush.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Nitrocarbol 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CH_3NO_2 3.4 IMCO/United Nations Numerical Designation: 1.1 (26)	2. LABEL 
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Air mask (do NOT use organic canisters); goggles. 5.2 Symptoms Following Exposure: Liquid may dry out skin and cause irritation. 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 (Do NOT swallow; kg trait). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Less than 200 ppm.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Fairly strong characteristic.

6 FIRE HAZARDS 6.1 Flash Point: 110°F (40.95°C) 6.2 Flammable Limits in Air: 7.3% (LFL) 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Containers may explode. 6.7 Ignition Temperature: 785°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 1.1 mm/min.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Water-bowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Wet material corrodes steel and copper, but the reaction is slow. 7.3 Stability During Transport: Considered stable, but may become sensitized by organic bases (amines) and some metal oxides, such as lead pigments. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS Commercial Solvents Corp. 245 Park Ave. New York, N.Y. 10017.								
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) VAPORS 12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>3</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	3	10. SHIPPING INFORMATION 10.1 Grades or Purity: 95.99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open or pressure vacuum 13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 61.04 13.3 Boiling Point at 1 atm: 24.2°F = 101.2°C = 374.4°K 13.4 Freezing Point: -11°F = -23°C = 244°K 13.5 Critical Temperature: 560°F = 315°C = 588°K 13.6 Critical Pressure: 915.5 psia = 62.4 atm = 6.071 MN/m ² 13.7 Specific Gravity: 1.1 (at 20° (liquid)) 13.8 Liquid Surface Tension: 37.3 dynes/cm = 0.0373 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.175 13.12 Latent Heat of Vaporization: 241 Btu/lb = 134 cal/g = 561 X 10 ³ J/kg 13.13 Heat of Combustion: -1411 Btu/lb = -2517 cal/g = -105.4 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Heat of solution = -9 Btu/lb = -5 cal/g = -0.2 X 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent.
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	3								
Reactivity (Yellow)	3								
NOTES									

NTP

2-NITROPHENOL

Common Synonyms o-Nitrophenol 2-Hydroxynitrobenzene ONP	
Solid	Yellow
Sinks and mixes slowly with water	
1. HAZARD IDENTIFICATION 2. HAZARD STATEMENT 3. HAZARD PICTURE	
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	4. HAZARD IDENTIFICATION 5. HAZARD STATEMENT 6. HAZARD PICTURE
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intake
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Toxic warning - water contaminant Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Hydroxynitrobenzene o-Nitrophenol ONP 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_6H_5NO_2$ 3.4 IMCO/United Nations Numerical Designation: 6.1 1663	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow 4.3 Odor: Peculiar aromatic
5. HEALTH HAZARDS	
5.1 Personal Protective Equipment: Self-contained breathing apparatus, gloves, rubber gloves, goggles 5.2 Symptoms Following Exposure: Inhalation or ingestion causes headache, drowsiness, nausea and blue color in lips, ears, and fingernails (cyanosis). Contact with eyes causes irritation. Can be absorbed through the intact skin to give same symptoms as for inhalation. 5.3 Treatment for Exposure, INHALATION or INGESTION: remove victim to fresh air, give artificial respiration if needed or if symptoms persist. EYES: flush with water for at least 15 min., get medical attention. SKIN: cleanse thoroughly with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral LD₅₀ = 1,297 mg/kg rats 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS	
6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Toxic and irritating fumes of unburned material and oxides of nitrogen can form in fire. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	
7. CHEMICAL REACTIVITY	
7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	
8. WATER POLLUTION	
8.1 Aquatic Toxicity: 46.3 NT6 ppm, 48 hr, bluegill, 11 m, fresh water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 4.2 m 0.94 days, acclimated culture 8.4 Food Chain Concentration Potential: None	
9. SELECTED MANUFACTURERS	
1. Monsanto Company 800 North Lindbergh Blvd St. Louis, MO 63166 2. J. I. Baker Chemical Co. Phillipsburg, N.J. 08865 3. Eastman Organic Chemicals Rochester, N.Y. 14650	
10. SHIPPING INFORMATION	
10.1 Grades or Purities: Commercial Pure 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	
11. HAZARD ASSESSMENT CODE	
(See Hazard Assessment Handbook, CG 446-3) II	
12. HAZARD CLASSIFICATIONS	
12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
13. PHYSICAL AND CHEMICAL PROPERTIES	
13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 139.1 13.3 Boiling Point at 1 atm: 417°F = 215°C = 457°K 13.4 Freezing Point: 111°F = 44°C = 313°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.49 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -8,910 Btu/lb = -4,950 cal/g = -207 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
NOTES	

NPP

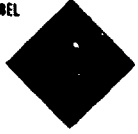
2-NITROPROPANE

Common Synonyms Isopropyl nitrate 2-NP sec-Nitropropane	Liquid Colorless Mild, fruity odor May float or sink in water
Fire	Combustible Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Extinguish with dry chemical or foam Water may cause more fire if the liquid is released in a pool with water
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat If inhaled will cause headache, dizziness, coughing, or difficult breathing If swallowed, do not induce vomiting. Flush with plenty of water. If swallowed, do not induce vomiting. If unconscious or having convulsions, do not induce vomiting. LIQUID Irritating to skin and eyes If swallowed will cause nausea and vomiting If swallowed, do not induce vomiting. Flush with plenty of water. If swallowed, do not induce vomiting. If unconscious or having convulsions, do not induce vomiting. If swallowed, do not induce vomiting. If unconscious or having convulsions, do not induce vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Do not discharge into water
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Use warning of high flammability Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Isopropyl nitrate sec-Nitropropane 2-NP 3.2 Coast Guard Compatibility Classification: Nitrocompound 3.3 Chemical Formula: <chem>CH3CH(NO2)CH3</chem> 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild, fruity
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Inhalation causes respiratory tract irritation, headache, dizziness, nausea, and diarrhea. Ingestion causes irritation of mouth and stomach. Contact with liquid irritates eyes and causes mild irritation of skin. 5.3 Treatment for Exposure: INHALATION: In case of pulmonary symptoms, enforce rest and give oxygen. Get medical attention at once. INGESTION: Give plenty of water and induce vomiting. SKIN: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral rat LD ₅₀ = 7,000 mg/kg 5.7 Late Toxicity: Causes liver cancer in rats 5.8 vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system. Present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of skin. 5.10 Odor Threshold: 100 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 100°F (38°C) 82°F (28°C) 6.2 Flammable Limits in Air: 2.6% (LFL) 6.3 Fire Extinguishing Agents: Foam dries chemical carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Alcohol. Foam water may be ineffective 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: 692°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Commercial Solvents Corp. 245 Park Avenue New York, N.Y. 10017 2. Aldrich Chemical Co. 440 W. Saint Paul Ave. Milwaukee, Wis. 53233 3. Eastman Organic Chemicals Rochester, N.Y. 14650																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) APQT-XX	10. SHIPPING INFORMATION 10.1 Grade or Purity: Technical 94+9 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)																																				
12. HAZARD CLASSIFICATION 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poisons</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td>2</td> </tr> <tr> <td>Human Toxicity</td> <td>2</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>3</td> </tr> <tr> <td>Other Chemicals</td> <td>3</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self-Reaction</td> <td>4</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>3</td> </tr> </tbody> </table>	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	1	Water Pollution	2	Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity	3	Other Chemicals	3	Water	0	Self-Reaction	4	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	3	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 89.09 13.3 Boiling Point at 1 atm: 24.5°C = 76.1°F = 297.5°K 13.4 Freezing Point: -132°F = -91°C = 182°K 13.5 Critical Temperature: Data not available 13.6 Critical Pressure: Data not available 13.7 Specific Gravity: 0.99 at 20°C (liquids) 13.8 Liquid Surface Tension: 30 dynes/cm = 0.030 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: 0.96 at 16°C 13.11 Ratio of Specific Heats of Vapor (Gas): 1.09 at 20°C 13.12 Latent Heat of Vaporization: 178 Btu/lb = 99 cal/g = 4.1 × 10 ⁵ J/kg 13.13 Heat of Combustion: -9,650 Btu/lb = -224 × 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	1																																				
Health	1																																				
Vapor Irritant	1																																				
Liquid or Solid Irritant	1																																				
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Health Hazard (Blue)	1																																				
Flammability (Red)	2																																				
Reactivity (Yellow)	3																																				
NOTES Continued on page 5 and 6																																					

NTC

NITROSYL CHLORIDE

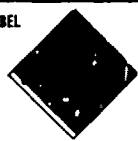
Common Synonyms	
Liquefied compressed gas Orange red Choking odor	
Liquid sinks and reacts with water. Poisonous visible vapor cloud is produced.	
Fire Not flammable POISONOUS GASES ARE PRODUCED WHEN HEATED	
Exposure VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED Irritating to eyes LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to eyes	
Water Pollution HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446.4) Issue warning: poison Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Nitrosyl chloride 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: NOCl 3.4 IMCO-United Nations Numerical Designation: 20 1049	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied gas 4.2 Color: Yellow to red 4.3 Odor: Irritating, choking
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus approved mask may be used for short exposures only; rubberized clothing, gloves, shoes, chemical goggles. 5.2 Symptoms Following Exposure: Gas is highly toxic. Inhalation causes severe irritation of respiratory tract and damage to mucous membranes. Delayed effects, which include severe pulmonary edema, may not be apparent for several hours. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; call a doctor; enforce complete rest until doctor arrives; on gas, at least 24 hours; delayed effects. SKIN OR EYES: Flush with water for at least 15 min; consult physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm (recommended) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe burns to eyes and skin. 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Very toxic gases are generated when heated 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Dissolves and reacts to form acid solution and to various oxides of nitrogen 7.2 Reactivity with Common Materials: Corrosive to most metals but reaction is not hazardous 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water. Residual acid may be neutralized with weak alkali 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	
8. AIR POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	
9. SELECTED MANUFACTURERS 1. Air Products and Chemicals Inc. Specialty Gas Dept. 71 West Broad St. Emmatus, Pa. 16049 2. Hercules Inc. Explosives & Chemical Propulsion Dept. Hercules Plant 9454	
10. SHIPPING INFORMATION 10.1 Grades or Purity: 97% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief	
11. HAZARD ASSESSMENT (See Hazard Assessment Handbook CG 446.3) A C O	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Nonflammable compressed gas 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 65.46 13.3 Boiling Point at 1 atm: 21.6°F = -5.5°C = 267.4 K 13.4 Freezing Point: -74°F = -59°C = 214 K 13.5 Critical Temperature: 332°F = 165°C = 441 K 13.6 Critical Pressure: 1300 psia = 90 atm = 9.1 MN/m ² 13.7 Specific Gravity: 1.36 at -5°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 2.3 13.11 Ratio of Specific Heats of Vapor (Gas): 1.229 13.12 Latent Heat of Vaporization: 664 Btu/lb = 920 cal/g = 3.81 x 10 ³ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
NOTES	

REVISED 1978

NTO

NITROUS OXIDE

Common Synonyms Laughing gas Dinitrogen monoxide		Liquefied compressed gas. Colorless. Odorless or mild sweet odor. Sinks and boils in water. Visible vapor cloud is produced.
Fire		Not flammable but will intensify fires.
Exposure		VAPOR If inhaled will cause dizziness, difficult breathing or loss of consciousness. LIQUID Will cause frostbite.
Water Pollution		Not harmful to aquatic life.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Restrict access.		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dinitrogen monoxide, laughing gas. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: N_2O . 3.4 IMCO/United Nations Numerical Designation: 2.1070.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied compressed gas. 4.2 Color: Colorless. 4.3 Odor: None, slightly sweetish.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus for high vapor concentrations. 5.2 Symptoms Following Exposure: Inhalation causes intense analgesia; concentrations of over 40-60% cause loss of consciousness preceded by hysteria. Contact of liquid with eyes or skin causes frostbite burn. 5.3 Treatment for Exposure: INHALATION: remove to fresh air. EYES: get medical attention for frostbite burn. SKIN: treat frostbite burn; soak in lukewarm water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: 50,000 ppm for 10 min. 5.6 Toxicity by Ingestion: Grade 0 LD ₅₀ > 1 g/kg. 5.7 Late Toxicity: Causes birth defects in rats; can cause lethal effects in chick eggs. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard; practically harmless to the skin. 5.10 Odor Threshold: Data not available.		

6 FIRE HAZARDS

6.1 **Flash Point:** Not pertinent
(nonflammable compressed gas)

6.2 **Flammable Limits in Air:** Not pertinent

6.3 **Fire Extinguishing Agents:** Not pertinent

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Not pertinent

6.6 **Behavior in Fire:** Will support combustion and may increase intensity of fire
(containers may explode when heated)

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** None

8.2 **Waterlow Toxicity:** None

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** None

7. CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** No reaction

7.2 **Reactivity with Common Materials:**
Supports combustion but does not cause spontaneous ignition

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibits of Polymerization:** Not pertinent

9 SELECTED MANUFACTURERS

1. Matheson Gas Products
P.O. Box 55
East Rutherford, N.J. 07073

2. Arco Incorporated
Ohio Medical Products Division
9050 Arco Drive
Madison, Wis. 53701

3. Air Products and Chemicals, Inc.
Specialty Gas Department
P.O. Box 518
Allentown, Pa. 18105

10 SHIPPING INFORMATION

10.1 **Grades or Purity:** 99.0+

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** No requirement

10.4 **Venting:** Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
N.C.I.

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Nonflammable compressed gas

12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	0
Health	0
Vapor Irritant	1
Liquid or Solid Irritant	0
Poisons	0
Water Pollution	0
Human Toxicity	0
Aquatic Toxicity	0
Acute Effect	0
Reactivity	0
Other Chemicals	0
Water	0
Self Reaction	0

12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Gas

13.2 **Molecular Weight:** 44.0

13.3 **Boiling Point at 1 atm:**
-120.1°C = -89.5°C = 183.1°K

13.4 **Freezing Point:**
-111.5°C = -89.5°C = 182.1°K

13.5 **Critical Temperature:**
36.5°C = 97.7°C = 320°K

13.6 **Critical Pressure:**
1054 psia = 1.7 atm = 7.25 MN/m²

13.7 **Specific Gravity:** 1.206 at -89°C (liquid)

13.8 **Liquid Surface Tension:**
16.1 dynes/cm = 0.0101 N/m at -25°C

13.9 **Liquid-Water Interfacial Tension:**
Data not available

13.10 **Vapor (Gas) Specific Gravity:** 1.53

13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.303 at 25°C

13.12 **Latent Heat of Vaporization:** 161.7 Btu/lb = 89.4 cal/g = 3.76 × 10³ J/kg

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

(Continued on page 5 and 6)

NOTES

NAN

NONANE

Common Synonyms n-Nonane		Liquid Floats on water	Colorless Gasoline-like odor
Fire	Combustible		
Exposure	LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting		
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4.) Mech = at environment Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: n-Nonane 3.2 Coast Guard Compatibility Classification: Paraffin 3.3 Chemical Formula: C ₉ H ₂₀ 3.4 IMCO/United Nations Numerical Designation: 1.1 (1929)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like gasoline	
5. HEALTH HAZARDS			
5.1 Personal Protective Equipment: Self-contained breathing apparatus for high vapor concentrations; goggles or face shield; rubber gloves			
5.2 Symptoms Following Exposure: Inhalation of concentrated vapor causes depression, irritation of respiratory tract, and pulmonary edema. Liquid can irritate eyes and (on prolonged contact) skin. Ingestion causes irritation of mouth and stomach. Aspiration causes severe lung irritation, rapidly developing pulmonary edema, and central nervous system excitement followed by depression			
5.3 Treatment for Exposure: INHALATION: remove victim from exposure; give artificial respiration if needed. EYES: irrigate with large amounts of water for 15 min. SKIN: flush with water; wash with soap and water. INGESTION: do NOT induce vomiting; call physician. ASPIRATION: encourage breathing; give oxygen; get medical attention			
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available			
5.5 Short Term Inhalation (L ₅₀): Data not available			
5.6 Toxicity by Ingestion (Grade 0 LD ₅₀): 1.5 g/kg			
5.7 Late Toxicity: Data not available			
5.8 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to eyes and throat			
5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin			
5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: 88°F (31°C)	8.1	Aquatic Toxicity: Data not available
6.2	Flammable Limits in Air: 0.8% - 2.9%	8.2	Waterflow Toxicity: Data not available
6.3	Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide	8.3	Biological Oxygen Demand (BOD): 1.1 g/day
6.4	Fire Extinguishing Agents Not to be Used: Water may be ineffective	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: Not pertinent	9. SELECTED MANUFACTURERS	
6.6	Behavior in Fire: Not pertinent	1. Phillips Petroleum Company, Chemical Department, Special Products Division, Bartlesville, OK 74004	
6.7	Ignition Temperature: 401°F	2. The Humphrey Chemical Company, Duxbury, MA 01929	
6.8	Electrical Hazard: Class I, Group D	3. Eastman Kodak Co., Eastman Organic Chemicals, Rochester, NY 14650	
6.9	Burning Rate: 5.5 mm/min		
7 CHEMICAL REACTIVITY			
7.1	Reactivity with Water: No reaction	10 SHIPPING INFORMATION	
7.2	Reactivity with Common Materials: No reaction	10.1 Grades or Purity: Research Pure, Technical 99.5%+	
7.3	Stability During Transport: Stable	10.2 Storage Temperature: Ambient	
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent	10.3 Inert Atmosphere: No requirements	
7.5	Polymerization: Not pertinent	10.4 Venting: Open flame arresters	
7.6	Inhibitor of Polymerization: Not pertinent		
11 HAZARD ASSESSMENT CODE		11 PHYSICAL AND CHEMICAL PROPERTIES	
(See Hazard Assessment Handbook, CG 446.5.) A 1.1		13.1 Physical State at 15°C and 1 atm: Liquid	
		13.2 Molecular Weight: 128.3	
		13.3 Boiling Point at 1 atm: 144°F = 62°C = 314 K	
		13.4 Freezing Point: -64.3°F = -53.5°C = 219.7 K	
		13.5 Critical Temperature: 610.4°F = 321.4°C = 594.6 K	
		13.6 Critical Pressure: 335 psia = 22.5 atm = 2.31 MPa	
		13.7 Specific Gravity: 0.718 at 20°C (liquid)	
		13.8 Liquid Surface Tension: 22.9 dynes/cm = 0.0229 N/m at 20°C	
		13.9 Liquid-Water Interfacial Tension: 18.1 dynes/cm = 0.0181 N/m at 20°C	
		13.10 Vapor (Gas) Specific Gravity: 4.4	
		13.11 Ratio of Specific Heats of Vapor (Gas): 0.42 at 16°C	
		13.12 Latent Heat of Vaporization: 127 Btu/lb = 70 kcal/kg = 295 kJ/kg	
		13.13 Heat of Combustion: -14,067 Btu/lb = -10,593 kcal/kg = -44,270 kJ/kg	
		13.14 Heat of Decomposition: Not pertinent	
		13.15 Heat of Solution: Not pertinent	
		13.16 Heat of Polymerization: Not pertinent	
12 HAZARD CLASSIFICATIONS			
12.1	Code of Federal Regulations: Not used		
12.2	NAS Hazard Rating for Bulk Water Transportation		
	Category Rating		
	Fire		
	Health		
	Vapor Irritant		
	Liquid or Solid Irritant		
	Poisons		
	Water Pollution		
	Human Toxicity		
	Aquatic Toxicity		
	Acute Effects		
	Reactivity		
	Other Chemicals		
	Water		
	Self-Reaction		
12.3	NFPA Hazard Classifications		
	Category Classification		
	Health Hazard (Blue)		
	Flammability (Red)		
	Reactivity (Yellow)		
		(continued on pages 5 and 6)	
NOTES			

NNN

NONANOL

Common Synonyms: 1-Nonanol Nonyl alcohol Octylcarbinol	Liquid Colorless Rose or fruity odor Floats on water. Freezing point is 23°F.
Fire	Combustible
Exposure	LIQUID Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 146-4. Mechanical containment. Should be removed. Chemical and physical treatment.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Nonanol Nonyl alcohol Octylcarbinol Pentagonyl alcohol 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: $\text{CH}_3(\text{CH}_2)_8\text{OH}$ 3.4 IMCO United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Rose/straw
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, face shield, rubber gloves. 5.2 Symptoms Following Exposure: Irritation, redness, eyes. 5.3 Treatment for Exposure: Flush eyes and skin with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is irritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No apparent hazard. Practically harmless to fish. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 210°F (99°C) (65°F (19°C)) 6.2 Flammable Limits in Air: 6.5 - 16.1 6.3 Fire Extinguishing Agents: Alcohol foam dry chemical or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD) (after 199 days): None. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Caledon Corp. Aroma Chemical Division 125 Delaware Ave. Chicago, IL 60604																												
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 146-4. A-T-U	10. SHIPPING INFORMATION 10.1 Grades or Purities: 97% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not required. 10.4 Venting: Open flame arresters.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table data-bbox="1001 1454 1244 1716"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td></td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor/Irritant</td><td>0</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>0</td></tr> <tr> <td> Toxicity</td><td>0</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td></td></tr> <tr> <td> Aquatic Toxicity</td><td>3</td></tr> <tr> <td> Acute Toxicity</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>0</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self-Reaction</td><td>0</td></tr> </tbody> </table> 12.3 KFFA Hazard Classifications: Not listed.	Category	Rating	Fire		Health		Vapor/Irritant	0	Liquid or Solid Irritant	0	Toxicity	0	Water Pollution		Human Toxicity		Aquatic Toxicity	3	Acute Toxicity	2	Reactivity		Other Chemicals	0	Water	0	Self-Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 144.27. 13.3 Boiling Point at 1 atm: 415.1 = 213.4°C = 416.1 K. 13.4 Freezing Point: 23.1 = -4.8°C = 268.1 K. 13.5 Critical Temperature: 590.1 = 316.9°C = 593.1 K. 13.6 Critical Pressure: 48.0 psi = 3.24 atm = 2.4 MN/m ² . 13.7 Specific Gravity: 0.827 at 20°C (liquid). 13.8 Viscosity Surface Tension: 28 dynes/cm = 0.028 N/m at 24°C. 13.9 Liquid-Water Interfacial Tension: 9.0 dynes/cm = 0.0090 N/m at 31.3°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 17,600 Btu/lb = 413 x 10 ³ J/kg. 13.13 Heat of Combustion: 17,600 Btu/lb = 413 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire																													
Health																													
Vapor/Irritant	0																												
Liquid or Solid Irritant	0																												
Toxicity	0																												
Water Pollution																													
Human Toxicity																													
Aquatic Toxicity	3																												
Acute Toxicity	2																												
Reactivity																													
Other Chemicals	0																												
Water	0																												
Self-Reaction	0																												
NOTES																													

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NON

NONENE

Common Synonyms Propylene Trimer Nonene (see label)	Liquid Colorless Gasoline-like odor Floats on water. Flammable; irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or loss of consciousness. LIQUID Irritating to skin and eyes.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Mechanical containment. Should be removed. Chemical and physical treatment.	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Nonene-trimer; linear propylene trimer; tripropylene. 3.2 Coast Guard Compatibility Classification: Other. 3.3 Chemical Formula: C ₉ H ₁₈ . 3.4 IMCO United Nations Numerical Designation: Not listed.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Characteristic, like gasoline.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Respiratory; goggles; vapor cartridge or air supplied mask; face splash shield. 5.2 Symptoms Following Exposure: High vapor concentrations irritate eyes and respiratory tract and act as an anesthetic. 5.3 Treatment for Exposure: INHALATION: Remove patient to fresh air; breathing steps; apply artificial respiration and prompt medical attention. INGESTION: DO NOT induce vomiting because of aspiration hazard. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of eyes; no respiratory system irritation at high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on skin and allowed to remain may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 75°F (1°C) 6.2 Flammable Limits in Air: 0.7% - 7.5% (vol.) 6.3 Fire Extinguishing Agents: Foam, carbon dioxide or dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 6.0 m/s (min).	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterborne Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																												
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS Atlantic Richfield Co. ARCO Chemical Co. Division 2401 N. Broad St. Philadelphia, Pa. 19104. Exxon Chemical Co. Houston, Tex. 77001. Sasol Co. Durban, Pa. 19087.																												
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.7) A 11	10 SHIPPING INFORMATION 10.1 Grade or Purity: Technical. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame atmosphere or pressure vacuum.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="930 1446 1192 1712"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td>1</td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>0</td></tr> <tr> <td>Water Pollution</td><td>0</td></tr> <tr> <td>Human Toxicity</td><td>0</td></tr> <tr> <td>Aquatic Toxicity</td><td>0</td></tr> <tr> <td>Acute Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td>0</td></tr> <tr> <td>Other Chemicals</td><td>0</td></tr> <tr> <td>Water</td><td>1</td></tr> <tr> <td>Self-Reactive</td><td>1</td></tr> </tbody> </table> 12.3 MFPA Hazard Classifications: Not listed.	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	0	Water Pollution	0	Human Toxicity	0	Aquatic Toxicity	0	Acute Effect	2	Reactivity	0	Other Chemicals	0	Water	1	Self-Reactive	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 126.2. 13.3 Boiling Point at 1 atm: 275 - 284°F = 135 - 140°C = 405 - 415°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Data not available. 13.6 Critical Pressure: Data not available. 13.7 Specific Gravity: 0.719 at 20°C (liquid). 13.8 Liquid Surface Tension: 22 dynes/cm = 0.022 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 35.5 dynes/cm = 0.0355 N/m at 21.3°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.044. 13.12 Latent Heat of Vaporization: 12,240 cal/g = 50.76 kcal/g = 213.5 kJ/kg. 13.13 Heat of Combustion: -19,100 Btu/lb = -10,600 cal/g = -445 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	1																												
Health	1																												
Vapor Irritant	1																												
Liquid or Solid Irritant	1																												
Poisons	0																												
Water Pollution	0																												
Human Toxicity	0																												
Aquatic Toxicity	0																												
Acute Effect	2																												
Reactivity	0																												
Other Chemicals	0																												
Water	1																												
Self-Reactive	1																												
NOTES																													

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6 FIRE HAZARDS 61 Flash Point: Data not available 62 Flammable Limits in Air: 0.5 - 11.1% 63 Fire Extinguishing Agents: Foam Carbon dioxide or dry chemical 64 Fire Extinguishing Agents Not to be used: Water may be ineffective 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Data not available 68 Electrical Hazard: Not pertinent 69 Burning Rate: Data not available	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterflow Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None																		
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS The Humphries Chemical & Device Co. North Haven, Conn. 06473 2 Philco Chemical Co. Bartonsville, Ohio 44830 3 Exxon Chemical Co. Houston, Tex. 77001																		
11 HAZARD ASSESSMENT CODE Seeing Hazard Assessment Handbook, 1984, 3 A-11	10 SHIPPING INFORMATION 101 Grades or Purity: Technical 102 Storage Temperature: Ambient 103 Inert Atmosphere: Not required 104 Venting: Open (flame arrestor)																		
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable Liquid 122 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Category</th> <th style="width: 50%;">Rating</th> </tr> </thead> <tbody> <tr> <td>Flammable Liquid</td> <td></td> </tr> <tr> <td>Health Hazard</td> <td></td> </tr> <tr> <td>Acute Toxicity</td> <td></td> </tr> <tr> <td>Chronic Toxicity</td> <td></td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Environmental</td> <td></td> </tr> <tr> <td>Water</td> <td></td> </tr> <tr> <td>Soil</td> <td></td> </tr> </tbody> </table> 123 NFPA Hazard Classifications: Not used	Category	Rating	Flammable Liquid		Health Hazard		Acute Toxicity		Chronic Toxicity		Reactivity		Environmental		Water		Soil		13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: 122.1 133 Boiling Point at 1 atm: 22.1°C (72°F) 134 Freezing Point: -10.8°C (13°F) 135 Critical Temperature: 122.1°C (252°F) 136 Critical Pressure: 40.0 psia = 2.74 atm = 2.99 MN/m² 137 Specific Gravity: 0.736 (20°C/4°C) 138 Liquid Surface Tension: 23.0 dyne/cm = 0.0230 N/m at 20°C 139 Liquid-Water Interfacial Tension: Data not available 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Relative Specific Heats w/ Vapor (Gas): Data not available 1312 Latent Heat of Vaporization: 24.8 kJ/mol = 5.97 kcal/mol 1313 Heat of Combustion: -44.4 kJ/mol = -10.6 kcal/mol 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
Category	Rating																		
Flammable Liquid																			
Health Hazard																			
Acute Toxicity																			
Chronic Toxicity																			
Reactivity																			
Environmental																			
Water																			
Soil																			

NOTES

NOTES

NNP	NONYLPHENOL
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Common Synonyms	Thick liquid Light yellow straw color Medicinal odor Floats on water
Fire	Combustible
Exposure	Irritant Irritates skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Mechanically contained Should be removed Chemical and physical treatment	2. LABELS See Hazard Assessment Handbook, CG 446-3 No hazard required by U.S. Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Nonylphenol 3.2 Coast Guard Compatibility Classification: Phase 1 3.3 Chemical Formula: $C_{11}H_{23}O$ 3.4 IMCO United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Pale cream 4.3 Odor: Pungent, caustic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, splash protection 5.2 Symptoms Following Exposure: Moderate skin irritation, Nausea, vomiting, diarrhea 5.3 Treatment for Exposure: EVEN EXPOSURE: Wash with soap and water. IRRITATION OF SKIN: Wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 1.5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapor irritates eyes, nose, throat, and respiratory system. Irritant in high concentrations. The odor is overpowering. 5.9 Liquid or Solid Irritant Characteristics: Causes skin irritation. Harmful if swallowed. 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 140 F (60 C) (ASTM D 56) 6.2 Flammable Limits in Air: Vapors (ASTM E 681) 6.3 Fire Extinguishing Agents: Alcohol, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water (may cause splashing) 6.5 Special Hazards of Combustion Products: None known 6.6 Behavior in Fire: Non-flammable 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Non-conductive 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Non-reactive 7.2 Reactivity with Common Materials: Non-reactive 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Non-reactive 7.5 Polymerization: Non-reactive 7.6 Inhibitor of Polymerization: Non-reactive	9. SELECTED MANUFACTURERS GAF Corp. Cincinnati, Ohio Calvert Corp., Box 4202 Jettison Chemical Co., Inc. 4500 Richmond Ave. Houston, Tex. 77052 Kuhn & Haas Independence Mall West Philadelphia, Pa. 19103																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A 1.1	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99.9% pure, polymer grade, without water and 0.2% dimethylphenol 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open flame heaters																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table> <tr> <th>Category</th><th>Rating</th></tr> <tr> <td>Fire</td><td></td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>2</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td>Poison</td><td></td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>2</td></tr> <tr> <td>Aquatic Toxicity</td><td>3</td></tr> <tr> <td>Acute Toxicity</td><td>3</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self-heating</td><td>0</td></tr> </table> 12.3 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </table>	Category	Rating	Fire		Health		Vapor Irritant	2	Liquid or Solid Irritant	2	Poison		Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	Acute Toxicity	3	Reactivity		Other Chemicals	2	Water	0	Self-heating	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 229.4 13.3 Boiling Point at 1 atm: 229.4°C (445°F) 13.4 Freezing Point: Not known 13.5 Critical Temperature: Not known 13.6 Critical Pressure: Not known 13.7 Specific Gravity: 0.9494 at 25°C (liquid) 13.8 Liquid Surface Tension: Not known 13.9 Liquid-Water Interfacial Tension: Not known 13.10 Vapor (Gas) Specific Gravity: Not known 13.11 Ratio of Specific Heats of Vapor (Gas): Not known 13.12 Latent Heat of Vaporization: Not known 13.13 Heat of Combustion: Not known 13.14 Heat of Decomposition: Not known 13.15 Heat of Solution: Not known 13.16 Heat of Polymerization: Not known
Category	Rating																																				
Fire																																					
Health																																					
Vapor Irritant	2																																				
Liquid or Solid Irritant	2																																				
Poison																																					
Water Pollution																																					
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Aquatic Toxicity	3																																				
Acute Toxicity	3																																				
Reactivity																																					
Other Chemicals	2																																				
Water	0																																				
Self-heating	0																																				
Category	Classification																																				
Health Hazard (Blue)	2																																				
Flammability (Red)	2																																				
Reactivity (Yellow)	2																																				
NOTES																																					

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OAN

OCTANE

Common Synonyms n-Octane		Liquid	Colorless	Gasoline like odor
		Floats on water. Flammable; irritating vapor is produced.		
Fire		FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.		
Exposure		VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, difficult breathing, or loss of consciousness. LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE See Response Manual Handbook (CG 446-4). Issue warning: high flammability. Restrict access. Mechanically contained. Should be removed. Chemical and physical treatment.		2 LABEL 		
3 CHEMICAL DESIGNATIONS 1. Synonyms: n-Octane. 2. Coast Guard Compatibility Classification: Flammable. 3. Chemical Formula: C ₈ H ₁₈ . 4. IMCO/United Nations Numerical Designation: 12.0202.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Gasoline.		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus with high capacity cylinders; protective clothing; gloves. 5.2 Symptoms Following Exposure: Irritation; eye discomfort; cough; sore throat; respiratory distress; and pulmonary edema. Liquid can irritate the skin and cause prolonged contact dermatitis and skin ulceration. Ingestion causes nausea and vomiting. Aspiration causes severe and fatal respiratory distress and pulmonary edema. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air; apply artificial respiration if breathing has stopped; physician needed. EYES: Flush with lots of water; flush with SKIN: Flush with lots of water; wash with soap and water. INGESTION: Do NOT induce vomiting; call poison center; ASPIRATION: physician called; give oxygen and medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 4 ppm. 5.5 Short-Term Inhalation Limits: 40 ppm (10 min). 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: 4 ppm.				

6 FIRE HAZARDS 6.1 Flash Point: 11.1°C 6.2 Flammable Limits in Air: 1.1% to 7.6% 6.3 Fire Extinguishing Agents: Dry chemicals; foam; carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: None listed 6.6 Behavior in Fire: Vapor is heavier than air and may travel along roads, piled dikes, service, right-of-way and burn back 6.7 Ignition Temperature: 423°C 6.8 Electrical Hazard: None known 6.9 Burning Rate: None listed	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: None listed 7.2 Reactivity with Common Materials: None listed 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not necessary 7.5 Polymerization: Not necessary 7.6 Inhibitor of Polymerization: Not necessary	9 SELECTED MANUFACTURERS Phillips Petroleum Company Chemical Department Special Products Division Bartlesville, Okla. 74004 The Esso Company Esso Refining Company P.O. Box 1000 New Haven, Conn. 06510 Esso Refining Company Esso Refining Company P.O. Box 1000 New Haven, Conn. 06510								
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook (CG 446-3) A 11	10 SHIPPING INFORMATION 10.1 Grades or Purities: Research, Industrial, Pure, Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not necessary 10.4 Venting: Open flame arrester								
1. HAZARD CLASSIFICATIONS 1.1 Code of Federal Regulations: Flammable liquid 1.2 NAS Hazard Rating for Bulk Water Transportation: None listed 1.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard</td><td>2</td></tr><tr><td>Flammability</td><td>2</td></tr><tr><td>Reactivity</td><td>1</td></tr></tbody></table>	Category	Classification	Health Hazard	2	Flammability	2	Reactivity	1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Liquid 13.2 Molecular Weight: 114.2 13.3 Boiling Point at 1 atm.: 125.6°C (258.1°F) @ 101.3 kPa 13.4 Freezing Point: -17.9°C (1°F) @ 101.3 kPa 13.5 Critical Temperature: 344.1°C (651.4°F) @ 101.3 kPa 13.6 Critical Pressure: 3.77 MPa (54.2 psi) @ 344.1°C 13.7 Specific Gravity: 0.703 at 20°C (liquid) 13.8 Liquid Surface Tension: 21.7 dynes/cm at 20°C (liquid) 13.9 Liquid-Water Interfacial Tension: 1.0 dyne/cm at 20°C (liquid) 13.10 Vapor (Gas) Specific Gravity: 3.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1 13.12 Latent Heat of Vaporization: 354.1 kJ/kg (77.1 Btu/lb) @ 101.3 kPa 13.13 Heat of Combustion: 44.4 MJ/kg (10.1 Btu/lb) @ 101.3 kPa 13.14 Heat of Decomposition: None listed 13.15 Heat of Solution: None listed 13.16 Heat of Polymerization: None listed
Category	Classification								
Health Hazard	2								
Flammability	2								
Reactivity	1								
NOTES									

Continued on pages 2 and 3

OTA

OCTANOL

Common Synonyms: 1-Octanol Octyl Alcohol n-Octanol	Thick liquid Colorless Sweet odor Flashes on water
Fire	Combustible
Exposure	LIQUID Irritating to skin Will burn eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating in shoreline May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE See Response Methods Manual, CG 446-4 Mechanical action: Should be avoided Chemical action: None	2. LABELS No hazard other than irritant (See Section 4.1.1.1)
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: <i>None</i> Heptyl Alcohol Octyl Octyl Alcohol 3.2 Coast Guard Compatibility Classification: <i>None</i> 3.3 Chemical Formula: $C_8H_{18}O$ 3.4 IMCO United Nations Numerical Designation: <i>None</i>	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Odorless
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: <i>Chemical goggles and gloves</i> 5.2 Symptoms Following Exposure: <i>Irritation</i> 5.3 Treatment for Exposure: <i>Flush with water</i> 5.4 Toxicity by Inhalation (Threshold Limit Value): <i>None</i> 5.5 Short-Term Inhalation Limits: <i>None</i> 5.6 Toxicity by Ingestion: Grade I, oral rat LD ₅₀ 2.2 g/kg 5.7 Late Toxicity: <i>None</i> 5.8 Vapor (Gas) Irritant Characteristics: <i>None</i> 5.9 Liquid or Solid Irritant Characteristics: <i>None</i> 5.10 Odor Threshold: 0.49 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 111°C 6.2 Flammable Limits in Air: 1.4-10% 6.3 Fire Extinguishing Agents: <i>Water</i> 6.4 Fire Extinguishing Agents Not to be Used: <i>None</i> 6.5 Special Hazards of Combustion Products: <i>None</i> 6.6 Behavior in Fire: <i>None</i> 6.7 Ignition Temperature: <i>None</i> 6.8 Electrical Hazard: <i>None</i> 6.9 Burning Rate: <i>None</i>	8. WATER POLLUTION 8.1 Aquatic Toxicity: <i>None</i> 8.2 Waterway Toxicity: <i>None</i> 8.3 Biological Oxygen Demand (BOD): <i>None</i> 8.4 Food Chain Concentration Potential: <i>None</i>
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: <i>None</i> 7.2 Reactivity with Common Materials: <i>None</i> 7.3 Stability During Transport: <i>None</i> 7.4 Neutralizing Agents for Acids and Caustics: <i>None</i> 7.5 Polymerization: <i>None</i> 7.6 Inhibitor of Polymerization: <i>None</i>	9. SELECTED MANUFACTURERS Chemagro Corp. Chemagro Chemical Division P.O. Box 100 Northbrook, N.J. 07640 Chemagro Corp. Chemagro Chemical Division P.O. Box 100 Northbrook, N.J. 07640 Chemagro Corp. Chemagro Chemical Division P.O. Box 100 Northbrook, N.J. 07640
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 446-1 VII	10. SHIPPING INFORMATION 10.1 Grades or Purity: <i>None</i> 10.2 Storage Temperature: <i>None</i> 10.3 Inert Atmosphere: <i>None</i> 10.4 Venting: <i>Open</i>
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: <i>Combustible Liquid</i> 12.2 NAS Hazard Rating for Bulk Water Transportation: <i>None</i> 12.3 NFPA Hazard Classifications: <i>None</i>	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: <i>Liquid</i> 13.2 Molecular Weight: <i>130.17</i> 13.3 Boiling Point at 1 atm: <i>176.7°C</i> 13.4 Freezing Point: <i>-16.5°C</i> 13.5 Critical Temperature: <i>305.1°C</i> 13.6 Critical Pressure: <i>24.8 atm</i> 13.7 Specific Gravity: <i>0.825</i> 13.8 Liquid Surface Tension: <i>21.8 dyne/cm</i> 13.9 Liquid-Water Interfacial Tension: <i>18.5 dyne/cm</i> 13.10 Vapor (Gas) Specific Gravity: <i>None</i> 13.11 Ratio of Specific Heats of Vapor (Gas): <i>None</i> 13.12 Latent Heat of Vaporization: <i>35.5 kJ/mol</i> 13.13 Heat of Combustion: <i>44.4 kJ/mol</i> 13.14 Heat of Decomposition: <i>None</i> 13.15 Heat of Solution: <i>None</i> 13.16 Heat of Polymerization: <i>None</i>
NOTES	

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OTE

1-OCTENE

Common Synonyms Caprylene alpha-Octylene	Liquid Colorless Gasoline-like odor Floats on water. Flammable, harmful vapor is produced
	FLAMMABLE Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR If inhaled, will cause dizziness May be dangerous if it enters water intakes LIQUID Irritating to skin and eyes If swallowed, will cause nausea or vomiting Do not induce vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Not pertinent to waste disposal
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability Evacuate area Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Caprylene alpha-Octylene 3.2 Coast Guard Compatibility Classification: Olefin 3.3 Chemical Formula: C_8H_{16} 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like gasoline
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor canister, goggles or face shield 5.2 Symptoms Following Exposure: Generally low toxicity. Mildly anesthetic at high vapor concentrations. May irritate eyes. 5.3 Treatment for Exposure: INHALATION: remove from exposure, support respiration. INGESTION: do NOT induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present at high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 70°F (21°C) 6.2 Flammable Limits in Air: 0.9 - 11.1% 6.3 Fire Extinguishing Agents: Dry chemical foam or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 493°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 6.5 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0.9% (theoretical) 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Air Products and Chemicals, Inc. Hood River Division Paulsboro, N.J. 08066 2. The Humphries Chemical Co. Devine St. North Haven, Conn. 06473 3. Phillips Petroleum Co. Bartlesville, Okla. 74004
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3: A-T-L	10. SHIPPING INFORMATION 10.1 Grades or Purity: Research 99.7% pure, 99.3% technical 95% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester) or pressure vacuum
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 112.22 13.3 Boiling Point at 1 atm: 290.3°F = 121.3°C = 194.5°K 13.4 Freezing Point: -151°F = -102°C = 172°K 13.5 Critical Temperature: 560.1°F = 293.4°C = 566.6°K 13.6 Critical Pressure: 400 psia = 27.2 atm = 2.76 MN/m ² 13.7 Specific Gravity: 0.715 at 20°C (liquid) 13.8 Liquid Surface Tension: 21.76 dyne/cm = 0.02176 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 6.21 dyne/cm = 0.00621 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.040 13.12 Latent Heat of Vaporization: 129 Btu/lb = 71.9 cal/g = 3.01 x 10 ⁵ J/kg 13.13 Heat of Combustion: -19,170 Btu/lb = -10,650 cal/g = -44,849 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

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OET

OCTYL EPOXY TALLATE

Common Synonyms Epoxydized tall oil, octyl ester		Liquid	Pale yellow	Mild odor
		Floats on water		
Avoid contact with liquid. Keep in glass. No discharge if possible. Isolate and remove from area if spilled. Notify local authorities if spill is large.				
Fire	Combustible Flammable when mixed with air. Will burn with a yellow flame. Can explode if mixed with water.			
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. Harmful if swallowed. Respiratory irritation if inhaled. If in eyes, flush with water for 15 minutes. If on skin, wash with soap and water. If swallowed, do not induce vomiting. If swallowed, call a physician.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local authorities if spill is large.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Epoxydized tall oil, octyl ester 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: Mixture 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Pale yellow 4.3 Odor: Mild		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical goggles, face shield, oil resistant gloves 5.2 Symptoms Following Exposure: Contact with eyes causes mild inflammation. Contact with skin may produce allergic response. 5.3 Treatment for Exposure: EYES or SKIN: remove excess oil with cloth or absorbent paper; then wash with soapy water and flush with clear water; consult a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade D LD ₅₀ > 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: 450°F (O.C.) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS TONS Chemicals 600 Grant St. Pittsburgh, Pa. 15230
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-T-L	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 420 (approx.) 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: test at 1.002 at 20°C (liquid) 13.8 Liquid Surface Tension: 40.1 dynes/cm = 0.0401 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
(continued on pages 5 and 6)	
NOTES	

OCF

OILS: CLARIFIED

Common Synonyms		Only liquid	Colorless
		Floats on water	
Fire	Combustible		
Exposure	Not harmful		
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 31 Synonyms: No common synonyms 32 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 33 Chemical Formula: Not applicable 34 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Data not available 43 Odor: Data not available	
5 HEALTH HAZARDS 51 Personal Protective Equipment: Goggles or face shield 52 Symptoms Following Exposure: If liquid, ingested, an increased frequency of bowel movements will occur 53 Treatment for Exposure: INGESTION: Do not induce vomiting. SKIN: Wipe off; wash with soap and water. EYES: Wash with water for at least 15 min. 54 Toxicity by Inhalation (Threshold Limit Value): No single TLV applicable 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade I, LD ₅₀ 4 to 15 g/kg 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: Data not available			

6 FIRE HAZARDS 61 Flash Point: Data not available 62 Flammable Limits in Air: Data not available 63 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Data not available 68 Electrical Hazard: Not pertinent 69 Burning Rate: 4 mm/min		8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BCD): Data not available 84 Food Chain Concentration Potential: None	
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1 Shell Oil Co. 1 Shell Plaza Houston, Tex 77001 2 Exxon Co. Houston, Tex 77002 3 Sun Oil Co. St. Davids, Pa 19087	
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-T-L		10. SHIPPING INFORMATION 101 Grades or Purity: Data not available 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open flame arrestor	
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: Not pertinent 133 Boiling Point at 1 atm: Data not available 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: (est.) 0.85 at 20°C (liquid) 138 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C 139 Liquid-Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas) Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: (est.) -45,000 Btu/lb = -10,000 cal/g = -420 x 10 ³ J/kg 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent	
NOTES			

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OIL

OILS: CRUDE

Common Synonyms Petroleum	Only liquid	Dark	Acrid odor
Floats on water. Flammable vapor may be produced.			
Fire Combustible Extinguishing Agent: Water			
Exposure ALL FORMS OF VAPOR Not irritating to eyes, nose, or throat LIQUID Irritating to skin and eyes			
Water Pollution HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Flowing to shoreline May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 445-41 Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Petroleum 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 11126		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Dark 4.3 Odor: Offensive tars	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, face shield, rubber gloves and boots 5.2 Symptoms Following Exposure: May irritate eyes and skin 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min. SKIN: wipe off and wash with soap and water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause mild staining and reddening of skin 5.10 Odor Threshold: Data not available			

6. FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Extinguishing agent or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min		8. WATER POLLUTION 8.1 Aquatic Toxicity: 1 ppm * is not acutely toxic to fish; 200 ppm 24 hr LC50 to pike; 2000 ppm normal response in water * Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																					
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Exxon Co. Houston, Tex 77001 2. Shell Oil Co. Shell Plaza Houston, Tex 77001 3. San Oil Co. St. Davids, Pa 19087																																					
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A 1-U		10. SHIPPING INFORMATION 10.1 Grades or Purity: Wide variety depending on oil field where produced 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Open flame arresters																																					
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible liquid 12.2 HAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>0</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>0</td> </tr> <tr> <td>Poisons</td> <td>0</td> </tr> <tr> <td>Water Pollution</td> <td>1</td> </tr> <tr> <td>Human Toxicity</td> <td>2</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td>Aesthetic Effect</td> <td>4</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other chemicals</td> <td>0</td> </tr> <tr> <td>Water</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td></td> </tr> <tr> <td>Flammability (Red)</td> <td>3</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>		Category	Rating	Fire	1	Health		Vapor Irritant	0	Liquid or Solid Irritant	0	Poisons	0	Water Pollution	1	Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	4	Reactivity		Other chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)		Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: 300-350 °C 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity (60/60): 0.85-0.95 13.8 Liquid Surface Tension: 24-35 dynes/cm at 60/24-60/60 °C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 200-300 Btu/lb at 300-350 °C 13.13 Heat of Combustion: 18,000-19,000 Btu/lb 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Rating																																						
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Health																																							
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NOTES																																							

ODS

OILS: DIESEL

Common Synonyms: Fuel Oil 1-D Fuel Oil 2-D	Only liquid Yellow-brown Lube or fuel oil odor Floats on water
Fire	Combustible Water
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed DANGEROUS TO AQUEATIC LIFE IN HIGH CONCENTRATIONS Polluting to shoreline May be dangerous if it enters water intakes.
Water Pollution	DANGEROUS TO AQUEATIC LIFE IN HIGH CONCENTRATIONS Polluting to shoreline May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Fuel Oil 1-D Fuel Oil 2-D 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 111270	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light brown 4.3 Odor: Like fuel oil
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: If liquid is ingested, an increased frequency of bowel movements will occur 5.3 Treatment for Exposure: INGESTION: do NOT induce vomiting. SKIN: wipe off; wash with soap and water. EYES: wash with copious amounts of water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): No single TLV applicable 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1 LD ₅₀ 5 to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: (1-D) 100°F (38°C) (2-D) 125°F (52°C) 6.2 Flammable Limits in Air: 1.1-6.0 vol. % 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: (1-D) 390-625°F (2-D) 490-545°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 204 mg 1/24 hr. juvenile American shad/ 11 m salt water 8.2 Waterfowl Toxicity: >20 ml/kg /LD50/mallards 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Exxon Co. Houston, Tex. 77001 2. Shell Chemical 1 Shell Plaza Houston, Tex. 77001 3. Sun Oil Co. St. Davids, Pa. 19087
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Diesel Fuel 1-D (ASTM) Diesel Fuel 2-D (ASTM) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-2) A 1 1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: 300-340°F = 150-170°C = 560-325°K Freezing Point: 0-10°F = -18-12°C = 255-243°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.841 at 16°C (liquid) 13.8 Liquid Surface Tension: 35.5 dynes/cm = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 10 dynes/cm = 0.005 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -18,400 Btu/lb = -10,200 cal/g = 429 × 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Category Classification Health Hazard (Blue) 0 Flammability (Red) 2 Reactivity (Yellow) 0	NOTES

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OCA

OILS, EDIBLE: CASTOR

Common Synonyms	Odor liquid	Light yellow to green	Weak odor
	Floats on water		
Fire	Combustible		
Exposure	Not harmful		
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41 Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light yellow to green 4.3 Odor: Characteristic, odorless	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: If ingested causes severe diarrhea 5.3 Treatment for Exposure: INGESTION: if more than 2 tablespoons, consult physician. EYES: flush with water for at least 15 min. SKIN: wipe off; wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): None 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade I LD ₅₀ 15 g/kg (fatal dose unknown but presumably larger) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Not pertinent			

6 FIRE HAZARDS 6.1 Flash Point: 445°F (110°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical foam or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 840°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. N. E. Industries, Inc. Baker-Castor Oil Co. Division 20 Avenue A Bayonne, N. J. 07002 2. Textron, Inc. Spencer-Kellogg Division 100 Main St. Burlington, N. Y. 14240 3. Arthur C. Trask Corp. 7606 W. 63rd St. Vigo, Ill. 60901
	10 SHIPPING INFORMATION 10.1 Grades or Purities: Commercial meets Mil. Spec. and ASTM USP. USP (odorless, refined) meets NAVORD Spec. Technical. All grades differ only in color and acid values. 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arresters)
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 ATU	12 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Varies, depending on composition 13.4 Freezing Point: 10.1°C = 50.2°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.962 (20°C liquid) 13.8 Liquid Surface Tension: 39 dynes/cm = 0.039 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 19.2 dynes/cm = 0.0192 N/m at 22°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 42,400 Btu/lb = 17,950 kJ/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

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OCC

OILS, EDIBLE: COCONUT

Common Synonyms Coconut butter Copa oil Coconut oil	Solid or liquid Light yellow to orange Weak odor Floats on water
Fire	Combustible Not harmful
Exposure	LIQUID OR SOLID Not harmful May be dangerous if it enters water intakes
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment	2. LABELS No label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Coconut butter Coconut oil, Copa oil 3.2 Coast Guard Compatibility Classification: Harmless 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid or solid 4.2 Color: Light yellow-orange 4.3 Odor: Weak acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Oil is essentially nontoxic, but can cause mild irritation of eyes on contact 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: 420°F C.C. (crude) 580°F C.C. (refined) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause smothering; water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. PVO International, Inc. 1145 South Tenth Street Richmond, Calif. 94804 2. Cargill, Inc. Cargill Building Minneapolis, Minn. 55402 3. Capital City Products Co. P.O. Box 549 Columbus, Ohio 43216								
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) V 1 1	10 SHIPPING INFORMATION 10.1 Grade or Purity: Crude, Cushing All grades contain 5% free fatty acids 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arresters								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table data-bbox="1001 1457 1240 1543"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>0</td></tr> <tr> <td>Irritancy (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	0	Irritancy (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Not pertinent (very high) 13.4 Freezing Point: (approx.) 6°F = 24°C = 297°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.922 at 25°C (liquids) 13.8 Liquid Surface Tension: 33.4 dynes/cm = 0.0334 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (est.) 40 dynes/cm = 0.040 N/m at 25°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (est.) -15,500 Btu/lb = -3,600 cal/g = -40 × 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	0								
Irritancy (Red)	1								
Reactivity (Yellow)	0								
NOTES									

(continued on pages 5 and 6)

OCS

OILS, EDIBLE: COTTONSEED

Common Synonyms		Only liquid	Pale yellow	Odorless
Floats on water Freezing point is 32° F				
Fire		Combustible Flash point: 225°C (436°F) (refined oil) 610°F (321°C) (cooking oil)		
Exposure		Not harmful		
Water Pollution		Effect of low concentrations on aquatic life is unknown Feeding is short-term May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE		2. LABELS		
See Response Methods Manual, CG 446-41 Mechanical containment Should be removed Chemical and physical treatment		No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: No common synonyms		4.1 Physical State (as shipped): Liquid		
3.2 Coast Guard Competibility Classification: Ex-1		4.2 Color: Pale yellow		
3.3 Chemical Formula: Not applicable		4.3 Odor: Odorless		
3.4 IMCO United Nations Numerical Designation: Not listed				
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Goggles or face shield				
5.2 Symptoms Following Exposure: None is used as a food				
5.3 Treatment for Exposure: EYES: wash with water for at least 15 min				
5.4 Toxicity by Inhalation (Threshold Limit Value): None				
5.5 Short-Term Inhalation Limits: Not pertinent				
5.6 Toxicity by Ingestion: None				
5.7 Late Toxicity: None				
5.8 Vapor (Gas) Irritant Characteristics: None				
5.9 Liquid or Solid Irritant Characteristics: None				
5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point: 436°F (C) (refined oil), 610°F (C) (cooking oil) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, foam or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 650°F (refined oil) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Diamond Shamrock Corp. Nopco Chemicals Division Morristown, N.J. 07960 2. Pacific Vegetable Oil Corp. World Trade Center San Francisco, Calif. 94111 3. Stokes Van Camp, Inc. Capital City Products Co. Columbus, Ohio 43221								
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Refined, cooking 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arresters)								
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A 1 1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: -1.1 to 0°C = 29° K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.922 at 20°C (liquid) 13.8 Liquid Surface Tension: 35 dynes/cm = 0.035 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 25 dynes/cm at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 11,000 Btu/lb 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classification: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0	
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	1								
Reactivity (Yellow)	0								
NOTES									

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OFS

OILS, EDIBLE: FISH

Common Synonyms		Only liquid	Pale yellow	Fishy odor
Floats on water				
Fire	Combustible No hazard label required by U.S. Code of Federal Regulations			
Exposure	Not harmful			
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by U.S. Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Pale yellow 4.3 Odor: Fishy		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: None known 5.3 Treatment for Exposure: Flush with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: None 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: 420°F (100°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical foam or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Ashland Oil, Inc. Chemical Products Division Columbus, Ohio 43260 Diamond Shamrock Corp. National Chemical Division Marionville, Mo. 64659 Marine Products Co. 440 W. 1st St. Boston, Mass. 02127
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame protected
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-2 A T I	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.913 at 20°C (liquid) 13.8 Liquid Surface Tension: 38 dynes/cm = 0.038 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 22.5 mN/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 39,400 J/g (16,500 Btu/lb) = 39,400 J/g ÷ 4.184 J/cal = 9,417 cal/g 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
1. Continued on pages 1 and 2	
NOTES	

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OLD

OILS, EDIBLE: LARD

Common Synonyms Prime steam lard Lard rendered lard Leaf lard Lard		Liquid or solid Floats on water	Colorless to Light yellow	Fatty odor
Fire		Combustible		
Exposure		LIQUID OR SOLID Not harmful		
Water Pollution		Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE See Response to Methods Handbook, CG 446.4 Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Lard-rendered lard, Leaf lard, Prime steam lard 3.2 Coast Guard Compatibility Classification: Exempt III 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Fatty		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Substance is essentially nontoxic. Prolonged contact with skin may cause dermatitis (redness). Hot liquid can burn eyes or skin. 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min.; get medical attention for burn. SKIN: wipe oil; get medical attention for burn. INGESTION: do NOT induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS

- 6.1 Flash Point: 344°F (173°C)
 6.2 Flammable Limits in Air: Not pertinent.
 6.3 Fire Extinguishing Agents: Dry chemical (from carbon dioxide).
 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing; water may be ineffective.
 6.5 Special Hazards of Combustion Products: Not pertinent.
 6.6 Behavior in Fire: Not pertinent.
 6.7 Ignition Temperature: 811°F.
 6.8 Electrical Hazard: Not pertinent.
 6.9 Burning Rate: 4 mm/min.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Ecological Oxygen Demand (BOD): Data not available.
 8.4 Food Chain Concentration Potential: None.

9 SELECTED MANUFACTURERS

- Smith Edible Oil Company
 145 West Jackson Boulevard
 Chicago, IL 60604
 2. Marco Oil and Chemical Co., Inc.
 Beaver and Kane Streets
 Bristol, Pa. 19007
 3. Colfax, Inc.
 5400 42nd St.
 Park Forest, IL 60460

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
 7.2 Reactivity with Common Materials: No reaction.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Various grades depending on source of animal, used and method of rendering.
 10.2 Storage Temperature: Ambient, or elevated (hot liquid).
 10.3 Inert Atmosphere: No requirement.
 10.4 Venting: Open flame protectors.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446.3)
 A 1.1

12. HAZARD CLASSIFICATIONS

- 12.1 Code(s), Federal Regulations: Not listed.
 12.2 MAP Hazard Rating for Bulk Water Transportation: Not listed.
 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 0 |
| Flammability (Red) | 0 |
| Reactivity (Yellow) | 0 |

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid.
 13.2 Molecular Weight: Not pertinent.
 13.3 Boiling Point at 1 atm: Not pertinent.
 13.4 Freezing Point: 34°F (1°C).
 13.5 Critical Temperature: Not pertinent.
 13.6 Critical Pressure: Not pertinent.
 13.7 Specific Gravity: 0.94 at 15°C (liquid).
 13.8 Liquid Surface Tension: 29 dynes/cm = 0.029 N/m at 30°C.
 13.9 Liquid-Water Interfacial Tension: 40 dynes/cm = 0.040 N/m at 30°C.
 13.10 Vapor (Gas) Specific Gravity: Not pertinent.
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.
 13.12 Latent Heat of Vaporization: Not pertinent.
 13.13 Heat of Combustion: 9,120 cal/g = 380 x 10³ J/kg.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: Not pertinent.

NOTES

001

OILS, EDIBLE: OLIVE

Common Synonyms		Only liquid	Pale yellow
		Flows on water	
Fire	Combustible		
Exposure	Not harmful		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Tending to dissolve. May be dangerous if it enters water makes		
1. RESPONSE TO DISCHARGE See Response Statement: Hazardous (CG 404.4) Mechanical equipment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: None 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: Not used		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Pale yellow-green 4.3 Odor: Weak characteristic	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles and gloves 5.2 Symptoms Following Exposure: None reported 5.3 Treatment for Exposure: No treatment necessary 5.4 Toxicity by Inhalation (Threshold Limit Value): Not reported 5.5 Short-Term Inhalation Limits: Not reported 5.6 Toxicity by Ingestion: None 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point: 377°F (192°C)		8.1 Aquatic Toxicity: Data not available	
6.2 Flammable Limits in Air: Data not available		8.2 Waterway Toxicity: Data not available	
6.3 Fire Extinguishing Agents: Dry chemical, water, carbon dioxide		8.3 Biological Oxygen Demand (BOD): Data not available	
6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing		8.4 Food Chain Concentration Potential: None	
6.5 Special Hazards of Combustion Products: No pertinent			
6.6 Behavior in Fire: Not pertinent		9 SELECTED MANUFACTURERS	
6.7 Ignition Temperature: Not reported		Fisher, Inc. 400 East 10th Ave. East Paterson, N.J. 07627	
6.8 Electrical Hazard: Not pertinent		Perry-Walman, Inc. Cochranville, Pa. 17029	
6.9 Burning Rate: Data not available		Wegon-Hammond Corp. - Inc. 1000 N. 2nd St. Harrisburg, N.J. 17101	
7 CHEMICAL REACTIVITY			
7.1 Reactivity with Water: No reaction		10 SHIPPING INFORMATION	
7.2 Reactivity with Common Materials: No reaction		10.1 Grades or Purity: Data not available	
7.3 Stability During Transport: Stable		10.2 Storage Temperature: Ambient	
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent		10.3 Inert Atmosphere: No requirements	
7.5 Polymerization: Not pertinent		10.4 Venting: Open flame arrester	
7.6 Inhibitor of Polymerization: Not pertinent			
11 HAZARD ASSESSMENT CODE		13 PHYSICAL AND CHEMICAL PROPERTIES	
See Hazard Assessment Statement: CG 404.4 N/A		13.1 Physical State at 15°C and 1 atm: Liquid	
12 HAZARD CLASSIFICATIONS		13.2 Molecular Weight: Not pertinent	
12.1 Code of Federal Regulations: Not listed		13.3 Boiling Point at 1 atm: Not high	
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed		13.4 Freezing Point: Not pertinent	
12.3 NFPA Hazard Classifications: Not listed		13.5 Critical Temperature: Not pertinent	
		13.6 Critical Pressure: Not pertinent	
		13.7 Specific Gravity: 0.91 at 20°C liquid	
		13.8 Liquid Surface Tension: 36 dynes/cm = 0.036 N/m at 20°C	
		13.9 Liquid-Water Interfacial Tension: 10 mN/m at 20°C	
		13.10 Vapor (Gas) Specific Gravity: Not pertinent	
		13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent	
		13.12 Latent Heat of Vaporization: Not pertinent	
		13.13 Heat of Combustion: 39,000 kJ/kg (16,770 Btu/lb) at 25°C	
		13.14 Heat of Decomposition: Not pertinent	
		13.15 Heat of Solution: Not pertinent	
		13.16 Heat of Polymerization: Not pertinent	
NOTES			

REVISED 1978

OPM

OILS, EDIBLE: PALM

Common Synonyms Palm fruit oil Palm butter Palm oil		Liquid or solid Floats on water	Orange red Pleasant odor
Fire	Combustible		
Exposure	LIQUID OR SOLID Not harmful		
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE <i>(See Response Methods Manual, CG and 4)</i> Mechanical containment Should be removed (chemical and physical treatment)		2. LABELS No label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Palm butter; Palm fruit oil 3.2 Coast Guard Compatibility Classification: Exter 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Semi-solid to liquid 4.2 Color: Orange red 4.3 Odor: Pleasant characteristic	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield; rubber gloves 5.2 Symptoms Following Exposure: Oil is essentially inert; may cause irritation of eyes 5.3 Treatment for Exposure: EYES: Flush with water for at least 15 min. INGESTION: do NOT induce vomiting 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent			

6 FIRE HAZARDS 6.1 Flash Point: 141°C (4) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Extinguish chemical carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing; water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 199°C 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Capitol Products P.O. Box 500 Columbus, OH 43216 2. Welch Home & Chemical Co. 1000 South High Street Hartford, CT 06109 3. PVO International, Inc. 141 South Tech Street Richmond, CA 94804								
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Manual, CG and 3) A 1	10 SHIPPING INFORMATION 10.1 Grades or Purity: Various grades depending on source. Contains 1-4% fatty acids 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arresters								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>0</td> </tr> <tr> <td>Flammability (Red)</td> <td>0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	0	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid to liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Not pertinent (very high) 13.4 Freezing Point: 10-10°C = 212°F = 294-300°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.906 at 15°C (liquid) 13.8 Liquid Surface Tension: 29 dyne/cm = 0.029 N/m at 17°C 13.9 Liquid-Water Interfacial Tension: 19-30 dyne/cm = 0.019-0.030 N/m at 17°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 102.1-115.001 Btu/lb = 3,800-4,000 cal/g = 160-170 J/g 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	0								
Reactivity (Yellow)	0								
(Continued on pages 7 and 8)									
NOTES									

(Continued on page 1 and 2)

OPN

OILS, EDIBLE: PEANUT

Common Synonyms		Only liquid	Pale yellow	Weak peanut odor
		Floats on water		
Fire	Combustible May be dangerous if it enters water intakes			
Exposure	Not Harmful			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Not a pollutant under Federal Water Pollution Control Act			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 47, 4) Mechanical containment should be removed Chemical and physical treatment		2 LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Pale yellow 4.3 Odor: Characteristic slight nutty odor		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Goggles or face shield				
5.2 Symptoms Following Exposure: None - is a food				
5.3 Treatment for Exposure: EYES: flush with water for at least 15 min				
5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent				
5.5 Short-Term Inhalation Limits: Not pertinent				
5.6 Toxicity by Ingestion: None				
5.7 Late Toxicity: None				
5.8 Vapor (Gas) Irritant Characteristics: None				
5.9 Liquid or Solid Irritant Characteristics: None				
5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: 640°F (340°C)	8.1	Aquatic Toxicity: Data not available
6.2	Flammable Limits in Air: Data not available	8.2	Waterfowl Toxicity: Data not available
6.3	Fire Extinguishing Agents: Dry chemical foam, or carbon dioxide	8.3	Biological Oxygen Demand (BOD): Data not available
6.4	Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: Not pertinent		
6.6	Behavior in Fire: Not pertinent	9 SELECTED MANUFACTURERS	
6.7	Ignition Temperature: 833°F	1	Rully Whiteman, Inc. Conshohocken, Pa. 19428
6.8	Electrical Hazard: Not pertinent	2	Stokes-Van Camp, Inc. Capital City Products Co. Columbus, Ohio 43216
6.9	Burning Rate: Data not available	3	Welch Holm, and Clark Co., Inc. 1000 S. 4th St. Harrison, N. J. 07029
7. CHEMICAL REACTIVITY			
7.1	Reactivity with Water: No reaction	10 SHIPPING INFORMATION	
7.2	Reactivity with Common Materials: No reaction	10.1	Grades or Purity: Data not available
7.3	Stability During Transport: Stable	10.2	Storage Temperature: Ambient
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent	10.3	Inert Atmosphere: No requirement
7.5	Polymerization: Not pertinent	10.4	Venting: Open (flame arrester)
7.6	Inhibitor of Polymerization: Not pertinent		
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T-U		13. PHYSICAL AND CHEMICAL PROPERTIES	
12 HAZARD CLASSIFICATIONS		13.1	Physical State at 15°C and 1 atm: Liquid
12.1	Code of Federal Regulations: Not listed	13.2	Molecular Weight: Not pertinent
12.2	NAS Hazard Rating for Bulk Water Transportation: Not listed	13.3	Boiling Point at 1 atm: Very high
12.3	NFPA Hazard Classifications:	13.4	Freezing Point: 28°F = -2°C = 271 K
	Category Classification	13.5	Critical Temperature: Not pertinent
	Health Hazard (Blue) 0	13.6	Critical Pressure: Not pertinent
	Flammability (Red) 1	13.7	Specific Gravity: 0.919 at 20°C (liquid)
	Reactivity (Yellow) 0	13.8	Liquid Surface Tension: 35.5 dynes/cm = 0.0355 N/m at 20°C
		13.9	Liquid-Water Interfacial Tension: 30 dynes/cm = 0.030 N/m at 70°C
		13.10	Vapor (Gas) Specific Gravity: Not pertinent
		13.11	Ratio of Specific Heats of Vapor (Gas): Not pertinent
		13.12	Latent Heat of Vaporization: Not pertinent
		13.13	Heat of Combustion: (est.) -16,000 cal/lb = -8,570 cal/g = -371 x 10 ³ J/kg
		13.14	Heat of Decomposition: Not pertinent
		13.15	Heat of Solution: Not pertinent
		13.16	Heat of Polymerization: Not pertinent
(Continued on pages 2 and 3)			
NOTES			

REVISED 1278

OSF

OILS, EDIBLE: SAFFLOWER

Common Synonyms Safflower oil Safflower seed oil Carchamus tinctorius oil		Liquid Floats on water	Light yellow 	Bland fatty odor
Fire	Combustible 			
Exposure	LIQUID Not harmful 			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes 			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 448-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Carchamus tinctorius oil, Safflower seed oil 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Pale yellow 4.3 Odor: Bland, fatty		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Oil is essentially nontoxic. Contact with eyes can cause mild irritation. 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry chemical foam or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective; water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. PVO International Inc. 1145 South Tenth Street Richmond, Calif. 94804 2. Capital City Products Co. P.O. Box 549 Columbus, Ohio 43216
	10. SHIPPING INFORMATION: 10.1 Grades or Purity: Food grade contains 0.02% propyl gallate, 0.01% citric acid or may contain no additives. Technical non break and alkali refined 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 448-4) A-T-L	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Not pertinent (very high) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.923 at 25°C (liquid) 13.8 Liquid Surface Tension: (ext.) 25 dynes/cm = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (ext.) 50 dynes/cm = 0.050 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (ext.) -15,500 Btu/lb = -4,600 cal/g = -360 X 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

(Continued on pages 4 and 6)

(Continued on pages 4 and 5)

OSB

OILS, EDIBLE: SOYA BEAN

Common Synonyms	Oil: liquid Pale yellow Weak odor Floats on water
1. IDENTIFICATION 1.1 CAS No. 8001-82-5 1.2 Chemical Name: Soybean oil 1.3 Other Names: Soybean oil, Soybean oil, Soybean oil	
Fire	Combustible Extinguish with dry chemical, carbon dioxide, or water. Water may cause frothing.
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Soybean oil 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Pale yellow 4.3 Odor: Weak
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: None - is a food 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: None 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: 540°F (3°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 833°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 39%, 5 days 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Ashland Oil Co. Chemical Products Division Peoria, Ill. 61601 2 A. E. Staley Manufacturing Co. Decatur, Ill. 62525 3 Arthur C. Trask Corp. 7666 W. 63rd St. Argo, Ill. 60501								
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U	10 SHIPPING INFORMATION 10.1 Grades or Purity: Refined, crude 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>0</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: -11° = -20°C = 253°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.922 at 20°C (liquid) 13.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (est.) -16,000 Btu/lb = -8,870 cal/g = -371 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	1								
Reactivity (Yellow)	0								
NOTES 16 continued on pages 4 and 5									

REVISED 1978

OTC

OILS, EDIBLE: TUCUM

Common Synonyms Aouara oil American palm kernel oil Palm seed oil Tucum oil		Liquid	Light yellow	Weak odor
Floats on water				
SECTION 1 PHYSICAL PROPERTIES				
Fire	Combustible Flash point: 395°F (199°C) Water solubility: Insoluble in water			
Exposure	LIQUID Not harmful POISONOUS BY INGESTION			
Water Pollution	Effect of low concentrations on aquatic life is unknown Foaming to shoreline May be dangerous if it enters water intakes. Not flammable in water Not persistent in water			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: American palm kernel oil Aouara oil, Palm seed oil 3.2 Coast Guard Compatibility Classification: Esters (13) 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light yellow 4.3 Odor: Weak acid		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Oil is essentially nontoxic. Contact with eyes causes mild irritation, and prolonged contact with skin may cause dermatitis. 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min. INGESTION: do NOT induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None known 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS

- 6.1 Flash Point: 395°F (199°C)
6.2 Flammable Limits in Air: Not pertinent
6.3 Fire Extinguishing Agents: Dry chemical foam, carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing, water may be ineffective
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: Data not available
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 4 mm/min

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
8.2 Waterway Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

Capital City Products, Inc.
P. O. Box 469
Columbus, Ohio 43216

10 SHIPPING INFORMATION

- 10.1 Grade or Purity: Commercial
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
A-T-U

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 0 |
| Flammability (Red) | 1 |
| Reactivity (Yellow) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
13.2 Molecular Weight: Not applicable
13.3 Boiling Point at 1 atm: Not pertinent (very high)
13.4 Freezing Point: 86°F = 30°C = 303°K
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 0.908 at 60°C (liquid)
13.8 Liquid Surface Tension: (est.)
25 dynes/cm = 0.025 N/m at 30°C
13.9 Liquid-Water Interfacial Tension: (est.)
50 dynes/cm = 0.050 N/m at 30°C
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: (est.) = 15,500 Btu/lb
= 8,600 cal/g = 360 × 10³ J/kg
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

NOTES

OYG

OILS, EDIBLE: VEGETABLE

Common Synonyms		Only liquid	Pale yellow	Weak, fatty odor
		Floats on water		
6.1 Flash Point: 610°F O.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical foam or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available				
Fire	Combustible			
Exposure	Not harmful			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Ester 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: colorless to pale yellow 4.3 Odor: Weak fatty		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: None is known 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: None 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: 610°F O.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical foam or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Ashland Oil Co. Chemical Products Division Perrin, Ill 61660 2. Sherwin Williams Co. 101 Prospect Ave. Cleveland, Ohio 44101 3. A. F. Staley Manufacturing Co. Decatur, Ill 62525									
11. HAZARD ASSESSMENT CODE (See 1220 Assessment Handbook, CG 446-3) A-F-1		10. SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>0</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>		Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.923 at 20°C (liquid) 13.8 Liquid Surface Tension: 25.125 dyne/cm at 20°C 13.9 Liquid-Water Interfacial Tension: 15.0 dyne/cm at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 16,000 Btu/lb 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Classification										
Health Hazard (Blue)	0										
Flammability (Red)	1										
Reactivity (Yellow)	0										
NOTES											

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OSX

OILS, FUEL: 6

Common Synonyms Diesel Fuel Residual fuel oil No. 6	Thick liquid Black Tar odor Usually floats on water
Fire	Combustible Flash point: 140°F (60°C) Ignition temperature: 765°F (413°C) Self-heating temperature: Not pertinent
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed Respiratory irritation May be dangerous if it enters water intakes
Water Pollution	Dangerous to aquatic life in high concentrations Fouling to shoreline May be dangerous if it enters water intakes

6 FIRE HAZARDS 6.1 Flash Point: > 140°F (60°C) 6.2 Flammable Limits in Air: 1-10% 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 765°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: 24 hr LC50 for juvenile American shad: 11 mg/l fresh water; 24 hr LC50 for juvenile American shad: 11 mg/l salt water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration: Potential Data not available								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Atlantic Richfield Co. 711 Fifth Ave. New York, N.Y. 10022 Shell Oil Co. 1 Shell Plaza Houston, Tex. 77001 Sun Oil Co. St. Davids, Pa. 19087								
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 445.3 A U	10 SHIPPING INFORMATION 10.1 Grades or Purities: Commercial 10.2 Storage Temperature: Elevated 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arrester								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></tbody></table>	Category	Classification	Health hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: 415 >> 1093°F = 212 >> 588°C = 485 >> 861°K 13.4 Freezing Point: 25 to 55°F = -4 to +13°C = 269 to 286°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.967 at 16°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -18,000 Btu/lb = -10,000 cal/g = -42,000 kJ/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health hazard (Blue)	0								
Flammability (Red)	2								
Reactivity (Yellow)	0								
NOTES									

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OTW

OILS, FUEL: 2

Common Synonyms: Home heating oil	Oil: liquid Yellow-brown Lube or fuel oil odor Floats on water
Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes If swallowed, will cause nausea, vomiting
Water Pollution	Dangerous to aquatic life in high concentrations Floating to shoreline May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Response Methods Handbook CG 446-41 Mechanical containment Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Home heating oil 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 133, 1223	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light brown 4.3 Odor: Fuel-oil-like characteristics
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles or face shield 5.2 Symptoms Following Exposure: INHALATION causes headache and slight dizziness. INGESTION causes nausea, vomiting, and cramping; depression of central nervous system, ranging from mild headache to anesthesia, coma, and death; pulmonary irritation; secondary to exhalation of solvent vapors; kidney and liver damage may be delayed. ASPIRATION causes severe lung irritation with coughing, gagging, dyspnea, substernal distress, and rapid developing pulmonary edema; irritation of bronchioles, pneumonia, and pneumonitis; acute onset of central nervous system depression; followed by depression. 5.3 Treatment for Exposure: INGESTION does NOT induce vomiting. ASPIRATION calls for rapid treatment: administer oxygen, seek medical attention on F.I.T.S. Wash with copious quantities of water. SKIN: remove solvent by wiping and wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not single value applicable 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade: LD ₅₀ 10 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Slight irritation to respiratory system; present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minor skin hazard. If spilled on clothing and allowed to remain, may cause irritation and reddening of skin. 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: 136 F (60) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 494 F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Drippen 24 hr. Toxic to American shad, Herring, brook trout, rainbow trout, etc. TL ₅₀ 100 mg/l water 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None						
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Atlantic Refining Co. 757 Fifth Ave. New York, N.Y. 10022 Shell Oil Co. Shell Plaza Houston, Tex. 77001 Sun Oil Co. No. Duane, Pa. 19087						
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook CG 446-3 A 11	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open flame, etc.						
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table> <tr> <td>Health Hazard (Blue)</td> <td>0</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </table>	Health Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: 147.40 F (64.67 C) (588.61 K) 13.4 Freezing Point: -20.1 F (-6.2 C) (263.1 K) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.879 at 20°C (liquid) 13.8 Liquid Surface Tension: 25.2 dynes/cm (0.025 N/m) at 20°C 13.9 Liquid-Water Interfacial Tension: 25.2 dynes/cm (0.025 N/m) at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 19,447 Btu/lb (46,000 kJ/kg) (42,770 kJ/mol) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Health Hazard (Blue)	0						
Flammability (Red)	2						
Reactivity (Yellow)	0						
NOTES Continued on page 1000A							

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OFR

OILS, FUEL: 4

Common Synonyms Residual fuel oil No. 4	Only liquid Dark Lube or fuel oil odor Floats on water
Fire	Combustible
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown Foaming to shoreline May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Mechanical containment: Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Residual fuel oil No. 4 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 13.1224	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Brown 4.3 Odor: Characteristic, like kerosene
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles or face shield 5.2 Symptoms Following Exposure: INGESTION: gastroenteral irritation. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure. 5.3 Treatment for Exposure: INGESTION: do NOT lavage or induce vomiting. ASPIRATION: treatment probably not required. delayed development of pulmonary irritation can be detected by serial chest x-rays, consider prophylactic antibiotic regime if condition warrants. EYES: wash with copious quantities of water. SKIN: wipe off and wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 1, TD ₀₁ 5 to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause smearing and reddening of the skin. 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS

- 6.1 Flash Point: $>130^{\circ}\text{F}$ ($>55^{\circ}\text{C}$)
 6.2 Flammable Limits in Air: 1.0% - 8.5%
 6.3 Fire Extinguishing Agents: Dry chemical,
foam, or carbon dioxide.
 6.4 Fire Extinguishing Agents Not to be Used:
Water may be ineffective.
 6.5 Special Hazards of Combustion Products:
Not pertinent.
 6.6 Behavior in Fire: Not pertinent.
 6.7 Ignition Temperature: $>500^{\circ}\text{F}$
 6.8 Electrical Hazard: Not pertinent.
 6.9 Burning Rate: 4 in./min.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD):
Data not available.
 8.4 Food Chain Concentration Potential:
None.

9. SELECTED MANUFACTURERS

1. Atlantic Richfield Co.
717 Fifth Ave.
New York, N. Y. 10022
 2. Shell Oil Co.
1 Shell Plaza
Houston, Tex. 77001
 3. Sun Oil Co.
St. Davids, Pa. 19081

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
 7.2 Reactivity with Common Materials:
No reaction.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and
Caustics: Not pertinent.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Commercial.
 10.2 Storage Temperature: Ambient.
 10.3 Inert Atmosphere: No requirement.
 10.4 Venting: Open flame protectors.

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3
 A T U

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations:
Combustible Liquid
 12.2 NAS Hazard Rating for Bulk Water
Transportation: Not listed.
 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 0 |
| Flammability (Red) | 2 |
| Reactivity (Yellow) | 0 |

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid.
 13.2 Molecular Weight: Not pertinent.
 13.3 Boiling Point at 1 atm: 214 to $>1092^{\circ}\text{F}$
 $= 101$ to $>589^{\circ}\text{C}$ $= 374$ to 861°K
 13.4 Freezing Point: -20 to <-1
 $= -29$ to $<-4^{\circ}\text{C}$ $= 244$ to 264°K
 13.5 Critical Temperature: Not pertinent.
 13.6 Critical Pressure: Not pertinent.
 13.7 Specific Gravity:
0.904 at 15°C (liquid)
 13.8 Liquid Surface Tension:
Data not available.
 13.9 Liquid-Water Interfacial Tension:
Data not available.
 13.10 Vapor (Gas) Specific Gravity:
Not pertinent.
 13.11 Ratio of Specific Heats of Vapor (Gas):
Not pertinent.
 13.12 Latent Heat of Vaporization:
Not pertinent.
 13.13 Heat of Combustion: $-17,400$ Btu/lb
 $= -4,000$ cal/g $= -40,000$ J/kg
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: Not pertinent.

Continued on page 5 and 6

NOTES

Common Synonyms Residual fuel oil No. 5		Only liquid	Dark	Strong kerosene odor
		Usually floats on water		
Fire	Combustible			
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Residual fuel oil No. 5 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 111 1221		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State, as shipped: Liquid 4.2 Color: Brown 4.3 Odor: Characteristic, like kerosene		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles or face shield 5.2 Symptoms Following Exposure: INGESTION: Gastrointestinal irritation. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure 5.3 Treatment for Exposure: INGESTION: do NOT have person induce vomiting. ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be delayed by several chest x-rays, consider prophylactic antibiotic regime. EYE: Irritation: EYES: wash with copious quantities of water. SKIN: wipe off and wash with soap and water 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade III D to IV p. kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: $> 130^{\circ}\text{F}$ (C.C.) 6.2 Flammable Limits in Air: 1-8% 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Fox Chain Concentration Potential: None									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Atlantic Richfield Co. 717 Fifth Ave. New York, N.Y. 10022 2. Shell Oil Co. 1 Shell Plaza Houston, Tex. 77001 3. Sun Oil Co. St. Davids, Pa. 19081									
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-1) A 11		10. SHIPPING INFORMATION 10.1 Grades or Purity: Fuel oil No. 5 (heavy) Fuel oil No. 5 (light) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Open flame arrester									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>0</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>		Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: $426 > 1062^{\circ}\text{F}$ $= 219 > 570^{\circ}\text{C}$ (491-584) $^{\circ}\text{K}$ 13.4 Freezing Point: $0 < 15 < 10 < 273^{\circ}\text{K}$ 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity 0.936 at 16°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: $44,000 \text{ Btu/lb}$ $= 10,000 \text{ cal/g}$ (41,868 kJ/kg) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Classification										
Health Hazard (Blue)	0										
Flammability (Red)	2										
Reactivity (Yellow)	0										
NOTES											

OOD

OILS, FUEL: I-D

Common Synonyms Diesel oil (light)		Oil: liquid	Yellow-brown	Little or fuel oil odor		
		Floats on water				
<table border="1"> <tr> <td>Fire</td> <td>Combustible</td> </tr> </table>					Fire	Combustible
Fire	Combustible					
<table border="1"> <tr> <td>Exposure</td> <td>LIQUID Irritating to skin and eyes. Harmful if swallowed.</td> </tr> </table>					Exposure	LIQUID Irritating to skin and eyes. Harmful if swallowed.
Exposure	LIQUID Irritating to skin and eyes. Harmful if swallowed.					
<table border="1"> <tr> <td>Water Pollution</td> <td>Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if enters water intakes.</td> </tr> </table>					Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if enters water intakes.
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if enters water intakes.					
1. RESPONSE TO DISCHARGE See Response Methods Manual: CG 646-4. Mechanical oil separator. Should be removed and proper treatment.		2. LABELS No hazard label required by U.S. or Federal Regulations.				
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Diesel oil, light. 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures. 3.3 Chemical Formula: Not applicable. 3.4 IMCO United Nations Numerical Designation: 1500.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Light brown. 4.3 Odor: Characteristic.				
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles, face shield. 5.2 Symptoms Following Exposure: INHALATION causes headache and coughing. INGESTION causes nausea, vomiting, and a burning depression of central nervous system. IRITATION causes irritation of skin and eyes. PNEUMONITIS may develop if inhaled vapors are inhaled in sufficient quantities. ASPIRATION causes coughing, gagging, choking, and rapid breathing. INGESTION causes nausea, vomiting, and a burning depression of central nervous system. 5.3 Treatment for Exposure: INGESTION do NOT induce vomiting. Seek medical attention. ASPIRATION get victim to fresh air immediately. EYES wash with large quantity of water. SKIN remove victim from exposure and wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not applicable. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 1 (Dangerous). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Slight irritation of eyes, nose, and throat if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause staining and reddening of skin. 5.10 Odor Threshold: 0.7 ppm.						

6. FIRE HAZARDS 6.1 Flash Point: (API) 60°C 6.2 Flammable Limits in Air: 1.1% to 7.6% 6.3 Fire Extinguishing Agents: D, foam, water. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 4 mm/min.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Not applicable (24 hr LC50 for American oysters). 8.2 Waterway Toxicity: Not applicable (LD50 for oysters). 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not pertinent. 7.2 Reactivity with Common Materials: Not pertinent. 7.3 Stability During Transport: None. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS Arthur's Refining Co. 100 E. 1st Ave. New York, N.Y. 10022 2. Shell Refining New York Houston, Tex. 77001 3. Sun Oil Co. St. Davids, Pa. 19382									
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual: CG 646-5. VII		10. SHIPPING INFORMATION 10.1 Grades or Purity: Description: D ASTM 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not applicable. 10.4 Venting: Open flame protected.									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table border="1"> <tr> <th>Category</th> <th>Classification</th> </tr> <tr> <td>Health Hazard (Blue)</td> <td>0</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </table>		Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: Not pertinent. 13.3 Boiling Point at 1 atm: (API) 340°C (644°F) at 101.3 kPa (14.7 psi). 13.4 Freezing Point: (API) 15°C (59°F) at 101.3 kPa (14.7 psi). 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.84 at 15°C (59°F). 13.8 Liquid Surface Tension: 24.12 dynes/cm at 20°C (68°F). 13.9 Liquid-Water Interfacial Tension: 47.49 dynes/cm at 20°C (68°F). 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 101.16 kcal/kg (42.3 Btu/lb) at 101.3 kPa (14.7 psi). 13.13 Heat of Combustion: 42.3 Btu/lb (17.7 kJ/kg) at 101.3 kPa (14.7 psi). 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.	
Category	Classification										
Health Hazard (Blue)	0										
Flammability (Red)	2										
Reactivity (Yellow)	0										
NOTES											

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OTD

OILS, FUEL: 2-D

Common Synonyms Diesel oil medium		Odor: liquid	Yellow-brown	Late or fuel oil odor
Floats on water				
Physical State (as shipped): LIQUID Color: Yellow-brown Odor: Late or fuel oil odor				
Fire	Combustible Flash Point: 125°F (52°C) Autoignition Temperature: 400°F (204°C) Burning Rate: 4 in/min			
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed Inhalation: Irritating Ingestion: Harmful Skin Contact: Irritating Eye Contact: Irritating Inhalation: Irritating			
Water Pollution	Dangerous to aquatic life at high concentrations Floating to shoreline May be dangerous if it enters water intakes			
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-4 Mechanism: self-ignition Should be contained Chemical and physical reaction		2 LABELS No Hazardous Ingredients Late Federal Regulation		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Diesel oil medium 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: $C_{12}H_{26}$ 3.4 IMCO United Nations Numerical Designation: 1.2		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow-brown 4.3 Odor: Late or fuel oil odor		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles, face shield 5.2 Symptoms Following Exposure: INGESTION causes nausea, vomiting and cramping, depression of central nervous system, burning of mouth, throat, stomach, and skin, and death. Inhalation causes irritation of respiratory tract, coughing, choking, and damage to the lungs. ASPIRATION causes severe inflammation with coughing, gagging, wheezing, substernal distress, and rapidly developing pulmonary edema. Later signs of bronchopneumonia and pneumonia are acute onset of central nervous system excitement followed by depression. 5.3 Treatment for Exposure: INGESTION: DO NOT induce vomiting. ASPIRATION: Do not feed or administer oxygen. Seek medical attention. EVEN with water, give quantities of 1-2 LITERS. Do not use mouth-to-mouth respiration and wash with clean and warm water. 5.4 Toxicity by Inhalation (Threshold Limit Value): No specific TLV appears. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Irritant. LD ₅₀ 5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Slight irritation to eyes and respiratory tract. Irritation is temporary. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Moderate and irritant to skin and eyes. Irritation may cause swelling and reddening of skin. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point: 125°F (52°C)		8.1 Aquatic Toxicity: 24 hr LC ₅₀ for American shad 11% in water	
6.2 Flammable Limits in Air: 1.1-7.1%		8.2 Waterfowl Toxicity: Data not available	
6.3 Fire Extinguishing Agents: (1) chemical foam (2) water		8.3 Biological Oxygen Demand (BOD): Data not available	
6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective		8.4 Food Chain Concentration Potential: None	
6.5 Special Hazards of Combustion Products: No peroxide			
6.6 Behavior in Fire: No peroxide			
6.7 Ignition Temperature: 400°F (204°C)			
6.8 Electrical Hazard: No peroxide			
6.9 Burning Rate: 4 in/min			
7 CHEMICAL REACTIVITY		9 SELECTED MANUFACTURERS	
7.1 Reactivity with Water: No reaction		Vulcan Petroleum 7701 E. Ave. New York, N.Y. 10022	
7.2 Reactivity with Common Materials: No reaction		2. No. 000 Sheep Point Houston, Tex. 77001	
7.3 Stability During Transport: Stable		3. No. 000 S. Davis, Pa. 15807	
7.4 Neutralizing Agents for Acids and Caustics: No peroxide			
7.5 Polymerization: No peroxide			
7.6 Inhibitor of Polymerization: No peroxide			
10 SHIPPING INFORMATION			
10.1 Grades or Purity: Diesel oil 2-D ASTM			
10.2 Storage Temperature: Ambient			
10.3 Inert Atmosphere: No peroxide			
10.4 Venting: Open flame heaters			
11 HAZARD ASSESSMENT CODE		13 PHYSICAL AND CHEMICAL PROPERTIES	
See Hazard Assessment Handbook, CG 444-1		13.1 Physical State at 15°C and 1 atm: Liquid	
X 1.1		13.2 Molecular Weight: 170.34	
		13.3 Boiling Point at 1 atm: 343°F (173°C)	
		13.4 Freezing Point: 1°F (-17°C)	
		13.5 Critical Temperature: No peroxide	
		13.6 Critical Pressure: No peroxide	
		13.7 Specific Gravity: 0.85 (at 15°C)	
		13.8 Liquid Surface Tension: Data not available	
		13.9 Liquid-Water Interfacial Tension: Data not available	
		13.10 Vapor (Gas) Specific Gravity: No peroxide	
		13.11 Ratio of Specific Heats of Vapor (Gas): No peroxide	
		13.12 Latent Heat of Vaporization: No peroxide	
		13.13 Heat of Combustion: 14,451 Btu/lb = 14,451 kcal/kg	
		13.14 Heat of Decomposition: No peroxide	
		13.15 Heat of Solution: No peroxide	
		13.16 Heat of Polymerization: No peroxide	
12 HAZARD CLASSIFICATIONS			
12.1 Code of Federal Regulations: Combustible Liquid			
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed			
12.3 NFPA Hazard Classifications:			
Category	Classification		
Health Hazard (H)	3		
Flammability (F)	2		
Reactivity (R)	1		
NOTES			

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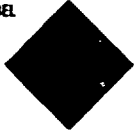
OON	OILS, FUEL: NO. 1
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Common Synonyms: Kerosene Lamp oil JP-1	Waters: liquid Floats on water	Colorless	Kerosene odor
Fire	Combustible		
Exposure	LIQUID Irritating to skin and eyes Harmful if swallowed		
Water Pollution	Dangerous to aquatic life in high concentrations Floating to shoreline May be dangerous if it enters water intakes		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Mechanical cleaning Should be removed Chemical and physical cleaning		2 LABELS No hazard labels required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: JP Kerosene Kerosene Kerosene 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 190 223		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light brown 4.3 Odor: Characteristic	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Protection gloves, goggles, and clothing 5.2 Symptoms Following Exposure: INGESTION causes irritation of gas, burning, throat pain, nausea, vomiting, diarrhea, and dizziness. ASPIRATION causes irritation of the lungs, coughing, wheezing, and difficulty breathing. SKIN contact causes irritation and rapidly developing dermatitis. EYES cause irritation and tearing. INHALATION causes irritation of the respiratory tract and may lead to bronchitis and pneumonia. 5.3 Treatment for Exposure: INGESTION: Do NOT induce vomiting. Give plenty of water. ASPIRATION: Remove from exposure. Administer oxygen if possible. SKIN: Wash with plenty of water. EYES: Wash with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm (average) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1 (Highly Toxic) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight irritation of the eyes in high concentrations if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing, it is allowed to remain, may cause staining and reddening of the skin. 5.10 Odor Threshold: 1 ppm			

6 FIRE HAZARDS 6.1 Flash Point: 100°F (38°C) 6.2 Flammable Limits in Air: 1.1% to 7.6% 6.3 Fire Extinguishing Agents: Dry chemical, foam, water (not effective) 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 422°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 in/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 15% (5 days) 8.4 Food Chain Concentration Potential: None
9 SELECTED MANUFACTURERS Atlantic Richfield 700 East Ave. New York, N.Y. 10022 Shell Oil Co. Shell Plaza Houston, Tex. 77001 Sun Oil Co. 10000 North Loop West	
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not pertinent 7.2 Reactivity with Common Materials: Not pertinent 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	
10 SHIPPING INFORMATION 10.1 Grades or Purity: Light hydrocarbon distillate (JP-1) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open flame accepted	
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A 1.1	
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Category Rating Fire 2 Health 0 Vapor Irritant 0 Liquid - Solid Irritant 0 Pressure 0 Water Pollution 0 Human Toxicity 0 Aquatic Toxicity 0 Acute Effects 0 Reactivity 0 Other Chemicals 0 Water 0 Self-Reactive 0	
13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: 190 to 310°C (374 to 582°F) 13.4 Freezing Point: -25 to -1°C (-13 to 32°F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.78 to 0.82 (at 15°C) 13.8 Liquid Surface Tension: 24 to 28 dyne/cm (at 15°C) 13.9 Liquid-Water Interfacial Tension: 25 to 30 dyne/cm (at 15°C) 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 250 to 300 Btu/lb (700 to 850 J/g) 13.13 Heat of Combustion: 130,000 to 140,000 Btu/lb (30,000 to 32,000 J/g) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
12.3 NFPA Hazard Classifications Category Classification Health Hazard (Blue) 0 Flammability (Red) 2 Reactivity (Yellow) 0	
NOTES	

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OAS	OHS, MISCELLANEOUS: ABSORPTION		
Common Synonyms: Achlorinated oil	Liquid	Colorless to pale yellow	Faint oil odor
	Floats on water		
Not for human consumption May irritate skin and eyes Harmful if swallowed May be dangerous if it enters water intakes May cause smogging and reddening of skin			
Fire	Combustible Flash point: 100°F (38°C) Boiling point: 300°F (150°C)		
Exposure	LIQUID: Irritating to skin and eyes. Harmful if swallowed. VAPORS: May irritate respiratory tract. May cause smogging and reddening of skin.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Feeding to shoreline may be dangerous if it enters water intakes. May cause smogging and reddening of skin.		
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4. Mechanical containment. Should be removed. Chemical and physical treatment.		2. LABELS See Hazard Assessment Handbook, CG 446-3. No hazard label required by Code of Federal Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonym(s): Achorchlorated oil. 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures. 3.3 Chemical Formula: Not applicable. 3.4 HMCO United Nations Numerical Designation: 1.1 (270).		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Pale yellow to colorless. 4.3 Odor: Faint petroleum.	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles or face shield. 5.2 Symptoms Following Exposure: INGESTION: irritation of stomach; ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure. (Delayed development can be detected by serial chest x-rays.) 5.3 Treatment for Exposure: INGESTION: have victim drink water or milk; do NOT induce vomiting. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade I LD ₅₀ : 5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: None. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of skin. 5.10 Odor Threshold: Data not available.			
6. FIRE HAZARDS 6.1 Flash Point: 100°F. 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical foam or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 400°F. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 4 mph/min.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Cities Service Co., Inc. 60 Wall Tower New York, N.Y. 10005 2. Exxon Co. Houston, Tex. 77001 3. Standard Oil Co. (Indiana) 910 S. Michigan Ave. Chicago, Ill. 60605	
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3. A T L		10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arrester.	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid. 12.2 NAS Hazard Rating for Bulk Water Transport: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		12. PHYSICAL AND CHEMICAL PROPERTIES 12.1 Physical State at 15°C and 1 atm: Liquid. 12.2 Molecular Weight: Not pertinent. 12.3 Boiling Point at 1 atm: 300°F = 150°C. 12.4 Freezing Point: Not pertinent. 12.5 Critical Temperature: Not pertinent. 12.6 Critical Pressure: Not pertinent. 12.7 Specific Gravity: (est.) 0.85 at 20°C (liquid). 12.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C. 12.9 Liquid-Water Interfacial Tension: (est.) 30 dynes/cm = 0.03 N/m at 20°C. 12.10 Vapor (Gas) Specific Gravity: Not pertinent. 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 12.12 Latent Heat of Vaporization: Not pertinent. 12.13 Heat of Combustion: (est.) 15,000 Btu/lb = 10,000 cal/g = 420 W·hr/lb. 12.14 Heat of Decomposition: Not pertinent. 12.15 Heat of Solution: Not pertinent. 12.16 Heat of Polymerization: Not pertinent.	
NOTES			

Common Synonyms: Light oil		Liquid Flashes on water. Flammable, irritating vapor is produced.	Colorless to yellow Pleasant odor
No known acute or chronic health hazards.			
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. No known fire or explosion data.		
Exposure	No known Maximum Allowable Concentration (MAC) or Threshold Limit Value (TLV). VAPOR Irritating to eyes, nose and throat. LIQUID Irritating to skin and eyes. Harmful if swallowed.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Burning in shoreline. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE See Emergency Response Manual, CG 444-4. Use warning: High Flammability. Use caution.		2. LABEL 	
3. CHEMICAL DESIGNATIONS 21 Synonyms: Light oil. 22 Coast Guard Competibility Classification: Miscellaneous hydrocarbon mixtures. 23 Chemical Formula: Not applicable. 24 IMCO United Nations Numerical Designation: 1202.		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid. 42 Color: Colorless to yellow. 43 Odor: Aromatic, benzene-like odor.	
5. HEALTH HAZARDS 51 Personal Protective Equipment: Protective gloves, goggles, face shield. 52 Symptoms Following Exposure: Vapor causes eye irritation, burning and tearing; eye injury may result if contact is prolonged. 53 Treatment for Exposure: INGESTION: Have victim drink water or milk. Do not induce vomiting. LAY on back with head to one side. SKIN: Wipe, flush with water and soap. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Data not available. 57 Lethal Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Vapor causes a mild irritation, burning or stinging system if present in high concentrations. These few symptoms. 59 Liquid or Solid Irritant Characteristics: Minimal hazard. If spilled, it is irritating and should be removed to cause smearing and reddening of the skin. 510 Odor Threshold: Data not available.			

6 FIRE HAZARDS 6.1 Flash Point: Not applicable 6.2 Flammable Limits in Air: Not applicable 6.3 Fire Extinguishing Agents: Not applicable 6.4 Fire Extinguishing Agents Not to be Used: Not applicable 6.5 Special Hazards of Combustion Products: Not applicable 6.6 Behavior in Fire: Not applicable 6.7 Ignition Temperature: Not applicable 6.8 Electrical Hazard: Not applicable 6.9 Burn and Skin Irritation: Not applicable	8 WATER POLLUTION 8.1 Aquatic Toxicity: Not applicable 8.2 Waterfowl Toxicity: Not applicable 8.3 Biological Oxygen Demand (BOD): Not applicable 8.4 Food Chain Concentration Potential: Not applicable																										
9 SELECTED MANUFACTURERS Chemical Process Corp. 100 Madison Ave. New York, N.Y. 10017 Koppers Oneida Mall Piquette Bldg. Piquette, Pa. 15069 Northland Newland Land Piquette, Pa. 15069																											
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not applicable 7.2 Reactivity with Common Materials: Not applicable 7.3 Stability During Transport: Not applicable 7.4 Neutralizing Agents for Acids and Caustics: Not applicable 7.5 Polymerization: Not applicable 7.6 Inhibitor of Polymerization: Not applicable	10 SHIPPING INFORMATION 10.1 Grades or Purities: Not applicable 10.2 Storage Temperature: Not applicable 10.3 Inert Atmosphere: Not applicable 10.4 Venting: Open flame reaction not possible																										
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, 1968 N T L	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Liquid 13.2 Molecular Weight: Not applicable 13.3 Boiling Point at 1 atm.: 273°C (501°F) 13.4 Freezing Point: Not applicable 13.5 Critical Temperature: Not applicable 13.6 Critical Pressure: Not applicable 13.7 Specific Gravity (est. G/L at 20°C liquid): Not applicable 13.8 Liquid Surface Tension: Not applicable 13.9 Liquid-Water Interfacial Tension: Not applicable 13.10 Vapor (Gas) Specific Gravity: Not applicable 13.11 Ratio of Specific Heats of Vapor (Gas): Not applicable 13.12 Latent Heat of Vaporization: Not applicable 13.13 Heat of Combustion: Not applicable 13.14 Heat of Decomposition: Not applicable 13.15 Heat of Solution: Not applicable 13.16 Heat of Polymerization: Not applicable																										
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 HAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Category</th> <th style="width: 40%;">Rating</th> </tr> </thead> <tbody> <tr> <td>Health</td> <td></td> </tr> <tr> <td> Acute Toxicity</td> <td>1</td> </tr> <tr> <td> Long-Term Acute Toxicity</td> <td>1</td> </tr> <tr> <td> Irritation</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td> Hazard Toxicity</td> <td>2</td> </tr> <tr> <td> Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td> Acute Effect</td> <td>4</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td> Explosive hazard</td> <td>2</td> </tr> <tr> <td> Water</td> <td>1</td> </tr> <tr> <td> Self-Reaction</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classification: Not used	Category	Rating	Health		Acute Toxicity	1	Long-Term Acute Toxicity	1	Irritation	1	Water Pollution		Hazard Toxicity	2	Aquatic Toxicity	2	Acute Effect	4	Reactivity		Explosive hazard	2	Water	1	Self-Reaction	1	
Category	Rating																										
Health																											
Acute Toxicity	1																										
Long-Term Acute Toxicity	1																										
Irritation	1																										
Water Pollution																											
Hazard Toxicity	2																										
Aquatic Toxicity	2																										
Acute Effect	4																										
Reactivity																											
Explosive hazard	2																										
Water	1																										
Self-Reaction	1																										

OCR

OILS, MISCELLANEOUS: CROTON

Common Synonyms Croton tiglium oil Croton oil		Liquid	Dark	Unpleasant odor
Floats on water				
AVOID CONTACT WITH LIQUID. KEEP PEOPLE AWAY. Stop discharge if possible. Call fire department. Isolate and remove discharged material. Notify local health or pollution control agencies.				
Fire	Combustible Extinguish with dry chemical, foam, carbon dioxide, etc. Water may be ineffective on fire.			
 <u>Exposure</u>	CALL FOR MEDICAL AID LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes Remove or contaminated clothes and shoes. Flush affected eyes with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, and victim is CONSCIOUS, have victim drink water or milk. DO NOT INDUCE VOMITING.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous, if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Crotonols; Croton stigma L. oil. 3.2 Coast Guard Compatibility Classification: Esters (13) 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Dark 4.3 Odor: Unpleasant, acidic		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves and any other protective clothing to prevent contact with skin. 5.2 Symptoms Following Exposure: Contact of liquid with eyes causes severe irritation. May induce severe skin irritation, inflammation, swelling, and pustule formation. Absorption through the skin may cause purging. Ingestion causes burning of the mouth and stomach and drastic purging, possibly leading to collapse and death. Small doses have a strong laxative effect. 5.3 Treatment for Exposure: EYES: flush with water. A 2% hydrocortisone ointment is recommended. SKIN: remove as much liquid as possible from skin by use of a good solvent such as acetone or alcohol, wash with soap and water. INGESTION: for gastrointestinal symptoms, use demulcents; further treatment is symptomatic; do NOT induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4, LD ₅₀ < 50 mg/kg 5.7 Late Toxicity: Has been used in cancer research as a promoter for other compounds that cause skin cancer. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry chemical foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Consolidated Midland Corporation 195 East Main Street Brewster, N. Y. 10809
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A T U	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Not pertinent (very high) 13.4 Freezing Point: 0 to 18°F = -18 to -8°C = 255 to 265°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: (est.) 0.946 at 15°C (liquid) 13.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (est.) 50 dynes/cm = 0.050 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (est.) -16,800 Btu/lb = -9,800 cal/g = -390 × 10³ J/g 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

OLS

OILS, MISCELLANEOUS: LINSEED

Common Synonyms Flaxseed oil Raw linseed oil Linseed oil		Liquid Floats on water	Light yellow to dark yellow	Paint like odor
Stop discharge if possible Call fire department Isolate and remove spilled material Notify local fire and police departments				
Fire	Combustible Extinguish with dry chemical, foam, carbon dioxide. Water may be effective if fire is small.			
Exposure	LIQUID Not harmful Do not absorb on skin			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes No acute effects with oil spills on fish No biodegradation in cold water lakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Mechanical containment Should be removed Chemical and physical treatment			2. LABELS No label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Flaxseed oil, Raw linseed oil 3.2 Coast Guard Compatibility Classification: Esters (13) 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: Not listed			4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Pale yellow to dark amber 4.3 Odor: Like oil base paint	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Contact of liquid with eyes causes mild irritation. Prolonged contact with skin can cause dermatitis. Ingestion of large doses (over 1 oz) has laxative effect. 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: do NOT induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 0, LD ₅₀ > 15 g/kg 5.7 Late Toxicity: Liver damage in rats (from addition of oil to diet) 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: 515°F O.C., 403°F C.C.	8.1	Aquatic Toxicity: Data not available
6.2	Flammable Limits in Air: Not pertinent	8.2	Waterfowl Toxicity: Data not available
6.3	Fire Extinguishing Agents: Dry chemical foam, carbon dioxide	8.3	Biological Oxygen Demand (BOD): Data not available
6.4	Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing; water may be ineffective	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: Not pertinent		
6.6	Behavior in Fire: Not pertinent		
6.7	Ignition Temperature: 650°F		
6.8	Electrical Hazard: Not pertinent		
6.9	Burning Rate: 4 mm/min		
		9. SELECTED MANUFACTURERS	
		1	Cargill, Inc. Cargill Building Minneapolis, Minn. 55402
		2	PVQ International, Inc. 416 Division Street Bounton, N. J. 07005
		3	Textron, Inc. Spencer Kellogg Division 120 Delaware Ave. Buffalo, N. Y. 14240
7. CHEMICAL REACTIVITY			
7.1	Reactivity with Water: No reaction		
7.2	Reactivity with Common Materials: No reaction		
7.3	Stability During Transport: Stable		
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent		
7.5	Polymerization: Not pertinent		
7.6	Inhibitor of Polymerization: Not pertinent		
		10 SHIPPING INFORMATION	
		10.1	Grades or Purity: Raw grade, varnish grade, grinding grade, heat bodied grade, Mown grade
		10.2	Storage Temperature: Ambient
		10.3	Inert Atmosphere: No requirement
		10.4	Venting: Open (flame arrester)
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A-T-L		13 PHYSICAL AND CHEMICAL PROPERTIES	
		13.1	Physical State at 15°C and 1 atm: Liquid
		13.2	Molecular Weight: Not pertinent
		13.3	Boiling Point at 1 atm: Not pertinent (very high)
		13.4	Freezing Point: -2°F = -19°C = 254°K
		13.5	Critical Temperature: Not pertinent
		13.6	Critical Pressure: Not pertinent
		13.7	Specific Gravity: 0.932 at 20°C (liq.-liq.)
		13.8	Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C
		13.9	Liquid-Water Interfacial Tension: (est.) 40 dynes/cm = 0.040 N/m at 20°C
		13.10	Vapor (Gas) Specific Gravity: Not pertinent
		13.11	Ratio of Specific Heats of Vapor (Gas): Not pertinent
		13.12	Latent Heat of Vaporization: Not pertinent
		13.13	Heat of Combustion: -16,800 Btu/lb = -9,300 cal/g = -390 X 10 ³ J/kg
		13.14	Heat of Decomposition: Not pertinent
		13.15	Heat of Solution: Not pertinent
		13.16	Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS			
12.1	Code of Federal Regulations: Not listed		
12.2	NAS Hazard Rating for Bulk Water Transportation: Not listed		
12.3	NFPA Hazard Classifications:		
	Category	Classification	
	Health Hazard (Blue)	0	
	Flammability (Red)	1	
	Reactivity (Yellow)	0	
		<i>(Continued on pages 5 and 6)</i>	
NOTES			

OLB

OILS, MISCELLANEOUS: LUBRICATING

Common Synonyms: Crankcase oil Transmission oil Motor oil	Oil: liquid Yellow-brown Lube oil odor Flots on water
May discharge if spilled: Call fire department Do not use fire hose Do not use high pressure water Do not use high pressure steam	
Fire	Combustible Extinction with dry powder, foam, carbon dioxide Water may be used in large quantities Do not spray foam directly on fire
Exposure	CAUTION: IRRITANT AND LIQUID Irritating to skin and eyes Harmful if swallowed Do not inhale vapors Do not get on skin or clothes If on skin, wash with plenty of water If swallowed, do not induce vomiting If swallowed, give milk or water Do not induce vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes No acute toxicity to fish No chronic toxicity to fish
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4)	2 LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 31 Synonyms: Crankcase oil Motor oil Transmission oil 32 Coast Guard Compatibility Classification Miscellaneous hydrocarbon mixtures 33 Chemical Formula: Not applicable 34 IMCO United Nations Numerical Designation: 33/1270	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Yellow fluorescent 43 Odor: Characteristic
5 HEALTH HAZARDS 51 Personal Protective Equipment: Protective gloves, goggles or face shield 52 Symptoms Following Exposure: INGESTION: minimal gastrointestinal tract irritation; increased frequency of bowel passage may occur. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure. 53 Treatment for Exposure: INGESTION: do NOT induce vomiting. ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays. EYES: flush with copious quantities of water. SKIN: wipe off and wash with soap and water. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade I LD ₅₀ 5 to 15 g/kg 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eye or respiratory system if present in high concentrations. The effect is temporary. 59 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause stinging and reddening of the skin. 60 Odor Threshold: Data not available	

6 FIRE HAZARDS 61 Flash Point: 300°F-450°F (C) 62 Flammable Limits in Air: Data not available 63 Fire Extinguishing Agents: Dry chemical foam or carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Water of foam may cause frothing 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: 500°F (300°C) 68 Electrical Hazard: Not pertinent 69 Burning Rate: 4 mm/min	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterflow Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Shell Oil Co. 1 Shell Plaza Houston, Tex. 77001 2 Standard Oil Co. (Indiana) 910 S. Michigan Ave. Chicago, Ill. 60605 3 Sun Oil Co. St. Davids, Pa. 19087								
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A 1-L	10. SHIPPING INFORMATION 101 Grades or Purity: Various viscosities 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open (flame arresters)								
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed 122 HAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>0</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: Not pertinent 133 Boiling Point at 1 atm: Very high 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: (est.) 0.902 at 20°C (liquid) 138 Liquid Surface Tension: 36.37 dyne/cm = 0.03637 N/m at 20°C 139 Liquid-Water Interfacial Tension: 33.54 dyne/cm = 0.03354 N/m at 20°C 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: -18,486 Btu/lb = -10,270 cal/g = -42,948 kJ/kg 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	1								
Reactivity (Yellow)	0								
NOTES (Continued on pages 5 and 6)									

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OMN

OILS, MISCELLANEOUS: MINERAL

Common Synonyms White oil Liquid Petroleum		Only liquid	Colorless	Odorless								
Floats on water												
Stop discharge if possible. Call fire department. Avoid contact with liquid. Isolate and remove discharged material. Notify local health and pollution control agencies.												
Fire	Combustible Extinguish with dry chemical, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.											
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water. Do NOT induce vomiting.											
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operator of nearby water intakes.											
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.										
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Liquid petroleum White oil 3.2 Coast Guard Compatibility Classification Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: 13/1270		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Very faint										
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: Ingestion of liquid can cause very loose bowel movements. 5.3 Treatment for Exposure: EYES wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade I LD ₅₀ 5 to 15 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Not pertinent												
6. FIRE HAZARDS 6.1 Flash Point: 180 F (82 C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 560-700 F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: 4 mm/min												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent												
8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None												
9. SELECTED MANUFACTURERS 1. Shell Oil Co. 1 Shell Plaza Houston, Tex 77001 2. Standard Oil Co. (Indiana) 910 N. Michigan Ave. Chicago, Ill 60605 3. Sun Oil Co. St. Davids, Pa 19083												
10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial refined 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A 1-1		12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>			Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0
Category	Classification											
Health Hazard (Blue)	0											
Flammability (Red)	1											
Reactivity (Yellow)	0											
		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.822 at 20°C (liquid) 13.8 Liquid Surface Tension: 27 dynes/cm = 0.027 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 47 dynes/cm = 0.047 N/m at 70°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent										
NOTES												

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OMT

OILS, MISCELLANEOUS: MOTOR

Common Synonyms Crankcase oil Lubricating oil	Only liquid	Yellow brown	Lube oil odor
No discharge if possible Call fire department Avoid contact with liquid Isolate and remove discharged material Notify local health and pollution control agencies			
Fire	Combustible Extinguish with dry chemical, foam or water. The water may be ineffective on fire. Cool exposed containers with water.		
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water IF IN EYES, hold eyelids open and flush with plenty of water IF SWALLOWED, do not induce vomiting. If ONLY have to drink water or milk DO NOT INDUCE VOMITING.		
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes Notify local health and wildlife agencies Notify operators of nearby water intakes		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 31 Synonyms: crankcase oil Lubricating oil Transmission oil 32 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 33 Chemical Formula: Not applicable 34 IMCO/United Nations Numerical Designation: 3 + 1270		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Yellow fluorescent 43 Odor: Characteristic	
5. HEALTH HAZARDS 51 Personal Protective Equipment: Protective gloves, goggles or face shield 52 Symptoms Following Exposure: INGESTION: minimal gastrointestinal irritation; increased frequency of bowel passage may occur. ASPIRATION: pulmonary irritation is normally minimal but may become more severe several hours after exposure 53 Treatment for Exposure: INGESTION: do NOT lay up or induce vomiting. ASPIRATION: treatment probably not required; delayed development of pulmonary irritation can be detected by serial chest x-rays. EYES: wash with copious amounts of water. SKIN: wipe off oil and wash with soap and water 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade I LD₅₀ 5 to 15 g/kg 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary 59 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin 510 Odor Threshold: Data not available			

6 FIRE HAZARDS 61 Flash Point: 275 (400)°F (C) (C) 62 Flammable Limits in Air: Data not available 63 Fire Extinguishing Agents: Dry chemical foam, or carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: 325-625°F 68 Electrical Hazard: Not pertinent 69 Burning Rate: 4 mm/min	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterlow Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Shell Oil Co. 1 Shell Plaza Houston, Tex. 77001 2 Standard Oil Co. (Indiana) 910 S. Michigan Ave. Chicago, Ill. 60605 3 Sun Oil Co. St. Davids, Pa. 19087
	10 SHIPPING INFORMATION 101 Grades or Purity: Various viscosities 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open (flame arresters)
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-F-I	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: Not pertinent 133 Boiling Point at 1 atm: Very high 134 Freezing Point: -29.9°F = -34.4°C = 238.5°K 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 0.840-0.962, 15°C, liquid 138 Liquid Surface Tension: 36.47-54 dynes/cm = 0.036-0.047 N/m at 20°C 139 Liquid-Water Interfacial tension: 33-54 dynes/cm = 0.033-0.054 N/m at 20°C 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: -18,456 Btu/lb = -10,270 cal/g = -42,995 × 10³ J/kg 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed	

Continued on pages 1 and 6

NOTES

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ONF

OILS, MISCELLANEOUS: NEATSFOOT

Common Synonyms		Only liquid	Pale yellow	Peculiar odor
		Floats on water		
Stop discharge if possible Call fire department Isolate and remove discharging area Notify local health and fire departments				
Fire		Combustible Extinguish with fire chemical or water. Do not use water on burning liquid. Water may be ineffective.		
Exposure		Not harmful		
Water Pollution		Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes Notify local health and wildlife officials Notify operators of nearby water intakes		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2 LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Pale yellow 4.3 Odor: Peculiar		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Data not available 5.2 Symptoms Following Exposure: May cause dermatitis in sensitive individuals (humans) 5.3 Treatment for Exposure: Data not available 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: (Grade) I D above 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				
6 FIRE HAZARDS 6.1 Flash Point: 430°F O.C. 470°F C.C. 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Foam dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 228-1 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent				
8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None				
9 SELECTED MANUFACTURERS 1. Atlas Refinery, Inc. 142 Lockwood St. Newark, N.J. 07102 2. Neatsfoot Oil Refineries Corp. East Orleans and Bush Sts. Philadelphia, Pa. 19134 3. Arthur C. Clark Corp. 7000 W. 4th St. Argo, Ill. 60401				
10 SHIPPING INFORMATION 10.1 Grades or Purity: Various grades designated by post point (20° API), also various refined grades 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Vinting: Data not available				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook CG 446-7 A 11				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed				
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: 32° ± 14 F to 10° ± 27° ± 24 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.915 at 16°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent				
NOTES				

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OPT	OILS, MISCELLANEOUS: PENETRATING
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Common Synonyms:	Oil; Aquous Yellow Motor oil like odor Floats on water
Stop discharges if possible Call for help Avoid contact with liquid Do not inhale vapors or dusts Notify your health and safety officer	
Fire	Combustible Extinguish with foam, water, or carbon dioxide Water may be effective
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed Removes oil contaminated clothing and shoes Flush affected areas with plenty of water IF EYES: hold eyelids open and flush with plenty of water IF SWALLOWED: Do not induce vomiting. Notify your health and safety officer DO NOT INDUCE VOMITING
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Notify your health and safety officer Notify operators of nearby water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Manual, CG 446-4)	2 LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Preservative oil Water displacement 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 1.1 (27)	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellowish 4.3 Odor: Fuel oil like
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Protect eyes, nose, mouth and face shield 5.2 Symptoms Following Exposure: Liquid may irritate stomach and intestines; frequency of bowel movements 5.3 Treatment for Exposure: INGESTION: have victim drink water; do NOT induce vomiting. ASPIRATION: check for delayed development of pulmonary irritation by serious rales. EYES: wash with therapeutic amounts of water. SKIN: wipe off with soap and water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 Dose Noting sig 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes, respiratory system if present in high concentrations. The effect is temporary 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: 200 F 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Ashland Petroleum Co. 4401 Winchester Ave. Ashland, Ky 41001 Pentec, Inc. Bader, Pa 19009 Standard Oil Co. (Indiana) 510 N. Michigan Ave. Chicago, Ill 60610
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Manual, CG 446-5) A 1 1	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame or other
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm.: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.9961 at 20°C (liquid) 13.8 Liquid Surface Tension: 29.8 dynes/cm = 0.0298 N/m at 24°C 13.9 Liquid-Water Interfacial Tension: 5.5 dynes/cm = 0.0055 N/m at 22°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: $\Delta H_{\text{comb}} = -14,000 \text{ Btu/lb}$ $\Delta H_{\text{comb}} = -4200 \text{ kcal/kg}$ 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES continued on page 1 and 2	

ORG

OILS, MISCELLANEOUS: RANGE

Common Synonyms Kerosene Kerosene Fuel oil No. 1 JP-1	Waters: liquid Colorless Kerosene odor Floats on water
Fire	Combustible Flammable liquid Flammable solid
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed IF IN EYES , wash eyes with plenty of water IF SWALLOWED , do not induce vomiting. Consult a physician. DO NOT use emetics.
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. No special treatment required.
1. RESPONSE TO DISCHARGE See Response Methods Handbook (CG 445-1). Mechanical containment Should be removed. Chemical and physical treatment.	2. LABELS No hazard label required by Code of Federal Regulation.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No. 1 Fuel Oil JP-1 Kerosene Kerosene 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCC/United Nations Numerical Designation: 13.1223	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like kerosene
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles or face shield. 5.2 Symptoms Following Exposure: Vapor causes slight irritation of eyes and nose. Liquid enters stomach if taken into lungs causes coughing, distress and rapidly developing pulmonary edema. 5.3 Treatment for Exposure: ASPIRATION: unobstructed; administer oxygen; call a doctor. INGESTION: do NOT induce vomiting; call a doctor. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade I LD ₅₀ 5.0 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes slight smarting of eye and respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Mildly irritant. If spilled on clothing and allowed to remain may cause smarting and reddening of the skin. 5.10 Odor Threshold: 1 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 100°F (38°C) 6.2 Flammable Limits in Air: 0.8-8.5% 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: No pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 444°F 6.8 Electrical Hazard: No pertinent. 6.9 Burning Rate: 4 in./min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 2000 ppm 24 hr. (Bugs, 11 in. fresh water) 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Not applicable 8.4 Food Chain Concentration Potential: No																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Shell Oil Co. 6501 Steel Plaza Houston, Tex. 77005 2. Standard Oil Co. (Indiana) 600 S. Michigan Ave. Chicago, Ill. 60605 Sun Oil Co. 811 Davis Rd. Philadelphia, Pa. 19107																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook (CG 446-1) N F L	10. SHIPPING INFORMATION 10.1 Grades or Purity: Light fuel carbon distillate (99%) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open flame arresters																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation <table data-bbox="959 1428 1219 1690"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>2</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td></td></tr> <tr> <td>Liquid or Solid Irritant</td><td></td></tr> <tr> <td>Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>1</td></tr> <tr> <td>Aquatic Toxicity</td><td></td></tr> <tr> <td>Aesthetic Effect</td><td>1</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>0</td></tr> <tr> <td>Waxes</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications <table data-bbox="959 1712 1219 1799"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>0</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	2	Health		Vapor Irritant		Liquid or Solid Irritant		Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity		Aesthetic Effect	1	Reactivity		Other Chemicals	0	Waxes	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: 302.5 K (1 = 200.264°C = 392.473°F) 13.4 Freezing Point: -40.0°C (1 = -40.0°C = 230 to 225°F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.805 at 15°C (0.80 at 20°C) 13.8 Liquid Surface Tension: 23.2 dyne/cm = 0.0232 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 47.4 dyne/cm = 0.0474 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 405 Btu/lb (metric = 2318 kJ/kg) 13.13 Heat of Combustion: 145,540 Btu/lb (metric = 10,400 kJ/kg = 43,124 kJ/kg) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	2																																				
Health																																					
Vapor Irritant																																					
Liquid or Solid Irritant																																					
Poisons	1																																				
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Flammability (Red)	2																																				
Reactivity (Yellow)	0																																				
NOTES																																					

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ORS

OILS, MISCELLANEOUS: RESIN

Common Synonyms Resin oil Retinol Resin oil Codol		Liquid Light amber to red to black Pinetree pitch odor Floats on water
NOTE: This material is not a pure chemical compound. It is a mixture of many different compounds. The composition of this material varies from lot to lot and from manufacturer to manufacturer. The following information is based on the typical composition of this material.		
Fire	Combustible Flash point: 255-260°F (124-127°C) Autoignition temperature: 450-460°F (232-238°C)	
Exposure	CALL FOR HELP AT ONCE Exposure data not available May be dangerous if it enters water intakes.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Codol Retinol Resin oil Resin 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 1.2 (2N)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light amber to red to black depending on grade 4.3 Odor: Characteristic, pine tree pitch
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Data not available 5.2 Symptoms Following Exposure: Data not available 5.3 Treatment for Exposure: Data not available 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available, but toxicity is probably low 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS 6.1 Flash Point: 255-260°F (124-127°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 450-460°F (232-238°C) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS Crosby Chemicals, Inc. Pineville, Miss. 39466 Crosby Hydrocarbon Chemicals, Inc. 271 Madison Ave. New York, N.Y. 10017 Natrochem, Inc. Savannah, Ga. 31402																												
		10 SHIPPING INFORMATION 10.1 Grades or Purities: A variety of grades that differ primarily in color and flash point 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)																												
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-4. V 11		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm.: 572-580°F = 300-305°C = 273-273°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.95-1.02 at 15°C (liquid) 13.8 Liquid Surface Tension: res. 125 dynes/cm = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: res. 140 dynes/cm = 0.014 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: res. 3-18,000 Btu/lb = -10,000 cal/g = -420 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><td>Category</td><td>Rating</td></tr><tr><td>Toxic</td><td>2</td></tr><tr><td>Health</td><td>2</td></tr><tr><td>Vapor Irritant</td><td>2</td></tr><tr><td>Liquid or Solid Irritant</td><td>2</td></tr><tr><td>Poison</td><td>2</td></tr><tr><td>Water Pollution</td><td>1</td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td>2</td></tr><tr><td>Other Chemicals</td><td>2</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>1</td></tr></table> 12.3 NFPA Hazard Classifications: Not listed		Category	Rating	Toxic	2	Health	2	Vapor Irritant	2	Liquid or Solid Irritant	2	Poison	2	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity	2	Other Chemicals	2	Water	0	Self Reaction	1	
Category	Rating																													
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Poison	2																													
Water Pollution	1																													
Human Toxicity	1																													
Aquatic Toxicity	1																													
Aesthetic Effect	2																													
Reactivity	2																													
Other Chemicals	2																													
Water	0																													
Self Reaction	1																													

(continued on pages 1 and 2)

NOTES

ORD

OILS, MISCELLANEOUS: ROAD

Common Synonyms Slow-curing asphalt Petroleum asphalt Liquid asphalt		Oil: liquid	black	Tar color
Floats on water				
Fire		Combustible Will burn skin and eyes Harmful if swallowed		
Exposure		LIQUID Will burn skin and eyes Harmful if swallowed		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Liquid asphalt Petroleum asphalt Slow-curing asphalt 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 12 1999 13 1999		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Dark brown to black 4.3 Odor: Tar		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing for hot asphalt; face and eye protection when hot 5.2 Symptoms Following Exposure: Contact with skin may cause dermatitis. Inhalation of vapors may cause moderate irritation of nose and throat. Hot liquid burns skin. 5.3 Treatment for Exposure: Severe burns may result from hot liquid. Cool the skin at once with water. Cover burn with sterile dressing and seek medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Skin only 5.5 Short-Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 2 (LD ₅₀ 5.0 g/kg) 5.7 Late Toxicity: None observed 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel with high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smothering of the skin and first degree burns on short exposure. May cause secondary burns on long exposure. 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: 400 °N(1) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Foam dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 443 °N(1) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																					
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Johns Mansville Co. Greenwood Plaza Denver, Colo 80217 2. Sun Oil Co. St Davids, Pa. 19081 3. Witco Chem. Corp. Pioneer Division 277 Park Ave. New York, N.Y. 10017																																					
		10 SHIPPING INFORMATION 10.1 Grades or Purity: Not applicable 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arresters																																					
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A 1 1		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.012 at 25°C (liquids) 13.8 Liquid Surface Tension: (20-25 dynes/cm) = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (20-30 dynes/cm) = 0.03 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (test) = 4100 Btu/lb = 10 000 cal/g = 420 kJ/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																																					
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>2</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>0</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>4</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>0</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table> 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	1	Water Pollution		Human Toxicity	0	Aquatic Toxicity	1	Aesthetic Effect	4	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0	Continued on pages 7 and 8	
Category	Rating																																						
Fire	1																																						
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Vapor Irritant	1																																						
Liquid or Solid Irritant	2																																						
Poisons	1																																						
Water Pollution																																							
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Aquatic Toxicity	1																																						
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Flammability (Red)	1																																						
Reactivity (Yellow)	0																																						
NOTES																																							

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ORN

OILS, MISCELLANEOUS: ROSIN

Common Synonyms Resinoid Retinol Rosinol Rosinol	Liquid Light amber to red to black Pine-tree pitch odor Floats on water
Fire	Combustible Flash point: 250°F (93°C) Boiling point: 300°F (149°C)
Exposure	Exposure data not available Effect of low concentrations on aquatic life unknown Fouling to shoreline May be dangerous if it enters water intakes
Water Pollution	Effect of low concentrations on aquatic life unknown Fouling to shoreline May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE See Response Methods Handbook (CG 446-4) Mechanical contamination Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Coded Resinoid Retinol Rosinol 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 12.12NA	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light amber to red to black, depending on grade 4.3 Odor: Characteristic, like pine-tree pitch
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Data not available 5.2 Symptoms Following Exposure: Data not available 5.3 Treatment for Exposure: Data not available 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: No data available, but toxicity is probably low 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 250°F (93°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam (chemical or carbon dioxide) 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Data not available 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not pertinent 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Crooks Chemical, Inc. Pleasanton, Missouri Crooks Industrial Chemical, Inc. 27 Madison Ave. New York, N.Y. 10017 Natrosol, Inc. Savannah, Georgia 31402																												
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook (CG 446-5) N.T.	10. SHIPPING INFORMATION 10.1 Grades or Purity: As available grades (the data primarily in liquid and flake form) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arresters																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="925 1401 1156 1681"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>2</td></tr> <tr><td>Health</td><td>2</td></tr> <tr><td>Vapor Irritant</td><td>2</td></tr> <tr><td>Liquid or Solid Irritant</td><td>2</td></tr> <tr><td>Poisons</td><td>2</td></tr> <tr><td>Water Pollution</td><td>2</td></tr> <tr><td>Human Toxicity</td><td>2</td></tr> <tr><td>Aquatic Toxicity</td><td>2</td></tr> <tr><td>Anesthetic Effect</td><td>2</td></tr> <tr><td>Reactivity</td><td>2</td></tr> <tr><td>Other Chemicals</td><td>2</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self-Reacting</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed	Category	Rating	Fire	2	Health	2	Vapor Irritant	2	Liquid or Solid Irritant	2	Poisons	2	Water Pollution	2	Human Toxicity	2	Aquatic Toxicity	2	Anesthetic Effect	2	Reactivity	2	Other Chemicals	2	Water	0	Self-Reacting	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: 300°F (149°C) (at 10 mm Hg) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.95-1.02 at 15°C (liquid) 13.8 Liquid Surface Tension: 28-30 dynes/cm at 20°C (liquid) 13.9 Liquid-Water Interfacial Tension: 20-30 dyne/cm at 20°C (liquid) 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 40,000 Btu/lb (19,000 kJ/kg) (at 25°C) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	2																												
Health	2																												
Vapor Irritant	2																												
Liquid or Solid Irritant	2																												
Poisons	2																												
Water Pollution	2																												
Human Toxicity	2																												
Aquatic Toxicity	2																												
Anesthetic Effect	2																												
Reactivity	2																												
Other Chemicals	2																												
Water	0																												
Self-Reacting	0																												
NOTES																													

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OSP

OILS, MISCELLANEOUS: SPERM

Common Synonyms	Oil; liquid Pale yellow Floats on water
Stop discharge if possible Call for assistance Avoid contact with skin Avoid contact with eyes Avoid contact with clothing	
Fire	Combustible Extinguish with water, foam, or carbon dioxide Water may be used on fire
Exposure	CALL FOR MEDICAL AID Exposure data not available Effect of low concentrations on aquatic life is unknown Toxicity to shore life May be dangerous if it enters water intakes Not known to be a carcinogen Not known to be a mutagen
Water Pollution	
1. RESPONSE TO DISCHARGE See Response Methods Manual, CG 444-4 Minimize contamination Should be removed Chemical and physical treatment	2. LABELS No label and label required by FBI and Federal Maritime
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Not common synonyms 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IBCO United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: colorless to pale yellow 4.3 Odor: characteristic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Data not available 5.2 Symptoms Following Exposure: Data not available 5.3 Treatment for Exposure: Data not available 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available. Not toxic to probably low 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 42°F (5°C) (NTP) 40°F (4°C) (NTP) (NTP) (NTP) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, foam, water, not suitable 6.4 Fire Extinguishing Agents Not to be Used: Water, foam, not suitable (NTP) 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not known 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: Not reactive 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Acheson, Inc., Madison, WI Acheson, Inc., Park Acheson, Inc., St. Louis Acheson, Inc., St. Louis Acheson, Inc., St. Louis Acheson, Inc., St. Louis Acheson, Inc., St. Louis Acheson, Inc., St. Louis Acheson, Inc., St. Louis Acheson, Inc., St. Louis
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 444-3 N F 1	10. SHIPPING INFORMATION 10.1 Grades or Purity: Not known Material should be in original Packaging 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Data not available
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classification: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.842 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: 5.7 dynes/cm = 0.0257 N/m at 30°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not known 13.14 Heat of Decomposition: Not known 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

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OSD

OILS, MISCELLANEOUS: SPINDLE

Common Synonyms: High speed bearing oil Bearing oil	Only liquid Fluores on water	Light brown - Weak kerosene-like odor
Not for use in food contact applications. Not for use in electrical applications. Not for use in hydraulic applications. Not for use in automotive applications.		
Fire	Combustible Extinguish with foam, dry chemical, or carbon dioxide. Water may be ineffective.	
Exposure	CALL FOR MEDICAL AID. EQUID Irritating to skin and eyes. Harmful if swallowed. Avoid contact with skin and eyes. Wash skin and eyes with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED, do not induce vomiting. Have victim drink water. DO NOT INDUCE VOMITING.	
Water Pollution	Disperses to aquatic life in high concentrations. Fading to short time. May be disperses if it enters water tanks. Not for use in food contact applications. Not for use in electrical applications.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 400-4 Minimum containment should be required. A thermal and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Bearing oil High speed bearing oil 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 1.1, 1.2, 1.3		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light brown 4.3 Odor: Weak kerosene-like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles or face shield 5.2 Symptoms Following Exposure: Vapor causes slight irritation of eyes and nose. Liquid irritates skin. If swallowed, causes vomiting, distress, and rapidly developing pulmonary edema. 5.3 Treatment for Exposure: ASPIRATION: induce retching, vomit, or vomit with 1% sodium bicarbonate solution. IF INGESTED, do NOT induce vomiting, call a doctor. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1 LD50 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of eyes or nose, or system of present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of skin. 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: 160°F (71°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 475°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Swampy 24 hr. Marine 11 hr. Fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 515 mg/day 8.4 Food Chain Concentration Potential: None
9. SELECTED MANUFACTURERS Kerosene Lubricating Co. 2 and 1, 100000th Streets Philadelphia, Pa. 19132 2. Petro-Ind. Butte, Pa. 16001 1. White and Rogers Co. Worcester, Mass. 01601	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Stabilizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	10. SHIPPING INFORMATION 10.1 Grades or Purities: Several grades, all with same hazard associations 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Vending: Open flame attenders
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 400-3 V T U	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.881 at 15°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 MFPA Hazard Classifications: Not listed	NOTES

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OSY

OILS, MISCELLANEOUS: SPRAY

Common Synonyms Plant spray oil Dormant oil Foliar oil	Only liquid	Light brown	Kerosene-like odor
Stop discharge if possible Call fire department Avoid contact with liquid Isolate and remove discharged material Notify local health and pollution control agencies			
Fire	Combustible Extinguish with foam, dry chemical, or carbon dioxide Water may be ineffective		
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes Harmful if swallowed Remove contaminated clothing and shoes Flush affected areas with plenty of water If IN EYES, flush eyelids, open and flush with plenty of water If SWALLOWED, do not induce vomiting. Have victim drink water if able DO NOT INDUCE VOMITING		
Water Pollution	Dangerous to aquatic life in high concentrations Floating to shoreline May be dangerous if it enters water intakes Notify local health and pollution control agencies		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3) Mechanical containment Should be removed Chemical and physical treatments		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dormant oil Foliar oil Kerosene heavy Plant spray oil 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: 3.3/1270		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light brown 4.3 Odor: Like kerosene-like fuel oil	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles or face shield 5.2 Symptoms Following Exposure: Vapor causes slight irritation of eyes and nose. Liquid irritates stomach. If taken into lungs, causes coughing, distress, and rapidly developing edema. 5.3 Treatment for Exposure: ASPIRATION: encourage bed rest, administer oxygen, call a doctor. INGESTION: do NOT induce vomiting, call a doctor. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2.1 D ₆₀ 5 to 5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: 1 ppm			

6 FIRE HAZARD 61 Flash Point: 140°F (60°C) 62 Flammable Limits in Air: 0.6% - 4.6% 63 Fire Extinguishing Agents: Foam dry chemical or carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: 475°F 68 Electrical Hazard: Not pertinent 69 Burning Rate: 4 mm/min		8 WATER POLLUTION 81 Aquatic Toxicity: 500 ppm/* salmon fingerling-lethal, fresh water * Time period not specified 82 Waterway Toxicity: Data not available 83 Biological Oxygen Demand (BOD): 53% 5 days 84 Food Chain Concentration Potential: None																																					
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. Shell Oil Co. 1 Shell Plaza Houston, Tex. 77001 2. Standard Oil Co. (Indiana) 910 S. Michigan Ave. Chicago, Ill. 60605 3. Sun Oil Co. St. Davids, Pa. 19087																																					
		10 SHIPPING INFORMATION 101 Grades or Purity: Commercial 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open (flame arrester)																																					
11 HAZARD ASSIGNMENT CODE (See Hazard Assignment Handbook, CG 446-3) A-7 (6)		13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: Not pertinent 133 Boiling Point at 1 atm: 500.700°F = 261.5°C = 583.644°K 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 0.82 at 15°C (liquid) 138 Liquid Surface Tension: (test) 125 dynes/cm = 0.025 N/m at 20°C 139 Liquid-Water Interfacial Tension: (test) 50 dynes/cm = 0.05 N/m at 20°C 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: -18,540 Btu/lb = -10,100 cal/g = -41.24 x 10 ³ J/kg 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent																																					
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Combustible Liquid 122 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>1, 2</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>3</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>0</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table> 123 NFPA Hazard Classifications <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Rating	Fire	1, 2	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	3	Reactivity		Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0		
Category	Rating																																						
Fire	1, 2																																						
Health																																							
Vapor Irritant	1																																						
Liquid or Solid Irritant	1																																						
Poisons	1																																						
Water Pollution																																							
Human Toxicity	1																																						
Aquatic Toxicity	1																																						
Aesthetic Effect	3																																						
Reactivity																																							
Other Chemicals	0																																						
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Health Hazard (Blue)	0																																						
Flammability (Red)	2																																						
Reactivity (Yellow)	0																																						
<i>Continued on pages 5 and 6.</i>																																							
NOTES																																							

(Continued on pages 5 and 6)

OTL

OILS, MISCELLANEOUS: TALL

Common Synonyms	Oil; liquid	Yellow	Characteristic odor
Floats on water Stopper to get it loose. Call fire department. Avoid contact with liquid. Wash and remove discharged material. Notify local health and pollution control agency.			
Fire	Combustible. Flammable with heat, dry, heated, or in contact with oxidizers. Water may be used to extinguish fire.		
Exposure	CALL FOR MEDICAL AID. Exposure data not available. Fluid affected areas with water.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. No disposal in fresh water bodies.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Mechanical containment. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Ester. 3.3 Chemical Formula: Not applicable. 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Yellow. 4.3 Odor: Characteristic.	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Data not available. 5.2 Symptoms Following Exposure: Data not available. 5.3 Treatment for Exposure: Data not available. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.			

6. FIRE HAZARDS 6.1 Flash Point: 300°F (100°C). 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Georgia Pacific Corp. Commonwealth Bldg. Portland, Ore. 97264. 2. SCM Corp. Glidden Durkee Division 900 Union Commerce Bldg. Cleveland, Ohio 44115. 3. Union Carbide Corp. Chemical Division Jacksonville Fla. 32205.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3.) A T-1	10. SHIPPING INFORMATION 10.1 Grades or Purity: Various grades, which differ primarily in the relative content of fatty acids and rosin acids. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arrester.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: Not pertinent. 13.3 Boiling Point at 1 atm: Very high. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.951 at 16°C (liquid). 13.8 Liquid Surface Tension: 34.3 dynes/cm = 0.0343 N/m at 24°C. 13.9 Liquid Water Interfacial Tension: 11 dynes/cm = 0.011 N/m at 22.5°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: test 1 = 15,000 Btu/lb = 10,000 cal/g = 420 × 10 ³ kJ/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

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OTN

OILS, MISCELLANEOUS: TANNER'S

Common Synonyms Sulfated neatfoot oil	Oil; liquid
Neatfoot oil is a heavy, dark, viscous liquid. It is a by-product of the distillation of coal tar. It is used in the manufacture of certain types of paint and as a lubricant for certain types of machinery.	
Fire	Combustible Extinguish with foam, carbon dioxide, or dry chemical.
Exposure	ALL FOR MEDICAL USE Exposure data not available Irritation to skin and eyes is possible.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline May be dangerous if it enters water intakes. Not recommended for use in water.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Data not available.	2 LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 31 Synonyms: Sulfated neatfoot oil; sodium salt. 32 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures. 33 Chemical Formula: Not applicable. 34 IMCO/United Nations Numerical Designation: Not listed.	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Data not available. 42 Color: Data not available. 43 Odor: Data not available.
5. HEALTH HAZARDS 51 Personal Protective Equipment: Data not available. 52 Symptoms Following Exposure: Data not available. 53 Treatment for Exposure: Data not available. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Data not available. 57 Late Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Data not available. 59 Liquid or Solid Irritant Characteristics: Data not available. 60 Odor Threshold: Data not available.	

6 FIRE HAZARDS 61 Flash Point: Data not available. 62 Flammable Limits in Air: Data not available. 63 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide. 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 65 Special Hazards of Combustion Products: Not pertinent. 66 Behavior in Fire: Not pertinent. 67 Ignition Temperature: Data not available. 68 Electrical Hazard: Not pertinent. 69 Burning Rate: Data not available.	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available. 82 Waterfowl Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): Data not available. 84 Food Chain Concentration Potential: Data not available.
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: No reaction. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Not pertinent. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1 Diamond Shamrock Corp. Nopco Chemical Division Morristown, N.J. 07960 2 Kelly Whitehead Inc. Cincinnati, Pa. 19428 3 Arthur C. Frank Corp. 7646 W. 63 St. Argo, Ill. 60401
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3). A T L	10 SHIPPING INFORMATION 101 Grades or Purity: Data not available. 102 Storage Temperature: Ambient. 103 Inert Atmosphere: No requirement. 104 Venting: Data not available.
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed. 122 NAS Hazard Rating for Bulk Water Transportation: Not listed. 123 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid. 132 Molecular Weight: Not pertinent. 133 Boiling Point at 1 atm: Very high. 134 Freezing Point: Data not available. 135 Critical Temperature: Not pertinent. 136 Critical Pressure: Not pertinent. 137 Specific Gravity: (est.) 0.85 at 20°C (liquid). 138 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C. 139 Liquid-Water Interfacial Tension: (est.) 50 dynes/cm = 0.05 N/m at 20°C. 1310 Vapor (Gas) Specific Gravity: Not pertinent. 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 1312 Latent Heat of Vaporization: Not pertinent. 1313 Heat of Combustion: (est.) -18,000 B.t.u./lb = -10,000 cal/g = -420 X 10³ J/kg. 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: Not pertinent. 1316 Heat of Polymerization: Not pertinent.
NOTES	

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OTF

OILS, MISCELLANEOUS: TRANSFORMER

Common Synonyms: Insulating oil Electrical insulating oil Petroleum insulating oil	Only liquid Colorless to light brown Motor oil-like odor Floats on water
Fire	
Exposure	
Water Pollution	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Electrical insulating oil Insulating oil Petroleum insulating oil 3.2 Coast Guard Competibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: 3.3/1270	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light brown 4.3 Odor: Like motor oil
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles or face shield 5.2 Symptoms Following Exposure: Injection of liquid may irritate stomach and cause increased frequency of bowel movements. If taken into lungs, delayed pulmonary irritation may occur. 5.3 Treatment for Exposure: INGESTION: do NOT induce vomiting. ASPIRATION: check for delayed irritation by serial X-rays. EYES: wash with copious amounts of water. SKIN: wipe off and wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade I, LD ₅₀ to 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available	

6. HAZARD DATA 6.1 Flash Point: Data not available 6.2 Flammability: Data not available 6.3 Fire Extinguishing Agents: Foam dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Shell Oil Co. 1 Shell Plaza Houston, Tex. 77001 2. Standard Oil Co. (Indiana) 9105 Michigan Ave. Chicago, Ill. 60695 3. Sun Oil Co. St. Davids, Pa. 19087								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-T U	10. SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: -75°F = -59°C = 214°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.891 at 15°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: 49 dynes/cm = 0.049 N/m at 25°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	1								
Reactivity (Yellow)	0								
NOTES									

REVISED 1978

OTB

OILS, MISCELLANEOUS: TURBINE

Common Synonyms Steam turbine oil Steam turbine lube oil Turbine oil		Liquid Floats on water	Colorless to light brown	Aerosol-like odor
1. RESPONSE TO DISCHARGE¹ (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment				
2. LABELS No label required by Code of Federal Regulations				
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Steam turbine oil, Steam turbine lube oil 3.2 Coast Guard Compatibility Classification: Petroleum oils (12) 3.3 Chemical Formula: Not applicable 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale brown 4.3 Odor: Weak, like lube oil		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Contact with liquid causes slight irritation of eyes and (on prolonged contact) skin. Ingestion causes slight irritation of stomach and bowel, increased frequency of bowel movement 5.3 Treatment for Exposure: EYES: wash with copious quantity of water for at least 15 min. SKIN: wipe off, wash with soap and water. INGESTION: do NOT induce vomiting; do NOT lavage. 1-4 oz. olive oil and 1-2 oz. activated charcoal may be given 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 mg/m³ 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 0, LD₅₀ > 15 g/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: 390 - 485°F (177 - 252°C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry chemical, foam, carbon dioxide, water fog 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing; water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 700°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: (approx) 4 mm/min		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None									
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Shell Oil Co. One Shell Plaza Houston, Texas 77002 2. Exxon Co. P.O. Box 2180 Houston, Texas 77001 3. Sun Oil Co. P.O. Box 426 Marcus Hook, Pa. 19061									
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-T-U		10. SHIPPING INFORMATION 10.1 Grades or Purity: Solvent refined paraffinic oils 98.5+%, (grades vary in viscosity and flash point) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (Dome arrester)									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAB Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>0</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>		Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.87 at 20°C (liquid) 13.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (est.) 40 dynes/cm = 0.040 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (est.) -17 600 Btu/lb = -9 800 cal/g = -410 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Classification										
Health Hazard (Blue)	0										
Flammability (Red)	1										
Reactivity (Yellow)	0										
NOTES											

(Continued on pages 1 and 6)

OLA	OLEIC ACID
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Common Synonyms: cis-8 Heptadecylencarboxylic acid and cis-9 Octadecenoic acid cis-10 Octadecenoic acid Red oil	Label 2 Colorless to pale yellow Mild odor Floats on water	
HAZARD STATEMENT: H228, H302, H314, H332, H334, H373, H410, H411, H412, H413, H414, H415, H416, H417, H418, H419, H420, H421, H422, H423, H424, H425, H426, H427, H428, H429, H430, H431, H432, H433, H434, H435, H436, H437, H438, H439, H440, H441, H442, H443, H444, H445, H446, H447, H448, H449, H450, H451, H452, H453, H454, H455, H456, H457, H458, H459, H460, H461, H462, H463, H464, H465, H466, H467, H468, H469, H470, H471, H472, H473, H474, H475, H476, H477, H478, H479, H480, H481, H482, H483, H484, H485, H486, H487, H488, H489, H490, H491, H492, H493, H494, H495, H496, H497, H498, H499, H500, H501, H502, H503, H504, H505, H506, H507, H508, H509, H510, H511, H512, H513, H514, H515, H516, H517, H518, H519, H520, H521, H522, H523, H524, H525, H526, H527, H528, H529, H530, H531, H532, H533, H534, H535, H536, H537, H538, H539, H540, H541, H542, H543, H544, H545, H546, H547, H548, H549, H550, H551, H552, H553, H554, H555, H556, H557, H558, H559, H560, H561, H562, H563, H564, H565, H566, H567, H568, H569, H570, H571, H572, H573, H574, H575, H576, H577, H578, H579, H580, H581, H582, H583, H584, H585, H586, H587, H588, H589, H590, H591, H592, H593, H594, H595, H596, H597, H598, H599, H600, H601, H602, H603, H604, H605, H606, H607, H608, H609, H610, H611, H612, H613, H614, H615, H616, H617, H618, H619, H620, H621, H622, H623, H624, H625, H626, H627, H628, H629, H630, H631, H632, H633, H634, H635, H636, H637, H638, H639, H640, H641, H642, H643, H644, H645, H646, H647, H648, H649, H650, H651, H652, H653, H654, H655, H656, H657, H658, H659, H660, H661, H662, H663, H664, H665, H666, H667, H668, H669, H670, H671, H672, H673, H674, H675, H676, H677, H678, H679, H680, H681, H682, H683, H684, H685, H686, H687, H688, H689, H690, H691, H692, H693, H694, H695, H696, H697, H698, H699, H700, H701, H702, H703, H704, H705, H706, H707, H708, H709, H710, H711, H712, H713, H714, H715, H716, H717, H718, H719, H720, H721, H722, H723, H724, H725, H726, H727, H728, H729, H730, H731, H732, H733, H734, H735, H736, H737, H738, H739, H740, H741, H742, H743, H744, H745, H746, H747, H748, H749, H750, H751, H752, H753, H754, H755, H756, H757, H758, H759, H760, H761, H762, H763, H764, H765, H766, H767, H768, H769, H770, H771, H772, H773, H774, H775, H776, H777, H778, H779, H780, H781, H782, H783, H784, H785, H786, H787, H788, H789, H790, H791, H792, H793, H794, H795, H796, H797, H798, H799, H800, H801, H802, H803, H804, H805, H806, H807, H808, H809, H810, H811, H812, H813, H814, H815, H816, H817, H818, H819, H820, H821, H822, H823, H824, H825, H826, H827, H828, H829, H830, H831, H832, H833, H834, H835, H836, H837, H838, H839, H840, H841, H842, H843, H844, H845, H846, H847, H848, H849, H850, H851, H852, H853, H854, H855, H856, H857, H858, H859, H860, H861, H862, H863, H864, H865, H866, H867, H868, H869, H870, H871, H872, H873, H874, H875, H876, H877, H878, H879, H880, H881, H882, H883, H884, H885, H886, H887, H888, H889, H890, H891, H892, H893, H894, H895, H896, H897, H898, H899, H900, H901, H902, H903, H904, H905, H906, H907, H908, H909, H910, H911, H912, H913, H914, H915, H916, H917, H918, H919, H920, H921, H922, H923, H924, H925, H926, H927, H928, H929, H930, H931, H932, H933, H934, H935, H936, H937, H938, H939, H940, H941, H942, H943, H944, H945, H946, H947, H948, H949, H950, H951, H952, H953, H954, H955, H956, H957, H958, H959, H960, H961, H962, H963, H964, H965, H966, H967, H968, H969, H970, H971, H972, H973, H974, H975, H976, H977, H978, H979, H980, H981, H982, H983, H984, H985, H986, H987, H988, H989, H990, H991, H992, H993, H994, H995, H996, H997, H998, H999, H1000, H1001, H1002, H1003, H1004, H1005, H1006, H1007, H1008, H1009, H1010, H1011, H1012, H1013, H1014, H1015, H1016, H1017, H1018, H1019, H1020, H1021, H1022, H1023, H1024, H1025, H1026, H1027, H1028, H1029, H1030, H1031, H1032, H1033, H1034, H1035, H1036, H1037, H1038, H1039, H1040, H1041, H1042, H1043, H1044, H1045, H1046, H1047, H1048, H1049, H1050, H1051, H1052, H1053, H1054, H1055, H1056, H1057, H1058, H1059, H1060, H1061, H1062, H1063, H1064, H1065, H1066, H1067, H1068, H1069, H1070, H1071, H1072, H1073, H1074, H1075, H1076, H1077, H1078, H1079, H1080, H1081, H1082, H1083, H1084, H1085, H1086, H1087, H1088, H1089, H1090, H1091, H1092, H1093, H1094, H1095, H1096, H1097, H1098, H1099, H1100, H1101, H1102, H1103, H1104, H1105, H1106, H1107, H1108, H1109, H1110, H1111, H1112, H1113, H1114, H1115, H1116, H1117, H1118, H1119, H1120, H1121, H1122, H1123, H1124, H1125, H1126, H1127, H1128, H1129, H1130, H1131, H1132, H1133, H1134, H1135, H1136, H1137, H1138, H1139, H1140, H1141, H1142, H1143, H1144, H1145, H1146, H1147, H1148, H1149,		

6. FIRE HAZARDS 6.1 Flash Point: 90 - 125°F (C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frosting 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: 685°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Union Carbide Corp. 2051 N. Lane Ave. Jacksonville, FL 32206 2. Hercules Inc. Wilmington, Del. 19899 3. Armat Chemicals Div. Box 1805 Chicago, IL 60690								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A 1 U	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 79.83% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; width: 40%;">Category</th> <th style="text-align: left; width: 60%;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>0</td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>0</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 277 (avg.) 13.3 Boiling Point at 1 atm: 432°F = 222°C = 49°F 13.4 Freezing Point: 5°F = 14°C = 287°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.89 at 25°C (liquid) 13.8 Liquid Surface Tension: 32.8 dynes/cm = 0.0328 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 15.59 dynes/cm = 0.01559 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 103 Btu/lb = 45,441 g = 2.4 x 10⁵ J/kg 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	1								
Reactivity (Yellow)	0								

(cont. next page)

OAP

OLEIC ACID, POTASSIUM SALT

Common Synonyms Potassium oleate		Solid or liquid	Brown	Soapy odor
		Sinks and mixes slowly with water		
Avoid contact with liquid and solid. Keep away from fire. Not flammable. No spark. Is irritant and corrosive to target material. Not toxic to health and probably not irritant to eyes.				
Fire		Combustible Extinguish with water, dry chemicals, or carbon dioxide.		
Exposure		CALL FOR MEDICAL AID LIQUID OR SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS: Have victim drink water or milk. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS: Do nothing except keep victim warm.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not toxic to health and wildlife directly. Not a purveyor of nearby water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2 LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 31 Synonyms: Potassium oleate 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: $C_{18}H_{33}COOK$ 34 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid or liquid 42 Color: Brown 43 Odor: Faint soaps		
5 HEALTH HAZARDS 51 Personal Protective Equipment: Chemical goggles and rubber gloves. 52 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat, coughing and sneezing. Ingestion causes mild irritation of mouth and stomach. Contact with eyes causes irritation. 53 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water. EYES: flush with copious quantities of tap water for 15 min. and seek appropriate medical attention. SKIN: flush with water. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Data not available 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 60 Odor Threshold: Data not available				

6 FIRE HAZARDS 61 Flash Point: 100°F (38°C) 62 Flammable Limits in Air Data not available 63 Fire Extinguishing Agents: Dry chemical, alcohol foam, carbon dioxide 64 Fire Extinguishing Agents Not to be Used. Water may be ineffective 65 Special Hazards of Combustion Products 66 Behavior in Fire 67 Ignition Temperature: Data not available 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not pertinent	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterway Toxicity: Data not available 83 Biological Oxygen Demand (BOD) Data not available 84 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Diamond Shamrock Chemical Co. 1100 Superior Ave. Cleveland, Ohio 44114 2 Alcolac Chemical Corp. Trenton Avenue and William Street Philadelphia, Pa. 19134
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3: (liquid) A P (solid) S	10 SHIPPING INFORMATION 101 Grades or Purities: 19% solution in water 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid or liquid 132 Molecular Weight: 320 (solid only) 133 Boiling Point at 1 atm: Not pertinent (decomposes) 134 Freezing Point: 45°-46°F = 23°-24°C = -80°-53°F 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: >1.1 at 20°C (solid or liquid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
NOTES	

(continued on page 5 and 6)

OAC

OLEIC ACID, SODIUM SALT

Common Synonyms Unsaturated Sodium oleate		Solid	Light tan	Slight tallow like odor
		Sinks and mixes slowly with water		
Avoid contact with skin and eyes. If contact occurs, wash thoroughly with water. If swallowed, do not induce vomiting. Seek medical attention if necessary.				
Fire		Combustible Flash point: 300°F (149°C)		
Exposure		CALL FOR MEDICAL ADVICE SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. NOXIOUS IF SWALLOWED. Irritating to eyes. Irritating to skin. Irritating to respiratory system. Irritating to aquatic life. Hazardous to the environment. Hazardous to the ozone layer. Hazardous to the atmosphere. Hazardous to the water body. Hazardous to the soil. Hazardous to the land.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. NOXIOUS IF SWALLOWED.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Unatrol Sodium oleate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_{18}H_{33}O_2Na$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Light tan 4.3 Odor: Slight tallow like		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask and gloves 5.2 Symptoms Following Exposure: Inhalation: Dust causes irritation of nose and throat, coughing and sneezing. Ingestion causes mild irritation of mouth. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water. EYES: flush with copious quantities of tap water. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Product: .. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Diamond Shamrock Chemical Co. 1100 Superior Ave. Cleveland, Ohio 44114 2. Waco Chemical Corp. Organics Division 277 Park Avenue New York, N.Y. 10017
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NS	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 304 (approx.) 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 250, 454°K = 232, 235°C = 405, 496°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: >1.1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

OLM

OLEUM

Common Synonyms: Fuming sulfuric acid	Only liquid Colorless to cloudy Sharp, choking odor Mixes and reacts with water producing heat. Irritating mist is produced.
AVOID CONTACT WITH LIQUID AND MIST. Keep in place. Wear full protective clothing. Wash with water. Do not use water on adjacent fires.	
Fire	Not flammable. May cause fire on contact with combustibles. Flammable gas may be produced on contact with metals. Water from adjacent fires will cause acid to splash. DO NOT USE WATER ON ADJACENT FIRES.
Exposure	CAUTION MEDICAL AID MIST: Irritating to eyes, nose and throat. If inhaled, will cause coughing or difficult breathing. May cause frostbite. If inhaled, may cause respiratory distress. If inhaled, may cause pulmonary edema. LIQUID: Will burn skin and eyes. Harmful if swallowed. Remove from skin immediately with water. Flush affected areas with water for 15 minutes. IF IN EYES, flush with water for 15 minutes. IF SWALLOWED, do not induce vomiting. DO NOT INDUCE VOMITING.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Floating to shoreline. May be dangerous if it enters water intakes. Not persistent in the environment.
1. RESPONSE TO DISCHARGE See Hazard Assessment Handbook, CG 444-4. Issue water spill corrective. Restrict access. Chemical and physical treatment. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Fuming sulfuric acid. 3.2 Coast Guard Compatibility Classification: Inorganic acid. 3.3 Chemical Formula: H_2SO_4 . 3.4 IMCO United Nations Numerical Designation: N.O. (X3).	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless to cloudy. 4.3 Odor: Sharp penetrating, choking.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Respirator approved by U.S. Bureau of Mines for acid mists; rubber gloves; splashproof goggles; eye wash; suit and safety shower; rubber footwear; face shield. 5.2 Symptoms Following Exposure: Acute irritation of eyes, nose and throat. Liquid causes severe burns to skin and eyes. 5.3 Treatment for Exposure: INGESTION: Rinse mouth with water and do NOT induce vomiting. IF IN EYES: Flush with plenty of water for 15 minutes. IF ON SKIN: Flush with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): None. 5.5 Short-Term Inhalation Limits: NIOSH: 10 mg/m ³ for 15 min; 5 mg/m ³ for 30 min; 2 mg/m ³ for 45 min; 1 mg/m ³ for 60 min. 5.6 Toxicity by Ingestion: Severe burns to mouth and throat. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eye and throat and can cause eye and lung injury. They cannot be tolerated even at low concentration. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact; very injurious to the eye. 5.10 Odor Threshold: 1 mg/m ³ .	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Avoid use of water on adjacent fires. 6.5 Special Hazards of Combustion Products: Toxic and irritating vapors are generated. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not flammable.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 24 ppm 24 hr. bluegill; lethal fresh water; 42 ppm 48 hr. prawn; 100 ppm salt water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Vigorous reaction with water; spatter. 7.2 Reactivity with Common Materials: May react with cast iron with explosive violence. Attacks many metals, releasing flammable hydrogen gas. Capable of igniting finely divided combustible material on contact. Extremely hazardous in contact with many materials. 7.3 Stability During Transport: Normally stable. 7.4 Neutralizing Agents for Acids and Caustics: Caution dilution with water with procedure against violent spattering. Diluted acid may be neutralized with lime or soda ash. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Industrial Chemical Division Morristown, N.J. 07960 2. Monsanto Co. Monsanto Industrial Chemicals Co. 800 N. Lindbergh Blvd. St. Louis, Mo. 63166 3. Stauffer Chemical Co. Industrial Chemical Division 299 Park Ave. New York, N.Y. 10017																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-3. A O P 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive material. 12.2 NAS Hazard Rating for Bulk Water Transportation <table data-bbox="966 1418 1214 1677"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>0</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>4</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td> Poisonous</td><td>3</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>2</td></tr> <tr> <td> Aquatic Toxicity</td><td>1</td></tr> <tr> <td> Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>4</td></tr> <tr> <td> Water</td><td>1</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="966 1698 1214 1795"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Rating	Fire	0	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poisonous	3	Water Pollution		Human Toxicity	2	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemicals	4	Water	1	Self Reaction	0	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	2	10. SHIPPING INFORMATION 10.1 Grades or Purity: 20% (98% sulfuric acid) to 65% (112% sulfuric acid). 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open. 13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: Not pertinent. 13.3 Boiling Point at 1 atm: Decomposes. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.84 (98% sulfuric acid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	0																																				
Health																																					
Vapor Irritant	4																																				
Liquid or Solid Irritant	4																																				
Poisonous	3																																				
Water Pollution																																					
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NOTES (Continued on page 7 and 8)																																					

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OXALIC

OXALIC ACID

Common Synonyms Ethanedioic acid		Solid crystals White Odorless Sinks at bottom with water
Fire Not flammable Poisonous gases are produced in fire		
Exposure ALL FORMS OF ACID DUST Will burn eyes, nose and throat If inhaled will cause difficult breathing May cause irritation of the respiratory tract SOLID Will burn skin and eyes If swallowed will cause nausea or loss of consciousness IN EYES If swallowed will cause nausea or loss of consciousness If inhaled will cause difficulty breathing If in contact with skin will cause irritation		
Water Pollution Harmless to aquatic life in high concentrations May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE See Response to Material Handbook (C-4) for details Should be neutralized Chemical disposal required	2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethanedioic acid 3.2 Coast Guard Compatibility Classification: Not permissive 3.3 Chemical Formula: C₂H₂O₄ 3.4 IMCO United Nations Numerical Designation: Not permissive	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Odorless	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Respirator, gloves, goggles, apron 5.2 Symptoms Following Exposure: Irritation of the respiratory tract, nausea, vomiting, diarrhea, skin irritation 5.3 Treatment for Exposure: Inhalation: Move to fresh air. If breathing is difficult, give oxygen. Ingestion: Drink large amounts of water. Do not induce vomiting. Skin: Wash with plenty of water. Eyes: Flush with water for 15 minutes. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not permissive 5.5 Short-Term Inhalation Limits: Not permissive 5.6 Toxicity by Ingestion: Toxic if swallowed 5.7 Late Toxicity: Not permissive 5.8 Vapor (Gas) Irritant Characteristics: Not permissive 5.9 Liquid or Solid Irritant Characteristics: Not permissive 5.10 Odor Threshold: Not permissive		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not permissive 6.4 Fire Extinguishing Agents Not to be Used: Not permissive 6.5 Special Hazards of Combustion Products: Combustion produces toxic gases 6.6 Behavior in Fire: Not permissive 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not permissive 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: 4000 mg/l 24 hr bioassay 11 g/l fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 14 g/l 5 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: Not reactive 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Lime, soda ash 7.5 Polymerization: Not permissive 7.6 Inhibitor of Polymerization: Not permissive	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Industrial Chemicals Division Morristown, N.J. 07960 2. Mallinckrodt Chemical Works Industrial Chemicals Division 222 East Mallinckrodt St. St. Louis, Mo. 63103 P.O. Box 250 Chester, Pa. 19381 New York, N.Y. 10007
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook (C-4) for details NA	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 99.5% min 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: None required 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive Material 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Category Classification Health Hazard: 3 Flammability: 0 Reactivity: 0 12.4 Example of Labeling: See Figure 1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 126.07 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: 104°F (40°C) to 107°F (42°C) 13.5 Critical Temperature: Not permissive 13.6 Critical Pressure: Not permissive 13.7 Specific Gravity: 1.90 g/cm³ (solid) 13.8 Liquid Surface Tension: Not permissive 13.9 Liquid-Water Interfacial Tension: Not permissive 13.10 Vapor (Gas) Specific Gravity: Not permissive 13.11 Ratio of Specific Heats of Vapor (Gas): Not permissive 13.12 Latent Heat of Vaporization: Not permissive 13.13 Heat of Combustion: Not permissive 13.14 Heat of Decomposition: Not permissive 13.15 Heat of Solution: Not permissive 13.16 Heat of Polymerization: Not permissive
NOTES	

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OXY

OXYGEN, LIQUEFIED

Common Synonyms Liquid oxygen LOX		Liquefied gas Sinks and boils in water	Light blue	Odorless
When released, it will boil and expand rapidly. It will cause frostbite on contact with skin. It will cause dizziness or difficulty breathing if inhaled.				
Fire	Not flammable Containers may explode in fire			
Exposure	VAPOR If inhaled will cause dizziness or difficult breathing			
	LIQUID Will cause frostbite			
Water Pollution	Not harmful to aquatic life			
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 416-4 Protect access		2. LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Liquid oxygen, LOX 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: O ₂ 3.4 IMCO/United Nations Numerical Designation: 2.107		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied gas 4.2 Color: Light blue 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety glasses or face shield in liquid glow; long sleeves, trousers without pockets or pockets for gloves; shirt-sleeved liquid 5.2 Symptoms Following Exposure: Irritation; 100% oxygen can cause nausea, dizziness, minor swelling, pulmonary edema, pneumonia, and collapse. Liquid may cause frostbite on skin and eyes. 5.3 Treatment for Exposure: INHALATION: If inhaled, then move to fresh air and breathe normally. If rapid or regular breathing, oxygen pressure supportive treatment should be available. Immediate medical attention, therapy, needed and first AID. EYES: Treat with copious SKIN: Treat with copious water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Not pertinent. 5.7 Late Toxicity: Not pertinent. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.				

6 FIRE HAZARDS

- 6.1 Flash Point: Not flammable but supports combustion
- 6.2 Flammable Limits in Air: Not flammable
- 6.3 Fire Extinguishing Agents: Not pertinent
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
- 6.5 Special Hazards of Combustion Products: Not pertinent
- 6.6 Behavior in Fire: Increases intensity of any fire. Mixtures of liquid oxygen and any fuel are highly combustible
- 6.7 Ignition Temperature: Not pertinent
- 6.8 Electrical Hazards: Not pertinent
- 6.9 Burning Rate: Not pertinent

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Heats or water will vigorously vaporize liquid oxygen
- 7.2 Reactivity with Common Materials: Avoid organic and combustible materials such as oil, grease, coal dust, etc. Flammable such materials can explode. The low temperature may cause brittleness in some materials
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: None
- 8.2 Waterflow Toxicity: None
- 8.3 Biological Oxygen Demand (BOD): None
- 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

- 1. Union Carbide Corporation, Lique Division, Morristown, N.J. 07957
- 2. Airco, Inc., Industrial Gases Division, 575 Mountain Avenue, Murray Hill, N.J. 07974
- 3. Liquid Air, Inc., Embarcadero Center, San Francisco, Calif. 94111

10 SHIPPING INFORMATION

- 10.1 Grades or Purities: None
- 10.2 Storage Temperature: -183°C
- 10.3 Inert Atmosphere: Not required
- 10.4 Venting: Safety relief

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
A1

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not flammable compressed gas
- 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classifications

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Gas
- 13.2 Molecular Weight: 32.0
- 13.3 Boiling Point at 1 atm: -183°C = -297.3°F = -182.9°C = 90.2 K
- 13.4 Freezing Point: -182.9°C = 210.3 K
- 13.5 Critical Temperature: -118.3°C = 154.8 K
- 13.6 Critical Pressure: 50.1 atm = 5.01 MN/m²
- 13.7 Specific Gravity: 1.14 at -183°C (liquid)
- 13.8 Liquid Surface Tension: 13.4 dynes/cm = 0.0134 N/m at -183°C
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: 1.14
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: 9.48 Btu/lb = 21.9 cal/g = 21.9 kJ/kg
- 13.13 Heat of Combustion: Not pertinent
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

(Continued on page 3 and 4)

NOTES

PFA

PARAFORMALDEHYDE

Common Synonyms: Paraformaldehyde Polyoxymethylene Formaldehyde polymer	Solid powder White Irritating odor Sinks and mixes with water
Fire	Combustible
Exposure	HAZARDOUS DUST Irritating to eyes, nose and throat Harmful if inhaled SOLID Irritating to skin and eyes If swallowed, will cause nausea, vomiting or loss of consciousness
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Response to Accidents Handbook, CG 444-4 Dispose and flush	2. LABELS No hazard label required by U.S. Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Polyoxymethylene Polyformaldehyde Polyoxymethylene Polyoxymethylene glycol 3.2 Coast Guard Compatibility Classification: Aldehyde 3.3 Chemical Formula: $\text{HOCH}_2\text{O}_n\text{H}$ 3.4 IMCO United Nations Numerical Designation: 910	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Pungent and irritating like formaldehyde
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Eye, face and hand protective clothing 5.2 Symptoms Following Exposure: Vapor irritates eyes, mucous membranes and can cause dermatitis. Ingestion of solid or solution in water irritates mouth, throat and stomach and may cause death 5.3 Treatment for Exposure: INHALATION: Give milk or white sheep brand with water. If a skin OR EYES: Use with copious amount of water 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Lethal LD_{50} 500-500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that no animal will breathe it at a concentration higher than 100 ppm 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smothering and reddening of the skin 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: 199°F (upper limit) (NFI) (approx. 100°C) 6.2 Flammable Limits in Air: 0.001% (aldehyde gas) 1.1% (vapor) 6.3 Fire Extinguishing Agents: Water, foam, dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Data not available 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Changes to formaldehyde gas, which is highly flammable 6.7 Ignition Temperature: 572°F (approx.) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 10 ppm 24 hr. catfish; 10 mg./l. fresh water; 100-500 ppm 48 hr. daphnia; 11 mg./l. salt water 8.2 Waterbody Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 100% (data about 10% in days) 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Forms water solution of formaldehyde 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable; decomposes to formaldehyde gas 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Celanese Corp. Celanese Chemical Co., Division 245 Park Ave. New York, N.Y. 10017 2. Matheson Chemical Works 2nd and Mallinckrodt St. St. Louis, Mo. 63103 3. Fenchem Chemicals, Inc. Fenchem Intermediates Division 5 Fenner Place Parsippany, N.J. 07054
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-3 RR 4	10 SHIPPING INFORMATION 10.1 Grades or Purities: 99.9% powder and flake 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Operate flame arresters
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 30.026 g/mol 13.3 Boiling Point at 1 atm: 16.5°C (61.7°F) 13.4 Freezing Point: -12.3°C (9.9°F) (at 0.01 mm Hg) 13.5 Critical Temperature: 216.1°C (421.0°F) 13.6 Critical Pressure: 35.5 atm 13.7 Specific Gravity: 1.36 at 15°C 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 19,400 kJ/mol (4,640 kcal/mol) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -100 kJ/mol (24 kcal/mol) (at 25°C) 13.16 Heat of Polymerization: Not pertinent
NOTES	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Water is effective 6.4 Fire Extinguishing Agents Not to be Used: High pressure water hose may scatter particles from beneath materials increasing contamination hazard 6.5 Special Hazards of Combustion Products: Fumes from decomposing material may contain oxides of sulfur and sulfur oxen 6.6 Behavior in Fire: Container may explode when heated 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Upper 96-hr median LC50 for rainbow trout = 411 ppm; 48-hr median LC50 for bluegill = 100 ppm 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: No bioaccumulation data								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction; not considered hazardous 7.2 Reactivity with Common Materials: Not reactive 7.3 Stability During Transport: Not reactive 7.4 Neutralizing Agents for Acids and Bases: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS McLean Chemical and Products Company Agriculture Division 440 North Lindbergh Avenue St. Louis, MO 63106 2. National Chemical Corporation Agricultural Chemical Division Westport, Conn. 06890								
	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.5% Sometimes distributed as water-soluble emulsion 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Pressure not built up								
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3 20000	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 200.3 13.3 Boiling Point at 1 atm: Very high decomposition 13.4 Freezing Point: 2-3 + 0.4°C = 28.6 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.06 at 25°C liquid 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 44.8 kJ/mole 14.4 MJ/kg (3.83 x 10³ Btu/lb) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12 HAZARD CLASSIFICATIONS Code of Federal Regulations: Pesticides Class B 12.2 NAS Hazard Rating for Soil/Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard/Blue</td><td>3</td></tr><tr><td>Flammability/Red</td><td>0</td></tr><tr><td>Reactivity/White</td><td>0</td></tr></table>	Category	Classification	Health Hazard/Blue	3	Flammability/Red	0	Reactivity/White	0	
Category	Classification								
Health Hazard/Blue	3								
Flammability/Red	0								
Reactivity/White	0								
5 HEALTH HAZARDS (Cont'd.) 5.10 Odor Threshold: Not given 5 continued on pages 7 and 8									

PTB

PENTABORANE

Common Synonyms (9) Pentaboron monohydride		Liquid	Colorless	Strong sour milk odor
		Ignites when exposed to air. Floats on water.		
Fire		IGNITES WHEN EXPOSED TO AIR Burns with a blue flame.		
		HAZARD IS FROM PRODUCTS OF COMBUSTION VAPOR POISONOUS IF INHALED		
Exposure		LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to eyes.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE See Response Methods Manual, CG 404.4 Issue warning: High flammable liquid, water contaminant. Restrict access. Evacuate area. Dispense and flush.		2 LABELS 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: (9) Pentaboron monohydride. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: B ₅ H ₉ . 3.4 IMCO/United Nations Numerical Designation: 4.2 (F+).		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Characteristic, strong, pungent, sour milk-like.		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Self-contained breathing apparatus with canister, gloves, and protective clothing.				
5.2 Symptoms Following Exposure: Inhalation: Irritation, cough, chest pain, difficulty breathing, pulmonary edema. Ingestion: Irritation, nausea, vomiting, abdominal pain. Skin Contact: Irritation, redness, swelling. Eye Contact: Irritation, redness, swelling. Inhalation: Irritation, cough, chest pain, difficulty breathing, pulmonary edema. Ingestion: Irritation, nausea, vomiting, abdominal pain. Skin Contact: Irritation, redness, swelling. Eye Contact: Irritation, redness, swelling.				
5.3 Treatment for Exposure: For inhalation: Move to fresh air. For ingestion: Do not induce vomiting. For skin contact: Wash with soap and water. For eye contact: Flush with water.				
5.4 Toxicity by Inhalation (Threshold Limit Value): 0.05 ppm.				
5.5 Short-Term Inhalation Limits: 2 ppm for 15 min; 1 ppm for 30 min; 0.5 ppm for 60 min; 0.2 ppm for 120 min.				
5.6 Toxicity by Ingestion: Grade 4.1 (F+).				
5.7 Late Toxicity: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent. 6.2 Flammable Limits in Air: 4.7% - 15%. 6.3 Fire Extinguishing Agents: Pretreatments that attack and deactivate the input of the chemical reaction. 6.4 Fire Extinguishing Agents Not to be Used: Halogenated hydrocarbon gases. 6.5 Special Hazards of Combustion Products: Toxic fumes may be formed. 6.6 Behavior in Fire: Tends to explode if heated with water applied. Adjacent fires produce flame that feed back. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																															
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently with water to produce hydrogen gas. Reaction is exothermic and may be violent. 7.2 Reactivity with Common Materials: Corrosive to metals, reacts with some organic materials, some greases and some lubricants. 7.3 Stability During Transport: Stable below 400 °F. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9 SELECTED MANUFACTURERS General Chemical Company General Electric																															
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 404.3 A011 A W		10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical grade. 10.2 Storage Temperature: Room temperature. 10.3 Inert Atmosphere: Not required. 10.4 Venting: Not required.																															
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Health</td><td>4</td></tr><tr><td>Vapor Toxicity</td><td>4</td></tr><tr><td>Liquid Surface Tension</td><td>4</td></tr><tr><td>Pressure</td><td>4</td></tr><tr><td>Water Pollution</td><td>4</td></tr><tr><td>Human Toxicity</td><td>4</td></tr><tr><td>Acute Toxicity</td><td>4</td></tr><tr><td>Reactivity</td><td>4</td></tr><tr><td>Chronic Toxicity</td><td>4</td></tr><tr><td>Self-Reactivity</td><td>4</td></tr></table> 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>4</td></tr><tr><td>Flammability (Red)</td><td>4</td></tr><tr><td>Reactivity (Yellow)</td><td>4</td></tr></table>		Category	Rating	Health	4	Vapor Toxicity	4	Liquid Surface Tension	4	Pressure	4	Water Pollution	4	Human Toxicity	4	Acute Toxicity	4	Reactivity	4	Chronic Toxicity	4	Self-Reactivity	4	Category	Classification	Health Hazard (Blue)	4	Flammability (Red)	4	Reactivity (Yellow)	4	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Liquid. 13.2 Molecular Weight: 122. 13.3 Boiling Point at 1 atm.: 100.5 °C (212.9 °F). 13.4 Freezing Point: -102.5 °C (-152.5 °F). 13.5 Critical Temperature: 40.1 °C (104.2 °F). 13.6 Critical Pressure: 10.1 MPa (147.0 psi). 13.7 Specific Gravity: 0.62 (at 15°C). 13.8 Liquid Surface Tension: 20.5 dyne/cm (0.0205 N/m). 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 1.2. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.0. 13.12 Latent Heat of Vaporization: 2.4 kJ/mol (0.57 kcal/mol). 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.	
Category	Rating																																
Health	4																																
Vapor Toxicity	4																																
Liquid Surface Tension	4																																
Pressure	4																																
Water Pollution	4																																
Human Toxicity	4																																
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Chronic Toxicity	4																																
Self-Reactivity	4																																
Category	Classification																																
Health Hazard (Blue)	4																																
Flammability (Red)	4																																
Reactivity (Yellow)	4																																
5 HEALTH HAZARDS (Cont'd) 8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 9 Liquid or Solid Irritant Characteristics: Data not available. 10 Odor Threshold: 0.5 ppm.																																	

PCP

PENTACHLOROPHENOL

Common Synonyms Dowicide 7 Penta Santophen 20		Solid beads or flakes - White to light brown	
		Sinks in water	
Avoid contact with solid and dust. Keep people away. Wear goggles and water clothes, including aprons. Stop discharge if possible. If life and water is endangered, stop discharge. Not toxic to health and pollution in low concentrations.			
Fire		Not flammable	
		CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing difficult, give oxygen. SOLID POISONOUS IF SWALLOWED Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected area with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED, do not vomit. If CONSCIOUS, have victim drink water or milk and have vomiting induced by pumping. If SWALLOWED and unconscious, DO NOT HAVE CONVULSIONS. Call doctor for proper respiration aid.	
Exposure			
Water Pollution		HARMFUL TO AQUATIC LIFE AT VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Not toxic to fish and wildlife in low concentrations. Not dangerous to aquatic wildlife in lakes.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook (C-446-4). Issue warning - person Restrict access Should be removed		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dowicide 7 Penta Santophen 20 3.2 Coast Guard Compatibility Classification Not applicable 3.3 Chemical Formula: C ₆ Cl ₅ OH 3.4 IMCO/United Nations Numerical Designation: 6.1, 2620		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Colorless to light brown 4.3 Odor: Very weak	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Respirator for dust, goggles, protective clothing 5.2 Symptoms Following Exposure: Dust or vapor irritates skin and mucous membranes, causing coughing and sneezing. Ingestion causes loss of appetite, respiratory difficulties, indigestion, and constipation. Overexposure causes headache. 5.3 Treatment for Exposure: Call doctor! If INGESTION, induce vomiting if once. EYES, wash with water for 15-30 min. SKIN, wash well with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m ³ 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 50 to 500 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Causes smothering of the skin and first degree burns on brief exposure. May cause secondary burns on long exposure. 5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Generates toxic and irritating vapors 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable		8 WATER POLLUTION 8.1 Aquatic Toxicity: 5 ppm - the trout lethal fresh water 8.2 Waterfowl Toxicity: 4500 ppm/l C50/mallards 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available									
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48040 2. Reichold Chemicals, Inc. RCI Bldg. White Plains, N.Y. 10602 3. Sunford Chemical Co. Port Neches, Tex. 77661									
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook (C-446-3)) II		10 SHIPPING INFORMATION 10.1 Grades or Purity: 86-100% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open									
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (red)</td><td>3</td></tr><tr><td>Flammability (red)</td><td>0</td></tr><tr><td>Reactivity (yellow)</td><td>0</td></tr></tbody></table>		Category	Classification	Health Hazard (red)	3	Flammability (red)	0	Reactivity (yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 266.35 13.3 Boiling Point at 1 atm: 580.1 = 310.9°C = 583.6 K 13.4 Freezing Point: 370.1 = 18.8°C = 461.8 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.98 at 15°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Classification										
Health Hazard (red)	3										
Flammability (red)	0										
Reactivity (yellow)	0										
Continued on page 5 and 6											
NOTES											

Continued on page 5 and 6

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PDC

PENTADECANOL

Common Synonyms		Liquid	Colorless	Faint alcohol odor
		Floats on water		
Step 1: Institute measures to keep personnel safe. Call for medical aid. Avoid contact with liquid. Do not inhale vapors or dust. Notify local health and pollution control agencies.				
Fire	Combustible Extinguish with foam, dry chemical or water. Avoid use of water. Water may be used to extinguish fire on exposed containers with care.			
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. Remove contaminated clothing and shoes. Flush all exposed areas with plenty of water. IF IN EYES: Flush with water and flush with plenty of water.			
Water Pollution	Harmful to fish and water fowl Fouling to shoreline May be dangerous if it enters water intakes Notify local health and pollution control officials Notify local authorities of nearby water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanism of containment Should be removed		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1. Pentadecanol Pentadecyl alcohol 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: C ₁₅ H ₃₂ O, C ₁₅ H ₃₁ OH 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weak alcoholic		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: Low toxicity. Excessive exposure produces some central nervous system depression. Prolonged contact produces skin irritation. 5.3 Treatment for Exposure: INHALATION: If necessary, support respiration. INGESTION: Induce vomiting and call a doctor. SKIN OR EYES: Wash with copious amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				
6. FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None		
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS No bulk shipments		
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-1.1		10. SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)		
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 228.42 13.3 Boiling Point at 1 atm: 572°F = 300°C = 573°K 13.4 Freezing Point: 111°F = 44°C = 117°K 13.5 Critical Temperature: 521°F = 440°C = 713°K 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.829 at 50°C (liquid) 13.8 Liquid Surface Tension: (est) 25 dynes/cm = 0.025 N/m at 50°C 13.9 Liquid-Water Interfacial Tension: (est) 35 dynes/cm = 0.035 N/m at 50°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.024 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent		
NOTES				

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Common Synonyms 2,2 Hexahydroxyethyl 1,3 propanediol Pentacerythritol Tetrahydroxymethylmethane Hydroxyl PE Penick		Solid white Sinks and mixes slowly with water	Odorless
Fire		Combustible	
Exposure		VAPOR OR DUST Not harmful	
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-3) Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms Mono PE, PE, Pentacerythritol, Penick, Tetrahydroxymethylmethane, Tetra- hydroxymethyl methane, Tetramethylol methane 3.2 Coast Guard Compatibility Classification Not applicable 3.3 Chemical Formula $C_4H_{10}O_6$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles 5.2 Symptoms Following Exposure: Non-toxic, no symptoms likely 5.3 Treatment for Exposure: None needed 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent (Inert, particulate) 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 0 (D ₅₀ > 10 g/kg) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent			
6 FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: water, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 342°F (dust cloud) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent			
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent			
8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None			
9 SELECTED MANUFACTURERS 1. Celanese Chemical Company 245 Park Avenue New York, N.Y. 10017 2. Commercial Solvents Corporation Ferre Haute Ind. 47808 3. Hercules Incorporated Coatings & Specialty Products Department 910 Market Street Wilmington, Del. 19899			
10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 86-90% plus 10-14% dimer, Purity 98.4 + 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Optional			
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) SS			
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed			
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 136.2 13.3 Boiling Point at 1 atm: Not pertinent (sublimes) 13.4 Freezing Point: 402°F = 261°C = 534°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.39 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: ~8,740 Btu/lb = 4,400 cal/g = 205 kJ/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent			
Continued on page 5 and 6			
NOTES			

PTA

PENTANE

Common Synonyms	Liquid Colorless Gasoline odor Flashes on water. Flammable vapor is produced. Boiling point is 97°C.
Fire	FLAMMABLE Flashback along vapor trail may occur. Containers may explode when heated. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR If inhaled, will cause dizziness or difficulty breathing. LIQUID Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445-4) Evacuate area. High flammability. Restrict access. Evacuate area.	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Paraffin. 3.3 Chemical Formula: C ₅ H ₁₂ . 3.4 IMCO-United Nations Numerical Designation: 311265.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Gasoline.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield and gloves. 5.2 Symptoms Following Exposure: Low toxicity. Very high vapor concentrations produce irritation into lungs can produce chemical pneumonitis and pulmonary edema. 5.3 Treatment for Exposure: INHALATION: remove from exposure; support respiration; needed. INGESTION: do NOT induce vomiting; call physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): 500 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are irritant to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically non-toxic to skin. 5.10 Odor Threshold: 10 ppm.	

6 FIRE HAZARDS 6.1 Flash Point: -77.1°C (-107°F) 6.2 Flammable Limits in Air: 1.4 - 8.3% (by vol.) 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Containers may explode. 6.7 Ignition Temperature: 544°C (1011°F) 6.8 Electrical Hazard: Class I, Group D. 6.9 Burning Rate: 8.7 mm/min.	8 WATER POLLUTION 8.1 Aquatic Toxicity: > 60 ppm; toxic to fish; water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																																						
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Catalysts: Not pertinent. 7.5 Polymerization: No polymer. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Ashland Oil Co. Petrochemical Dept. Columbus, Ohio 43210. 2. Marathon Oil Co. 509 South Main St. Findlay, Ohio 45840. 3. Phillips Petroleum Co. Bartlesville, Okla. 74004.																																						
	10 SHIPPING INFORMATION 10.1 Grade or Purity: Pure (92%); technical grade (99.9%+). 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame indicator; pressure vacuum.																																						
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 FLUW	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 72.15. 13.3 Boiling Point at 1 atm: 97.0°C (367°F) @ 101.3 kPa. 13.4 Freezing Point: -130.0°C (-192.0°F) @ 101.3 kPa. 13.5 Critical Temperature: 196.1°C (385°F) @ 101.3 kPa. 13.6 Critical Pressure: 34.7 bar (502.6 psi) @ 101.3 kPa. 13.7 Specific Gravity: 0.626 at 20°C (liquid). 13.8 Liquid Surface Tension: 18 dyne/cm @ 20°C (N/m @ 20°C). 13.9 Liquid-Water Interfacial Tension: 50.2 dynes/cm @ 0.0502 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: 2.3. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.075. 13.12 Latent Heat of Vaporization: 377.6 kJ/mol (90.1 kcal/mol) @ 25°C. 13.13 Heat of Combustion: -14,552 kJ/mol @ 101.3 kPa; -42,012 kJ/mol (10,115 kcal/mol) @ 101.3 kPa. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.																																						
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulation: Flammable liquid. 12.2 NFPA Hazard Rating for Bulk Water Transportation <table data-bbox="943 1444 1190 1713"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>4</td></tr> <tr> <td>Health</td><td>0</td></tr> <tr> <td>Reactivity</td><td>0</td></tr> <tr> <td>Vapor Pressure</td><td>0</td></tr> <tr> <td>Liquid or Solid to Gas</td><td>0</td></tr> <tr> <td>Poisons</td><td>0</td></tr> <tr> <td>Water Pollution</td><td>0</td></tr> <tr> <td>Human Toxicity</td><td>0</td></tr> <tr> <td>Aquatic Toxicity</td><td>0</td></tr> <tr> <td>Aesthetic Effect</td><td>0</td></tr> <tr> <td>Reactivity</td><td>0</td></tr> <tr> <td>Other Chemicals</td><td>0</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications <table data-bbox="943 1736 1190 1825"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>4</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	4	Health	0	Reactivity	0	Vapor Pressure	0	Liquid or Solid to Gas	0	Poisons	0	Water Pollution	0	Human Toxicity	0	Aquatic Toxicity	0	Aesthetic Effect	0	Reactivity	0	Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	4	Reactivity (Yellow)	0	NOTES
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Reactivity (Yellow)	0																																						

REVISED 1978

PTE

1-PENTENE

Common synonyms: alpha-pentylene Propylene		Liquid Colorless Gasoline odor Floats on water. Flammable vapor is produced. Boiling point is 60°F.
	FLAMMABLE Flashback along vapor trail may occur. Containers may explode when heated. Vapor may explode if ignited in an enclosed area.	
Exposure	VAPOR If inhaled, will cause dizziness.	
	LIQUID Harmful if swallowed.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41. Issue warning: high flammability. Restrict access. Evacuate area.		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: alpha-pentylene Propylene 3.2 Coast Guard Compatibility Classification: Olefin 3.3 Chemical Formula: C_5H_{10} 3.4 IMCO United Nations Numerical Designation: 1.1 (10)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Like gasoline
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield (as for gasoline). 5.2 Symptoms Following Exposure: Acts as a simple asphyxiant or weak anesthetic in high vapor concentrations. Similar to effects caused by gasoline vapors. 5.3 Treatment for Exposure: INHALATION: remove victim from exposure. SKIN: wash with soap and water. EYES: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Not irritating. 5.9 Liquid or Solid Irritant Characteristics: Not irritating. 5.10 Odor Threshold: Data not available.		

6. FIRE HAZARDS

- 6.1 Flash Point: -60°F (-50°C)
 6.2 Flammable Limits in Air: 1.2-8.7%
 6.3 Fire Extinguishing Agents: Foam, dry chemical or carbon dioxide. Stop flow of vapor.
 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.
 6.5 Special Hazards of Combustion Products: Not pertinent.
 6.6 Behavior in Fire: Containers may explode in fire.
 6.7 Ignition Temperature: 527°F
 6.8 Electrical Hazard: Data not available.
 6.9 Burning Rate: Moderate.

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction.
 7.2 Reactivity with Common Materials: No reaction.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: 655 ppm (the 96-hour lethal fresh water).
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): 10% (theoretical) day 5 (theoretical) day 1 day.
 8.4 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

1. Exxon Chemical Co.
Houston, Tex. 77001
2. Phillips Petroleum
Bartlesville, Okla. 74603
3. Texaco Inc.
135 E. 42nd St.
New York, N.Y. 10018

10. SHIPPING INFORMATION

- 10.1 Grades or Purities: Research 99.9% pure, 99.4% technical 97.0%
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: Not required.
 10.4 Venting: Open flame arrester or pressure vacuum.

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3.
 NFPA 704

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations:
 Flammable liquid
 12.2 HAS Hazard Rating for Bulk Water
 Transportation: Not listed.
 12.3 NFPA Hazard Classifications: Not listed.

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm.: Liquid
 13.2 Molecular Weight: 70.13
 13.3 Boiling Point at 1 atm.:
 33°C (91°F)
 33°C (91°F)
 13.4 Freezing Point:
 -165°C (-265°F)
 -165°C (-265°F)
 13.5 Critical Temperature:
 197°C (397°F)
 197°C (397°F)
 13.6 Critical Pressure:
 33.5 atm (4.4 MN/m^2)
 33.5 atm (4.4 MN/m^2)
 13.7 Specific Gravity: 0.641 at 20°C (68°F)
 13.8 Liquid Surface Tension:
 16.5 dynes/cm (0.0165 N/m) at 20°C
 13.9 Liquid-Water Interfacial Tension:
 16.5 mdyne/cm (0.0165 N/m) at 20°C
 13.10 Vapor (Gas) Specific Gravity: 2.4
 13.11 Ratio of Specific Heats of Vapor (Gas):
 1.054
 13.12 Latent Heat of Vaporization:
 134.6 Btu/lb (3357 cal/g)
 134.6 Btu/lb (3357 cal/g)
 13.13 Heat of Combustion: $-19,559\text{ Btu/lb}$
 $-46,755\text{ cal/g}$ ($-46,755\text{ kJ/kg}$)
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: Not pertinent.

Continued on page 1 and 2.

NOTES

PAA

PERACETIC ACID

Common Synonyms Peroxyacetic acid Acetyl hydroperoxide		Liquid	Colorless	Strong odor
Mixes with water. Flammable. Irritating vapor is produced.				
<u>Fire</u>		Combustible May cause fire in contact with combustibles. Containers may explode in fire.		
<u>Exposure</u>		VAPOR Irritating to eyes, nose and throat. LIQUID Irritating to skin and eyes. Harmful if swallowed.		
<u>Water Pollution</u>		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water or lakes.		
1 RESPONSE TO DISCHARGE (See Response Procedures Handbook, CG 446-4) Issue warning - oxidizing material. Water contaminant. Restrict access. Dispense and flush.		2. LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetyl hydroperoxide Peroxyacetic acid 3.2 Coast Guard Compatibility Classification Not applicable 3.3 Chemical Formula: <chem>CH3COOOH</chem> , <chem>CH3COOH</chem> 3.4 IMCO/United Nations Numerical Designation: 2.1, 2.2		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent, strong.		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, protective clothing, goggles, rubber gloves, etc. 5.2 Symptoms Following Exposure: Inhalation causes severe irritation of mucous membranes. Contact with liquid causes severe irritation of eyes and skin. Ingestion causes severe distress, including burns of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air. If he is not breathing, apply artificial respiration and oxygen will assist. EYES: Flush with water for at least 10 min. SKIN: Flush with water and cover burn. INGESTION: Give plenty of warm water, call a doctor. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Fatal if swallowed. (Some symptoms may persist). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: 104 F (40 C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapors are very flammable and explosive. Liquid will detonate if concentration rises above 50% because of evaporation of acetic acid 6.7 Ignition Temperature: 492 F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May cause fire in contact with organic materials such as acids, cotton or straw. Corrosive to some metals including aluminum 7.3 Stability During Transport: Stable at room and ambient temperatures. At 40 C, concentration decreases about 1% each month 7.4 Neutralizing Agents for Acids and Caustics: Flush with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. EMC Corporation Industrial Chemical Division 633 Third Avenue New York, N.Y. 10017 2. High Pure Chemical Corp. 679 Taylor Street High Point, N.C. 27261 3. Ph. and Bauer, Inc. 26-04 Northern Boulevard Flushing, N.Y. 11368
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A P O	10 SHIPPING INFORMATION 10.1 Grades or Purity: 40% peracetic acid, 40% acetic acid, or hydroperoxide in water, 500 ppm stabilizer 10.2 Storage Temperature: 15 F to 22 F 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Organic Peroxide 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling point at 1 atm: Not pertinent (max. 100°C) 13.4 Freezing Point: approximately -22 F (-30 C) or 243 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: (at 20°C) (vs. water) 1.03 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Data not available 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent See material on acetic acid, H40
NOTES Continued on pages 1 and 2	

PCL

PERCHLORIC ACID

Common Synonyms Dioxonium perchlorate solution	Liquid Colorless Odorless Sinks and mixes with water
Fire	Not flammable Will increase the intensity of a fire May cause fire on contact with combustibles Containers may explode in fire POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing LIQUID Will burn skin and eyes If swallowed will cause nausea and vomiting
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Issue warning: corrosive/oxidizing material Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dioxonium perchlorate solution or Perchloric acid solution 3.2 Coast Guard Compatibility Classification Not listed 3.3 Chemical Formula: $\text{HClO}_4 \cdot \text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: 8+ (H ⁺)(ClO ₄ ⁻) acids < 1002 less than 50% acids	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, face shield or vapor-tight chemicals eye safety goggles, rubber apron, rubber boots or shoes 5.2 Symptoms Following Exposure: Inhalation of vapors or mist causes burning sensation of nose and throat, and lung irritation with coughing; prolonged or excessive exposure could cause vomiting and severe swelling. Ingestion causes blistering and burns of mouth and stomach. Contact with eyes or skin causes blistering and burns. 5.3 Treatment for Exposure: <i>Get medical attention as following all exposures to this compound.</i> INHALATION: move to fresh air, give oxygen if necessary. INGESTION: give large amounts of water. EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: 0.1 g/l air	

6. FIRE HAZARDS 6.1 Flash Point: No flammable but may explode in fire 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Water to non-protected area 6.4 Fire Extinguishing Agents Not to be Used 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: Above 160°C (320°F) will react with combustible material and increase intensity of fire. Containers may explode 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Contact with most combustible materials may cause fires and explosions. Corrosive to most metals with formation of flammable hydrogen gas, which may fill enclosed spaces. 7.3 Stability During Transport: Instable if heated 7.4 Neutralizing Agents for Acids and Caustics: Flush with water and rinse with dilute sodium bicarbonate or soda ash solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Specialty Chemicals Div. P.O. Box 1647R Morristown, N.J. 07960 2. J. I. Baker Chemical Co. Phillipsburg, N.J. 08865 3. Hooker Chemical Corporation Industrial Chemicals Division Natarata Falls, N.Y. 14902								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 445-3 A P	10. SHIPPING INFORMATION 10.1 Grades or Purities: ACS 60-72 solution in water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations, Oxydizer 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table data-bbox="1014 1496 1270 1582"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>0</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2.2</td></tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	2.2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 100.46 (solution 1.1) 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: -170°F = -112°C = 161°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.6-1.7 at 25°C (liquids) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Data not available 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	1								
Reactivity (Yellow)	2.2								
NOTES									

PERCHLOROMETHYL MERCAPTAN

Common Synonyms		Liquid	Yellow to orange red	Strong, unpleasant odor
Trichloromethyl sulfoxide Trichloroethyl sulfonchloride Trichloromethane sulfoxyl chloride		Sinks in water. Poisonous vapor is produced.		
Fire		Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED		
		VAPOR POISONOUS IF INHALED Irritating to eyes, nose and throat.		
		LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to eyes.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 44-4 Issue warning: poison water contaminant; air contaminant. Restrict access. Disperse and flush.		2 LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Trichloromethanesulfenyl chloride; Trichloromethane sulphuryl chloride; Trichloroethyl sulphochloride; Trichloromethylsulur chloride. 3.2 Coast Guard Competibility Classification: Not applicable. 3.3 Chemical Formula: CCl ₃ SOCl. 3.4 IMCO/United Nations Numerical Designation: F + 1670.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Bright yellow; pale yellow; range, red. 4.3 Odor: In excess, unpleasant strong; unbearable strongly acid.		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Organic and acid vaporizer mask or self-contained breathing apparatus; goggles or face shield; rubber gloves. 5.2 Symptoms Following Exposure: Inhalation may cause severe irritation of upper respiratory tract. Brief exposure to low concentration may produce central nervous system depression and lung, liver, and heart congestion. Severe exposures may be fatal. Contact of liquid with eyes causes immediate eye irritation and severe conjunctivitis if not promptly washed away; severe conjugal damage may result. Liquid also causes severe local skin irritation; may be absorbed through skin in quantities sufficient to produce systemic poisoning. Ingestion may cause damage to the membranes of the mouth, chest, and gastro-intestinal tract. Pain and burning of the mouth and throat, nausea, vomiting, cramps and diarrhea may occur. In severe cases toxic ulceration of central nervous system depression may result. 5.3 Treatment for Exposure: Get medical attention following all exposures to this compound. INHALATION: remove victim to fresh air; get enough to mouth resuscitation if needed. EYES: flush with copious amount of physician's quality labeled chemical safety eyewash. SKIN: flush with water. INGESTION: give large amounts of water; then induce vomiting until vomitus is clear; give milk, eggs, or some other foodstuffs as desired. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 3 - LD ₅₀ = 0.5 g/kg rats. 5.7 Late Toxicity: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Very irritating vapors formed from hot material. May form toxic phosphine gas, hydrogen chloride, and sulfur dioxide. 6.6 Behavior in Fire: At elevated temperatures will decompose to carbon tetrachloride, sulfur chloride, and heavy oils polymers. 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazards: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts only when not in gas; carbon dioxide, hydrochloric acid, and sulfur 7.2 Reactivity with Common Materials: Reacts with iron or steel, evolving carbon tetrachloride. Corrosive to most metals 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flood with water, rinse with dilute sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Stauffer Chemical Co. 1200 South 47th Street Richmond, Calif. 94804 2. Aldrich Chemical Co. 940 West St. Paul Ave. Milwaukee, Wis. 53233 3. Pfaltz and Bauer, Inc. 12640 Northern Boulevard Flushing, N.Y. 11356
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3 N O N	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 97% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not recommended 10.4 Venting: Pressure release
12 HAZARD CLASSIFICATIONS *2.1 Code of Federal Regulations: Poisonous Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 145.9 13.3 Boiling Point at 1 atm: 400°F = 204°C = 479°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: Not at 1°C liquid 13.8 Liquid Surface Tension: 34.02 dyne/cm = 0.03402 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 100,000 Btu/l = 22 x 10³ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

Continued on page 1 and 4

PTL

PETROLATUM

Common Synonyms Petroleum jelly	Thick liquid Dark brown, green, amber, or white Odorless Floats on water
Fire	Combustible
Exposure	LIQUID Irritating to eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Appendix Methods Manual, US 444.4 Mechanical: Intact Should be cleaned Chemical and physical treatment	2 LABELS No hazard label required Federal Label: Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Petroleum jelly Petroleum jelly Vaseline Vaseline petroleum 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: No applicable 3.4 IMCO United Nations Numerical Designation: No listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Dark brown, green, or dark 4.3 Odor: None
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, mask, shield 5.2 Symptoms Following Exposure: None 5.3 Treatment for Exposure: EYES: Wash with water 5.4 Toxicity by Inhalation (Threshold Limit Value): No pertinent 5.5 Short-Term Inhalation Limits: No pertinent 5.6 Toxicity by Ingestion: Grade I: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: No pertinent	

6 FIRE HAZARDS 6.1 Flash Point: 100-130 F (38-56 C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: No pertinent 6.5 Special Hazards of Combustion Products: No pertinent 6.6 Behavior in Fire: No pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: No pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: No pertinent 7.5 Polymerization: No pertinent 7.6 Inhibitor of Polymerization: No pertinent	9 SELECTED MANUFACTURERS M&B Corp. North American Division Parsippany, N.J. 07054 2. Paraffin Baker Petroleum 3. Quaker State Oil Refining Co. Oil City, Pa. 16133
11 HAZARD ASSESSMENT CODE See Methods of Assessment Manual, US 444.3 A T T	10 SHIPPING INFORMATION 10.1 Grades or Purity: USP NF technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arresters
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Cream 13.2 Molecular Weight: No pertinent 13.3 Boiling Point at 1 atm: Not listed 13.4 Freezing Point: 13.5 Critical Temperature: No pertinent 13.6 Critical Pressure: No pertinent 13.7 Specific Gravity (est.) 0.865 at 60°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: No pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): No pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: No pertinent 13.15 Heat of Solution: No pertinent 13.16 Heat of Polymerization: No pertinent
NOTES	

REVISED 1978

PTN

PETROLEUM NAPHTHA

Common Synonyms: Petroleum solvent	Liquid Colorless Gasoline odor Floats on water. Flammable vapor is produced.
Fire FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.	
Exposure VAPOR Not irritating to eyes, nose, or throat. LIQUID Harmful if swallowed.	
Water Pollution Effect of low concentration on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes.	
1 RESPONSE TO DISCHARGE See Response Methods Handbook (CS 444.4) Use warning: High Temperature Resistances Flammable	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Petroleum solvent 3.2 Coast Guard Compatibility Classification: Miscellaneous hydrocarbon mixtures 3.3 Chemical Formula: Not applicable 3.4 IMCO United Nations Numerical Designation: 2200	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Gasoline odor
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Not applicable 5.2 Symptoms Following Exposure: Irritation to eyes, nose, and throat. Liquid may cause skin irritation. 5.3 Treatment for Exposure: INHALATION: Move to fresh air. INGESTION: Do not induce vomiting. NOT TO BE USED FOR EYE WASHING. SKIN: Wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not applicable 5.5 Short-Term Inhalation Limits: Not applicable 5.6 Toxicity by Ingestion: Not applicable 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapor is not irritating to eyes, nose, and throat. 5.9 Liquid or Solid Irritant Characteristics: Not applicable 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS

- 6.1 Flash Point: 10 to 15°C (50 to 60°F)
- 6.2 Flammable Limits in Air: 0.7 to 7.4%
- 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, dry chemical
- 6.4 Fire Extinguishing Agents Not to be Used: Water, alcohol
- 6.5 Special Hazards of Combustion Products: None
- 6.6 Behavior in Fire: Not pertinent
- 6.7 Ignition Temperature: 400 to 450°C
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: 4 to 6 in./min.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

- Axon Chemical Co.
APCO Chemical Co. Division
20 N. Broad St.
Philadelphia, Pa. 19101
- Sachs O. Co.
Kansas City, Mo. 64114
- Exxon Chemical Co.
Aron, Division
100 N. Meacham Rd.
Pasadena, Ill. 60655

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Not pertinent
- 7.2 Reactivity with Common Materials: Not pertinent
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10 SHIPPING INFORMATION

- 10.1 Grades or Purities: Data not available
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: Not required
- 10.4 Venting: Open flame or other heat source, pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook (CS 444.3)
A T T A W

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable liquid
- 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classification: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
- 13.2 Molecular Weight: Not applicable
- 13.3 Boiling Point at 1 atm: 150 to 200°C (300 to 400°F)
- 13.4 Freezing Point: Not applicable
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 0.74 to 0.78 (liquid)
- 13.8 Liquid Surface Tension: 22 to 24 dyne/cm (20 to 22 mN/m)
- 13.9 Liquid-Water Interfacial Tension: 20 to 25 dyne/cm (18 to 22 mN/m)
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1 to 1.2
- 13.12 Latent Heat of Vaporization: 400 to 500 cal/g (1.7 to 2.1 kJ/g)
- 13.13 Heat of Combustion: Data not available
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

NOTES

PHN

PHENOL

Common Synonyms: Carbolic Acid Hydroxybenzene	Solid crystals or watery liquid May float on water and mixes slowly with water	White solid or light pink liquid Sweet tarry odor
Fire LIQUID OR SOLID POISONOUS IF SWALLOWED Will burn skin and eyes Exposure		
Water Pollution	HAZARDOUS TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intake	
1. RESPONSE TO DISCHARGE See Hazardous Waste Management Manual, 1980 EPA 40 CFR 117 RCRA 40 CFR 117 SARA 40 CFR 117 Chemical Safety and Hazard Investigation	2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Carbolic Acid Hydroxybenzene Phenol Carbolic Acid 3.2 Coast Guard Compatibility Classification Phenol 3.3 Chemical Formula: C ₆ H ₅ OH 3.4 IMCO United Nations Numerical Designation: 1500	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid Solid 4.2 Color: Colorless to pinkish 4.3 Odor: Sweet tarry odor 4.4 Other Characteristics: Highly corrosive to metals and organic materials	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Wear protective clothing and footwear. Use gloves when handling. 5.2 Symptoms Following Exposure: With acute exposure, irritation of the skin, eyes, and respiratory tract is observed. Ingestion causes severe irritation of the mouth and throat and death. 5.3 Treatment for Exposure: INHALATION: Remove from exposure. If breathing stops, give artificial respiration. INGESTION: Do NOT induce vomiting. Give milk or water. If eyes are exposed, flush with water for 15 minutes. If skin is exposed, wash with soap and water for 15 minutes. If swallowed, drink milk or water and seek medical attention immediately. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm as airborne exposure 5.5 Short-Term Inhalation Limits: Do not inhale 5.6 Toxicity by Ingestion: Lethal T.D. ₅₀ 1.5 g/kg 5.7 Late Toxicity: Carcinogenic in laboratory animals 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes severe irritation of the respiratory tract and death if inhaled for prolonged periods. 5.9 Liquid or Solid Irritant Characteristics: Liquid or solid causes severe irritation of the skin and eyes and death if swallowed. 5.10 Odor Threshold: 0.05 ppm		

6. FIRE HAZARDS

- 6.1 Flash Point: 100°C (212°F)
6.2 Flammable Limits in Air: 1.1-7.1%
6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide, dry chemical
6.4 Fire Extinguishing Agents Not to be Used: None
6.5 Special Hazards of Combustion Products: Toxic and irritating vapors are evolved when heated
6.6 Behavior in Fire: Solid phenol decomposes when heated which will form expensive materials
6.7 Ignition Temperature: 391°C
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: 1.5 g/min

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: No reaction
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: 250 mg/L (250 ppm) in fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 240 mg/L
8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

1. Allied Chemical Corp.
Easton, Pa.
Middletown, N.J. 07040
2. Dow Chemical
Midland, Mich. 48667
3. Monsanto Company
Morton, Ill. 61550
4. Union Carbide Corp.
P.O. Box 1170
N. York, N.Y. 10018

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: 99.5% min.
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: Not required
10.4 Venting: Pressure vacuum

11. HAZARD ASSESSMENT CODE

See Hazardous Waste Management Manual, 1980
A P Q

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations:
Phenol, liquid or solid, Class B
12.2 NAS Hazard Rating for Bulk Water
Transportation:
- | Category | Rating |
|-----------------|--------|
| Flammable | 1 |
| Corrosive | 2 |
| Reactive | 3 |
| Water Pollution | 4 |
| Health Hazard | 5 |
| Acute Toxic | 6 |
| Chronic Toxic | 7 |
| Other | 8 |
| Physical | 9 |
| Stability | 10 |
| Self-Heating | 11 |
| Self-Reacting | 12 |
| Other | 13 |
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|-------------------|----------------|
| Health Hazard (H) | 3 |
| Flammability (F) | 2 |
| Reactivity (R) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 94
13.3 Boiling Point at 1 atm: 181.5°C (358.7°F)
13.4 Freezing Point: 4°C (39.2°F)
13.5 Critical Temperature: 305.5°C (581.9°F)
13.6 Critical Pressure: 48.0 atm (690.7 psi)
13.7 Specific Gravity: 1.07 at 20°C (68°F)
13.8 Liquid Surface Tension: 37.5 dyne/cm at 20°C (68°F)
13.9 Liquid-Water Interfacial Tension: 3.5 dyne/cm at 20°C (68°F)
13.10 Vapor (Gas) Specific Gravity: 2.705
13.11 Ratio of Specific Heats of Vapor (Gas): 1.0
13.12 Latent Heat of Vaporization: 48.0 kJ/mol (11.4 kcal/mol)
13.13 Heat of Combustion: -30.8 kJ/mol (-7.3 kcal/mol)
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

NOTES

FDL

PHENYLDICHLOROARSINE, LIQUID

Common Synonyms Phenylarsene dichloride	Physical State Liquid Color Colorless to yellow Odor Weak unpleasant odor Sinks in water
Fire	
 Exposure LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes.	
Water Pollution	
1 RESPONSE TO DISCHARGE See Response to Material Handling (CS 446.4) Issue warning: phenylarsine dichloride Contain material in water Restrict access Disperse and flush	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Phenylarsene dichloride 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $C_6H_5AsCl_2$ 3.4 IMCO/United Nations Numerical Designation: A+ 159	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to yellow 4.3 Odor: Weak, barely unpleasant
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Full protective suit including gloves, boots, hood and breathing apparatus 5.2 Symptoms Following Exposure: Irritation of eyes, skin and respiratory tract with pain, redness and systemic effects. Vapor may cause eye burns, respiratory irritation, and systemic effects. Ingestion causes severe irritation of the mouth and stomach. 5.3 Treatment for Exposure: For moderate exposure, remove the person from the exposure area. If breathing has ceased, INHALATION: remove victim from exposure; give artificial respiration. If breathing has ceased, EYES: immediately wash with the generous amount of water for at least 15 min. SKIN: flush with water and wash well with soap and water. compound can be absorbed through skin and cause systemic effects. INGESTION: do not induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Highly toxic as combustion product when heated 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterford Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Very slow reaction; no hazardous products formed 7.2 Reactivity with Common Materials: Corrodes metals because of acid nature 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Aldrich Chemicals, Inc. 30 Anderson St. Danvers, Mass. 01923 Ventron Corporation Alfa Products Division 13 Congress St. Beverly, Mass. 01915
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook (CS 446.3) A 159	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Pressure required
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 222.9 13.3 Boiling Point at 1 atm: 205°C (401°F) 13.4 Freezing Point: -10°C (14°F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.47 at 20°C (liquid) 13.8 Liquid Surface Tension: 44 mdyne/cm = 0.044 N/m at 20°C 13.9 Liquid-Vapor Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 49 Btu/lb = 14.3 kJ/kg 13.13 Heat of Combustion: test = 16,450 Btu/lb = 3,800 kJ/kg; calc = 14,000 Btu/lb = 3,200 kJ/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

Continued on pages 3 and 4

PHH

PHENYLHYDRAZINE HYDROCHLORIDE

Common Synonyms: Phenylhydrazine chloride		Solid	White to tan	Weak odor
Sinks and mixes with water				
Fire		Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE		
		DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing.		
HAZARDOUS		SOLID POISONOUS IF SWALLOWED If swallowed will cause nausea		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE See Response to Methods Manual, CG 444.4 If swallowed, do not induce vomiting. If inhaled, move to fresh air. If on skin, flush with water.		2. LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Phenylhydrazine chloride 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₁₀ H ₁₀ N ₂ Cl ₂ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White to tan 4.3 Odor: Weak ammonia		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust goggles or rubber goggles, gloves. 5.2 Symptoms Following Exposure: Inhalation of dust may irritate the respiratory tract. If swallowed, the material may cause severe symptoms as described. Phenylhydrazine is a strong poison. Ingestion of various quantities of this material may cause nausea and vomiting, and may cause anemia and liver injury. Contact with eyes causes irritation. Contact with skin causes irritation and dermatitis. 5.3 Treatment for Exposure: INHALATION: Move to fresh air. Get medical attention. If swallowed, give large amount of water and see medical attention. If inhaled, flush with water for at least 15 min. If exposure is prolonged or repeated, get medical attention. SKIN: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Color Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Toxic and irritating gases. In fire, phenylhydrazine chloride may form nitrobenzene. 6.6 Behavior in Fire: The solid may melt, burn, and release irritating and deposit smoke particles. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not pertinent. 7.2 Reactivity with Common Materials: May be irritant to some metals. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS Eastman Organic Chemicals 400 State Street Rochester, N.Y. 14650 Aldrich Chemical Co. 231 W. Main Street Milwaukee, Wis. 53233 Gallard Schlegel Chemical Mfg. Co. 104 Niagara Ave. Erie, Pa. 16512
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 444.4 **	10 SHIPPING INFORMATION 10.1 Grades or Purities: Commercial, Pure. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not required. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Phenylhydrazine, Class B. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 224.4. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: Data not available. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: Not listed (at 20°C liquid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Polymerization: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

Continued on page 7 and 8

PAC	PHOSPHORIC ACID
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Common Synonyms Orthophosphoric acid	Thick liquid Colorless Odorless Sinks and mixes with water
Fire	Not flammable Flammable gas is formed on contact with metals
Exposure	LIQUID Will burn skin and eyes If swallowed, will cause nausea, vomiting, or loss of consciousness
Water Pollution	Dangerous to aquatic life in high concentration May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - corrosive Restrict access Disperse and flush	2 LABEL  CORROSIVE
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Orthophosphoric acid 3.2 Coast Guard Compatibility Classification: Non-oxidizing mineral acid 3.3 Chemical Formula: H_3PO_4 3.4 IMCO/United Nations Numerical Designation: 9.0-1805	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Odorless
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, face shield, rubber gloves and protective clothing. 5.2 Symptoms Following Exposure: Burns on mouth and lips, sour, acid taste, severe gastrointestinal irritation, nausea, vomiting, bloody diarrhea, difficulty swallowing, severe abdominal pains, thirst, urgent, difficult breathing, convulsions, collapse, shock, death. 5.3 Treatment for Exposure: INGESTION do NOT induce vomiting, give water, milk, or vegetable oil. SKIN OR EYE CONTACT flush with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1.0 mg/m³ 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 3 LD₅₀ 10 to 500 mg/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not volatile 5.9 Liquid or Solid Irritant Characteristics: Early severe skin irritation may cause pain and second degree burns after a few minutes contact. 5.10 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8 WATER POLLUTION 8.1 Aquatic Toxicity: 1.5 ppm, 24 hr. mosquito fish, 21 hr. fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (50°): None 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Mild evolution of heat 7.2 Reactivity with Common Materials: Reacts with metals to form flammable hydrogen gas 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flammable water neutralizes with time 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent																																					
9. SELECTED MANUFACTURERS 1. C.I. Industries Inc. Bartow Phosphate Complex Bartow, Fla. 33830 2. Cities Service Co. Inc. North American Chemicals & Metals Co. 60 Wall St. New York, N.Y. 10005 3. Freport Minerals Co. Freport Chemical Co. Division 161 East 42 St. New York, N.Y. 10017																																					
10 SHIPPING INFORMATION 10.1 Grades or Purity: Not food grade, commercial, all 98.5% the balance being water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open																																					
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 98.00 13.3 Boiling Point at 1 atm: > 260°C = > 100°C = > 400°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.892 at 25°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -52 Btu/lb = -2° cal/g = -1.2 x 10³ J/kg 13.16 Heat of Polymerization: Not pertinent																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive liquid 12.2 NAS Hazard Rating for Bulk Water Transportation <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>0</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>9</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td> Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>2</td></tr> <tr> <td> Aquatic Toxicity</td><td>3</td></tr> <tr> <td> Acid Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>3</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td></td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>		Category	Rating	Fire	0	Health		Vapor Irritant	9	Liquid or Solid Irritant	4	Poisons	1	Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	Acid Effect	2	Reactivity		Other Chemicals	3	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)		Flammability (Red)	0	Reactivity (Yellow)	0
Category	Rating																																				
Fire	0																																				
Health																																					
Vapor Irritant	9																																				
Liquid or Solid Irritant	4																																				
Poisons	1																																				
Water Pollution																																					
Human Toxicity	2																																				
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Health Hazard (Blue)																																					
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Reactivity (Yellow)	0																																				
NOTES																																					

PPO

PHOSPHORUS OXYCHLORIDE

Common Synonyms		Oily liquid	Colorless to light yellow	Musty odor
		Fumes in air, sinks and reacts with water. Poisonous gas is produced. Freezing point is 34°F.		
Fire		Not flammable		
		VAPOR Irritating to eyes, nose, and throat. Painful if inhaled.		
		LIQUID Will burn skin and eyes. Harmful if swallowed.		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE		2. LABEL		
See Response Methods Handbook, CG 446.4. Issue warning: Corrosive. Restrict access. Dilute and flush with care.				
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: Phosphorus chloride		4.1 Physical State (as shipped): Liquid		
3.2 Coast Guard Compatibility Classification Not applicable		4.2 Color: Colorless to pale yellow		
3.3 Chemical Formula: POCl ₃		4.3 Odor: Pungent and musty; disagreeable and lingering		
3.4 IMCO/United Nations Numerical Designation: 801N10				
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Chemical safety goggles; face shield; self-contained or air-line respirator; hard hat; foot protection; rubber gloves and clothing.				
5.2 Symptoms Following Exposure: Vapors burn eyes and respiratory tract. Liquid is very corrosive to body tissues because of reaction with water to form hydrochloric and phosphoric acids.				
5.3 Treatment for Exposure: CAUTION: persons doing treatment should protect themselves against exposure. INHALATION: remove victim from contaminated area if once; if breathing has stopped, start artificial respiration; call a doctor. INGESTION: give water or milk; do NOT induce vomiting. SKIN: remove contaminated clothing and flood exposed skin surfaces with water. EYES: retract eyelids and wash with water for at least 15 min; call a doctor.				
5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 ppm				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade 3, oral rat LD ₅₀ = 350 mg/kg				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations.				
5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes.				
5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: Not flammable	8.1	Aquatic Toxicity: Data not available
6.2	Flammable Limits in Air: Not flammable	8.2	Waterfowl Toxicity: Data not available
6.3	Fire Extinguishing Agents: Sand and carbon dioxide on adjacent fires	8.3	Biological Oxygen Demand (BOD): None
6.4	Fire Extinguishing Agents Not to be Used: Water	8.4	Food Chain Concentration Potential: None
6.5	Special Hazards of Combustion Products: Not pertinent		
6.6	Behavior in Fire: Poisonous, corrosive, irritating gases are generated when heated or when in contact with water		
6.7	Ignition Temperature: Not flammable		
6.8	Electrical Hazard: Not pertinent		
6.9	Burning Rate: Not flammable		
		9 SELECTED MANUFACTURERS	
		1	EMC Corp. Organic Chemicals Division 604 E. 4th Ave. New York, N.Y. 10017
		2	Monsanto Co. Monsanto Industrial Chemicals Co. 800 North Lindbergh Blvd. St. Louis, Mo. 63166
		3	Stauffer Chemical Co. Specialty Chemical Division Cold Creek, Ala. 36512
7 CHEMICAL REACTIVITY			
7.1	Reactivity with Water: Vigorous reaction with evolution of hydrogen chloride fumes		
7.2	Reactivity with Common Materials: Corrosive to most metals except nickel and lead. Products of its reaction with water rapidly corrode steel and most metals with formation of flammable hydrogen gas		
7.3	Stability During Transport: Stable		
7.4	Neutralizing Agents for Acids and Caustics: Flush with water; neutralize acids or mixed with lime or soda ash		
7.5	Polymerization: Not pertinent		
7.6	Inhibitor of Polymerization: Not pertinent		
		10 SHIPPING INFORMATION	
		10.1	Grades or Purity: 99.99%
		10.2	Storage Temperature: Above 35°F
		10.3	Inert Atmosphere: No requirement
		10.4	Venting: Pressure/vacuum
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) VO		13 PHYSICAL AND CHEMICAL PROPERTIES	
		13.1	Physical State at 15°C and 1 atm: Liquid
		13.2	Molecular weight: 153.34
		13.3	Boiling Point at 1 atm: 225°F = 107°C = 380 K
		13.4	Freezing Point: 34°F = 1°C = 274 K
		13.5	Critical Temperature: 630°F = 332°C = 605 K
		13.6	Critical Pressure: Not pertinent
		13.7	Specific Gravity: 1.675 at 15°C (liquid)
		13.8	Liquid Surface Tension: Not pertinent
		13.9	Liquid-Water Interfacial Tension: Not pertinent
		13.10	Vapor (Gas) Specific Gravity: Not pertinent
		13.11	Ratio of Specific Heats of Vapor (Gas): 0.511790
		13.12	Latent Heat of Vaporization: 97 Btu/lb = 24 cal/g = 2.4 X 10 ⁵ J/kg
		13.13	Heat of Combustion: Not pertinent
		13.14	Heat of Decomposition: Not pertinent
		13.15	Heat of Solution: Not pertinent
		13.16	Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS			
12.1	Code of Federal Regulations: Corrosive material		
12.2	NAS Hazard Rating for Bulk Water Transportation		
	Category	Rating	
	Toxic	0	
	Health		
	Vapor Irritant	4	
	Liquid or Solid Irritant	4	
	Poisons	4	
	Water Pollution		
	Human Toxicity	4	
	Aquatic Toxicity	3	
	Aesthetic Effect	2	
	Reactivity		
	Other Chemicals	4	
	Water	4	
	Self Reaction	0	
12.3	NFPA Hazard Classifications: Not listed		
		Continued on pages 10 and 11	
NOTES			

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PPP

PHOSPHORUS PENTASULFIDE

Common Synonyms	Solid flakes or powder. Yellow to green. Odorless or rotten egg odor. Smells and reacts with water. Poisonous gas is produced.
Fire	FLAMMABLE MAY BE IGNITED BY SPARK, FRICTION, OR STATIC DISCHARGE. Containers may explode in fire. POISONOUS, IRRITATING GASES ARE PRODUCED IN FIRE.
Exposure	AIR DUST Irritating to eyes, nose and throat. SOLID Irritating to skin and eyes. Harmful if swallowed.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4. Issues warning: high flammability, poison. Restrict access. Evacuate area. Should be removed.	2. LABELS 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Phosphorus sulfide, Phosphorus persulfide, Thiophosphoric anhydride. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: P ₂ S ₅ , P ₂ S ₄ . 3.4 IMCO/United Nations Numerical Designation: 411340.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Light greenish yellow, greenish gray. 4.3 Odor: Like rotten eggs. High (lethal) concentrations can paralyze the sense of smell.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety goggles, plastic face shield, self-contained or air-line respirator. 5.2 Symptoms Following Exposure: Hydrogen sulfide gas formed by reaction with moisture can cause death by respiratory failure. The gas also irritates eyes and respiratory system. The solid irritates skin and eyes; the symptoms may be delayed several hours. 5.3 Treatment for Exposure: INHALATION: remove victim from contaminated area; if breathing has stopped, begin artificial respiration. INGESTION: induce vomiting; call physician. SKIN: remove contaminated clothing and wash areas with large amounts of water. EYES: flush with large amounts of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 ppm (hydrogen sulfide). 5.5 Short-Term Inhalation Limits: 20 ppm for 5 min (hydrogen sulfide). 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Hydrogen sulfide gas, formed by reaction with moisture, causes severe irritation of eyes and throat and can cause eye and lung injury; it cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: 0.0037 ppm (hydrogen sulfide). See also Table on page 41.	

6. FIRE HAZARDS 6.1 Flash Point: Flammable solid. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Sand and carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water. 6.5 Special Hazards of Combustion Products: Products of combustion include sulfur dioxide and phosphorus pentoxide, which are irritating to the respiratory tract. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 527°F (liquid). 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterlow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts with liquid water or atmospheric moisture to liberate toxic hydrogen sulfide gas. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Can be ignited by friction. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Monsanto Co. Monsanto Industrial Chemicals Co. 800 North Lindbergh Blvd. St. Louis, Mo. 63106. 2. Occidental Petroleum Corp. Hess Chemical Corp. Industrial Chemicals Div. Niagara Falls, N.Y. 14202. 3. Stauffer Chemical Co. Specialty Chemical Division Morrisville, Pa. 19067.								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) RR C	10. SHIPPING INFORMATION 10.1 Grades or Purity: Regular, low reactivity; reactive, high reactivity; distilled, undistilled, all 99+. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Sealed containers must be stored in a well-ventilated area.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable solid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table data-bbox="964 1453 1207 1539"> <tr> <th>Category</th><th>Classification*</th></tr> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </table> *1st column refers to non-fire situation.	Category	Classification*	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 222.27. 13.3 Boiling Point at 1 atm: 95°F = 354°C = 587°K. 13.4 Freezing Point: 52°F = 11°C = 284°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.03 at 26°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 144 Btu/lb = 102 cal/g = 4.27 x 10 ³ J/kg. 13.13 Heat of Combustion: -10,890 Btu/lb = -7,950 cal/g = -253.3 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: -20 Btu/lb = -12 cal/g = -0.5 x 10 ³ J/kg. 13.16 Heat of Polymerization: Not pertinent.
Category	Classification*								
Health Hazard (Blue)	2								
Flammability (Red)	1								
Reactivity (Yellow)	2								
NOTES									

PPR

PHOSPHORUS, RED

Common Synonyms 1st: <i>phosphorus</i>	Solid powder Sinks in water	Reddish brown	Odorless
<u>Fire</u>	FLAMMABLE POISONOUS IRRITATING AND FLAMMABLE GASES ARE PRODUCED IN FIRE		
<u>Exposure</u>	SOLID Will burn eyes Harmful if swallowed		
<u>Water Pollution</u>	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability Should be removed Chemical and physical treatment		2. LABEL 	
3. CHEMICAL DESIGNATIONS 31 Synonyms: Amorphous phosphorus 32 Coast Guard Compatibility Classification: Phosphorus elemental 33 Chemical Formula: P^0 34 IMCO United Nations Numerical Designation: 4113XX		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: Reddish brown 43 Odor: Odorless	
5. HEALTH HAZARDS 51 Personal Protective Equipment: Dust mask, gloves of rubber or vinyl, chemical safety gloves, rubber shoes 52 Symptoms Following Exposure: Physically irritating to eyes, otherwise essentially harmless and non-toxic, unless contaminated by highly toxic yellow phosphorus as an impurity 53 Treatment for Exposure: EYES: flush thoroughly with water and get medical attention SKIN: flush with water and wash with soap and water. <i>CAUTION: Avoid brushing as friction may ignite material on skin or clothing.</i> 54 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 55 Short-Term Inhalation Limits: Not pertinent 56 Toxicity by Ingestion: Data not available 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Nonvolatile 59 Liquid or Solid Irritant Characteristics: Data not available 60 Odor Threshold: Not pertinent			

6 FIRE HAZARDS 61 Flash Point: Flammable solid 62 Flammable Limits in Air: Not pertinent 63 Fire Extinguishing Agents: Water 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Heat may cause reversion to yellow phosphorus which is toxic and spontaneously flammable upon contact with air. Burning yields toxic oxides of phosphorus. 66 Behavior in Fire: Refer to 6.5 67 Ignition Temperature: 395°F 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not pertinent	8 WATER POLLUTION 81 Aquatic Toxicity: 0.105 ppm 48 hr bluegill 11 gm fresh water 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None								
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: Avoid uncontrolled contact with oxidizing agents (chlorates, nitrates, halogens, etc.) or with strong alkaline hydroxides. Can react violently with oxidizing agent in presence of air and moisture, liberating phosphorus acids and toxic, spontaneously flammable phosphine gas. 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 EMC Corp. Inorganic Chemicals Division 634 Third Ave. New York, N.Y. 10017 2 Monsanto Co. Monsanto Industrial Chemicals Co. 300 North Lindbergh Blvd. St. Louis, Mo. 63166 3 Stauffer Chemical Co. Industrial Chemical Division Mt. Pleasant, Tenn. 38474								
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-31 II	10 SHIPPING INFORMATION 101 Grades or Purity: 99.9% Technical 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open								
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable solid 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>0</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>1</td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	1	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 123.89 133 Boiling Point at 1 atm: Catches fire 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 2.20 at 20°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	1								
Reactivity (Yellow)	1								
<i>Continued on pages 5 and 6</i> NOTES									

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PBR

PHOSPHORUS TRIBROMIDE

Common Synonyms Phosphorus bromide		Liquid	Colorless to pale yellow	Sharp, penetrating odor
		Sinks and mixes violently with water		
Fire		Not flammable Irritating gases may be produced when heated		
Exposure		LIQUID Will burn skin and eyes. If swallowed will cause nausea. Respiratory irritation may occur. Inhalation causes severe irritation of nose, throat, and lungs. Ingestion causes burns of mouth and stomach. Contact with eyes or skin causes severe burns.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4)		2. LABEL		
Issue warning: Corrosive air contaminant, water contaminant. Restrict access. Dispense and flush.				
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS		
31 Synonyms: Phosphorus bromide		41 Physical State (as shipped): Liquid		
32 Coast Guard Compatibility Classification: Not listed		42 Color: Colorless or slightly yellow		
33 Chemical Formula: PBr_3		43 Odor: Pungent, sharp, penetrating		
34 IMCO/United Nations Numerical Designation: N 1808				
5. HEALTH HAZARDS				
51 Personal Protective Equipment: Acid gas canister type mask (full face type for emergency use), chemical safety goggles, apron, gloves, clothing, and safety shoes all made from rubber.				
52 Symptoms Following Exposure: Inhalation causes severe irritation of nose, throat, and lungs. Ingestion causes burns of mouth and stomach. Contact with eyes or skin causes severe burns.				
53 Treatment for Exposure: INHALATION: remove victim to clean air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: dilute by drinking water, then neutralize with milk of magnesia, egg white, etc. do not use sodium bicarbonate. EYES: immediately flush with large amounts of water for at least 15 min. SKIN: immediately flush with large amounts of water; remove contaminated clothing.				
54 Toxicity by Inhalation (Threshold Limit Value): Data not available				
55 Short-Term Inhalation Limits: Data not available				
56 Toxicity by Ingestion: Data not available				
57 Late Toxicity: Data not available				
58 Vapor (Gas) Irritant Characteristics: Data not available				
59 Liquid or Solid Irritant Characteristics: Data not available				
510 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point Not flammable 6.2 Flammable Limits in Air Not flammable 6.3 Fire Extinguishing Agents Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Do not use water on adjacent fires 6.5 Special Hazards of Combustion Products: Irritating hydrogen bromide and phosphoric acid vapors may form in fire 6.6 Behavior in Fire Acids formed by reaction with water will attack metals and generate flammable hydrogen gas, which may form explosive mixtures in enclosed spaces 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently with water, evolving hydrogen bromide, an irritating and corrosive gas; apparent as white fumes 7.2 Reactivity with Common Materials: In the presence of moisture, highly corrosive to many metals except lead and nickel 7.3 Stability During Transport: Unstable if heated 7.4 Neutralizing Agents for Acids and Caustics: Flush with water and rinse with dilute aqueous sodium bicarbonate solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Michigan Chemical Corp. 351 East Ohio St. Chicago, Ill. 60661 2 White Chemical Corp. East 22 Street Bayonne, N. J. 07002 3 Pultz and Bauer, Inc. 351 Fairfield Ave. Stamford, Conn. 06902
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 441) A O	10 SHIPPING INFORMATION 10.1 Grades or Purity: Purified 99.99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations Corrosive liquid 12.2 NAS Hazard Rating for Bulk Water Transport: Not Listed 12.3 NFPA Hazard Classifications: Not Listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 270.74 13.3 Boiling Point at 1 atm: 141.1 ± 1.3°C = 286.0 ± 2.4°F 13.4 Freezing Point: -42.9 ± 1.1°C = -49.2 ± 2.0°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.862 at 30°C (liquids) 13.8 Liquid Surface Tension: 45 x dynes/cm = 0.045 N/m at 24°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 6.4 Btu/lb = 35 kcal/g = 150 x 10 ³ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -446 Btu/lb = -24 kcal/g = -10.4 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent
NOTES	

(Continued on page 1 and 2)

PPT

PHOSPHORUS TRICHLORIDE

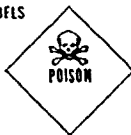
Common Synonyms		Liquid	Colorless to slightly yellow	Sharp irritating for
		Fumes in air, sinks and reacts with water. Harmful vapor is produced.		
		Not flammable		
Fire				
 <u>Exposure</u>		VAPOR Irritating to eyes, nose, and throat. Harmful if inhaled. LIQUID Will burn skin and eyes. Poisonous if swallowed.		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Manual Handbook, CG 446-4) Issue warning: Corrosive. Restrict access. Disperse and flush with care.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 31 Synonyms: No common names. 32 Coast Guard Compatibility Classification: Not applicable. 33 Chemical Formula: PCl_3 . 34 IMCO/United Nations Numerical Designation: N.O. 1809.		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid. 42 Color: Colorless to slightly yellow. 43 Odor: Pungent irritating like hyd. chloric acid.		
5. HEALTH HAZARDS 51 Personal Protective Equipment: Chemical safety goggles, plastic face shield, self-contained or air-line respirator, safety hat, rubber gloves and protective clothing. 52 Symptoms Following Exposure: VAPOR: cause severe irritation of eyes and respiratory tract. Liquid burns eyes and skin. 53 Treatment for Exposure: CAUTION: Persons doing treatment should protect themselves. INHALATION: remove victim from contaminated area; if breathing has stopped start artificial respiration; call a doctor. INGESTION: if victim is conscious, give large quantities of water; do NOT induce vomiting; call a doctor. EYES: retract eyelids and wash eye with water for at least 15 min.; call a doctor. SKIN: remove contaminated clothing and wash exposed skin with water. 54 Toxicity by Inhalation (Threshold Limit Value): 0.5 ppm. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Grade 2, oral rat LD_{50} = 550 mg/kg. 57 Late Toxicity: None. 58 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and nose and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 59 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes. 510 Odor Threshold: Data not available.				

6 FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Sand, carbon dioxide and dry chemicals on adjacent fires 64 Fire Extinguishing Agents Not to be Used: Water 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Generates toxic irritating gases 67 Ignition Temperature: Not flammable 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not flammable	8 WATER POLLUTION 8 Aquatic Toxicity: Data not available 82 Waterlow Toxicity: Data not available 83 Biological Oxygen Demand (BOD): None 84 Food Chain Concentration Potential: None										
7 CHEMICAL REACTIVITY 71 Reactivity with Water: Reacts violently and may cause flashes of fire. Hydrochloric acid fumes are formed in this reaction 72 Reactivity with Common Materials: Corrodes most common construction material. Reacts with water to form hydrochloric acid which reacts with most metals to form flammable hydrogen gas 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Flush with water; neutralize acids formed with lime or soda ash 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 EMC Corp. Organic Chemicals Division 633 Third Ave. New York, N.Y. 10012 2 Monsanto Co. Monsanto Industrial Chemicals Co. 810 North Lindbergh Blvd. St. Louis, Mo. 63166 3 Stauffer Chemical Co. Specialty Chemical Division Cold Creek, Ala. 36512										
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A.O.	10 SHIPPING INFORMATION 101 Grades or Purity: Pure 99.99% technical 99.99% 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Pressure/vacuum										
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Corrosive material 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>3</td></tr><tr><td>Flammability (Red)</td><td>0</td></tr><tr><td>Reactivity (Yellow)</td><td>2</td></tr><tr><td></td><td>W</td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	2		W	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: 137.33 133 Boiling Point at 1 atm: 161°F = 76°C = 349°K 134 Freezing Point: -170°F = -112°C = 161°K 135 Critical Temperature: 347°F = 286°C = 557°K 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.572 at 20°C (liquids) 138 Liquid Surface Tension: 25.6 dynes/cm = 0.0256 N/m at 20°C 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: 4.7 1311 Ratio of Specific Heats of Vapor (Gas): (est.) 1.290 1312 Latent Heat of Vaporization: 95 Btu/lb = 55.4 kJ/g = 27.7 cal/g 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
Category	Classification										
Health Hazard (Blue)	3										
Flammability (Red)	0										
Reactivity (Yellow)	2										
	W										
Continued on page 12 of 14											
NOTES											

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PPW

PHOSPHORUS WHITE

Common synonyms: Yellow phosphorus	Waxy solid Light yellow Cathic odor Flumes and burns in air; sinks in water
	FLAMMABLE May ignite on contact with air POISONOUS, IRRITATING GASES ARE PRODUCED IN FIRE
	SOLID Will burn skin and eyes If swallowed, will cause nausea, vomiting or loss of consciousness
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 555-4 Issue warning: high flammability poison Respiratory Environmental Shouting, removal Chemical and physical treatment	2. LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Yellow phosphorus 3.2 Coast Guard Compatibility Classification: Phosphorus, elemental 3.3 Chemical Formula: P 3.4 IMCO United Nations Numerical Designation: 4.2, 15X	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid or waxy solid 4.2 Color: Pale yellow to deep straw 4.3 Odor: Distinctive disagreeable pungent sharp like onion
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Heavy gloves and goggles; face shield 5.2 Symptoms Following Exposure: Solid or liquid causes severe burns; if inhaled, causes nausea, vomiting, and/or low blood pressure; if pressure is high, can cause death. Symptoms after onset may be delayed for 12 to 24 hours or 3 days. 5.3 Treatment for Exposure: INGESTION: if ingested, DO NOT induce vomiting; call a doctor at once. SKIN OR EYE CONTACT: immediately flush with plenty of water for at least 15 min; keep skin cool; wet until medical attention is obtained. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 4 LD ₅₀ below 50 mg/kg 5.7 Late Toxicity: Severe attack of liver and bones 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant; causes severe and prolonged burns on skin contact and is very irritating to the eyes 5.10 Odor Threshold: Not pertinent	

6. FIRE HAZARDS 6.1 Flash Point: Ignites spontaneously in air 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Fumes from burning phosphorus are highly irritating 6.6 Behavior in Fire: In case where it is not formed 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.05 ppm; 48 hr. LC50/11 g. fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Ignites when exposed to air 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. EMI Corp. Inorganic Chemicals Division 600 Third Ave. New York, N.Y. 10017 2. Monsanto Co. Monsanto Industrial Chemicals Co. 500 North Lindbergh Blvd. St. Louis, Mo. 63106 3. Stauffer Chemical Co. Industrial Chemical Division Mt. Pleasant, Pa. 15854																												
11. HAZARD ASSESSMENT CODE See Table 4 of Assessment Handbook, CG 555-4 II-RR	10. SHIPPING INFORMATION 10.1 Grades or Purities: Not pertinent 10.2 Storage Temperature: Elevated (if liquid) 10.3 Inert Atmosphere: Padded 10.4 Venting: Pressure vacuum																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable solid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table> <tr> <th>Category</th><th>Rating</th></tr> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td>1</td></tr> <tr> <td>Vapor Irritant</td><td>NA</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td>Poisons</td><td>4</td></tr> <tr> <td>Water Pollution</td><td>1</td></tr> <tr> <td>Human Toxicity</td><td>3</td></tr> <tr> <td>Aquatic Toxicity</td><td>3</td></tr> <tr> <td>Aesthetic Effect</td><td>1</td></tr> <tr> <td>Reactivity</td><td>1</td></tr> <tr> <td>Other Chemicals</td><td>4</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self-Reactive</td><td>0</td></tr> </table>	Category	Rating	Fire	1	Health	1	Vapor Irritant	NA	Liquid or Solid Irritant	2	Poisons	4	Water Pollution	1	Human Toxicity	3	Aquatic Toxicity	3	Aesthetic Effect	1	Reactivity	1	Other Chemicals	4	Water	0	Self-Reactive	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 31.0 13.3 Boiling Point: at 1 atm. 13.4 Freezing Point: 111.4°F = 44.1°C = 317.1°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.824 @ 20°C is liquid 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	1																												
Health	1																												
Vapor Irritant	NA																												
Liquid or Solid Irritant	2																												
Poisons	4																												
Water Pollution	1																												
Human Toxicity	3																												
Aquatic Toxicity	3																												
Aesthetic Effect	1																												
Reactivity	1																												
Other Chemicals	4																												
Water	0																												
Self-Reactive	0																												
12.3 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>1</td></tr> </table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	3	Reactivity (Yellow)	1	NOTES																				
Category	Classification																												
Health Hazard (Blue)	3																												
Flammability (Red)	3																												
Reactivity (Yellow)	1																												

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PAN

PHTHALIC ANHYDRIDE

Common Synonyms Phthalic acid anhydride PAN		Solid flakes or liquid (heated) Colorless or pale yellow Choking odor Solid sinks in water. Liquid solidifies and sinks in water.
Fire		Combustible
Exposure		DUST Irritating to eyes, nose, and throat. If inhaled, with cause coughing. LIQUID OR SOLID Will burn skin or eyes. Harmful if swallowed.
Water Pollution		Effect of low concentration on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4 Dispose and flush.		2 LABELS No hazard label required by Code of Federal Regulation.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,2-Benzenedicarboxylic anhydride; 1,3-Dioxaphthalic PAN; Phthalanone; Phthalic anhydride. 3.2 Coast Guard Compatibility Classification: Organic anhydride. 3.3 Chemical Formula: $C_{10}H_6O_4$ 3.4 IMCO, United Nations Numerical Designation: No listed.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid liquid. 4.2 Color: Colorless or pale yellow. 4.3 Odor: Characteristic choking odor; choking acid.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Coveralls and or rubber apron; rubber shoes or boots; chemical goggles and or face shield; Bureau of Mines organic vapor respirator (Type "E" for gasolite type leather or rubber gloves). 5.2 Symptoms Following Exposure: Solid irritates skin and eyes, causing coughing and sneezing. Liquid causes severe thermal burns. 5.3 Treatment for Exposure: INHALATION: gargle with water and use a sedative cough mixture. INGESTION: induce vomiting and give water, milk, or vegetable oil. SKIN OR EYE CONTACT: Flush with water for at least 5 min. If burned by molten material, remove as much solid as possible, soak off the remainder in cold water, and then treat the burn. 5.4 Toxicity by Inhalation (Threshold Limit Value): 2 ppm. 5.5 Short-Term Inhalation Limits: 4 ppm for 5 min. 5.6 Toxicity by Ingestion: Grade 2, LD ₅₀ 0.5 to 5 g/kg rats. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the eyes and first degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: 0.15-0.72 mg/m ³ .		

6 FIRE HAZARDS

6.1 Flash Point: 129°F (54°C) - 165°F (74°C)
 6.2 Flammable Limits in Air: 1.7 - 10.5%
 6.3 Fire Extinguishing Agents: Water, fog; dry chemical, carbon dioxide, or foam.
 6.4 Fire Extinguishing Agents Not to be Used: Water may cause frothing.
 6.5 Special Hazards of Combustion Products: Not pertinent.
 6.6 Behavior in Fire: Not pertinent.
 6.7 Ignition Temperature: 1055°F.
 6.8 Electrical Hazard: Not pertinent.
 6.9 Burning Rate: Data not available.

8 WATER POLLUTION

8.1 Aquatic Toxicity: >50 ppm 96 hr fathead minnow, 110% fresh water.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): 100% 5 days.
 8.4 Food Chain Concentration Potential: None.

7 CHEMICAL REACTIVITY

7.1 Reactivity with Water: Solid has very slow reaction; no hazard. Liquid splatters when in contact with water.
 7.2 Reactivity with Common Materials: No reaction.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: Water and sodium bicarbonate.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

9 SELECTED MANUFACTURERS

1. Allied Chemical Corp.
 Plastics Division
 Marlborough, N.J. 07540
 2. Koppers Co., Inc.
 Organic Materials Division
 Koppers Bldg.
 Pittsburgh, Pa. 15219
 3. Monsanto Co.
 Monsanto Industrial Chemical Co.
 800 North Lindbergh Blvd.
 St. Louis, Mo. 63116.

10 SHIPPING INFORMATION

10.1 Grades or Purities: Flake, molten, commercial, 99%.
 10.2 Storage Temperature: 26-120°F (liquids). Ambient (solids).
 10.3 Inert Atmosphere: No requirement.
 10.4 Venting: Open (flame arresters).

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446.3
 H for N.Y.

12 HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations: Not listed.
 12.2 HAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	1
Health	
Vapor Irritant	2
Liquid or Solid Irritant	3
Poison	1
Water Pollution	
Human Toxic	2
Aquatic Toxicity	2
Anesthetic Effect	2
Reactivity	
Other Chemicals	3
Water	1
Self Reaction	0

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	-
Flammability (Red)	1
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 Physical State at 15°C and 1 atm: Solid.
 13.2 Molecular Weight: 148.12.
 13.3 Boiling Point at 1 atm: 244.1°F = 284.6°C = 553°K.
 13.4 Freezing Point: 26.5°F = 111°C = 447°K.
 13.5 Critical Temperature: Not pertinent.
 13.6 Critical Pressure: Not pertinent.
 13.7 Specific Gravity: 1.20 at 15°C (liquids); 1.33 at 20°C (solids).
 13.8 Liquid Surface Tension: 35.5 dynes/cm = 0.0355 N/m at 155°C.
 13.9 Liquid-Water Interfacial Tension: 10.3 dynes/cm = 0.0103 N/m at 155°C.
 13.10 Vapor (Gas) Specific Gravity: Not pertinent.
 13.11 Ratio of Specific Heats of Vapor (Gas): 1.04.
 13.12 Latent Heat of Vaporization: 149 Btu/lb = 10 kcal/g = 4.40 x 10³ J/kg.
 13.13 Heat of Combustion: -9571 Btu/lb = -267 kcal/g = -220.4 x 10³ J/kg.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: -27 Btu/lb = -70 kcal/g = -296 x 10³ J/kg.
 13.16 Heat of Polymerization: Not pertinent.

Continued on page 7 and 8.

NOTES

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PLB

POLYBUTENE

Common Synonyms Butene resins Polymers butene resins		Oil liquid	Colorless	Odorless
		Floats on water		
Fire	Combustible			
Exposure	Not harmful			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Mechanical collection Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulation		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Butene resins Polymers butene resins Polymers butene resins Polymers butene resins 3.2 Coast Guard Compatibility Classification: Olefin 3.3 Chemical Formula: C_4H_6 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Data not available 4.3 Odor: Data not available		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, water shield 5.2 Symptoms Following Exposure: Low toxicity. Vapor may irritate eyes and skin at high concentration 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade II Irritant (See Response Methods) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapor irritates eyes, nose and throat 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically non-irritant to skin 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: 215-470 F (100) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water, alcohol, dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: None present 6.6 Behavior in Fire: None present 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: None present 6.9 Burning Rate: Data not available		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None									
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: None present 7.5 Polymerization: No polymer 7.6 Inhibitor of Polymerization: No polymer		9 SELECTED MANUFACTURERS Vulcan Chemical Corp. 10101 Randolph Drive Chicago, Illinois 60641 Chemical Process Corp. Industrial Chemical Division 200 Buffalo San Francisco, California 94120 Eastman Chemical Houston, Texas 77001									
		10 SHIPPING INFORMATION 10.1 Grades or Purity: Not listed 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open, limited venting									
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A 1 1		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 66.10 13.3 Boiling Point at 1 atm: 47.0°C 13.4 Freezing Point: Not present 13.5 Critical Temperature: Not present 13.6 Critical Pressure: Not present 13.7 Specific Gravity: 0.81 (at 15°C) (liquid) 13.8 Liquid Surface Tension: test 125 dynes/cm = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: test 150 dynes/cm = 0.05 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not present 13.11 Ratio of Specific Heats of Vapor (Gas): Not present 13.12 Latent Heat of Vaporization: Not present 13.13 Heat of Combustion, test 1 = 20,000 Btu/lb = 11,000 cal/g, test 2 = 470 x 10 ³ J/kg 13.14 Heat of Decomposition: Not present 13.15 Heat of Solution, test 1 = 9 Btu/lb = 5 cal/g = 0.2 x 10 ³ J/kg 13.16 Heat of Polymerization: Not present									
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (H)</td><td>0</td></tr><tr><td>Flammability (F)</td><td>2</td></tr><tr><td>Reactivity (R)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (H)	0	Flammability (F)	2	Reactivity (R)	0		
Category	Classification										
Health Hazard (H)	0										
Flammability (F)	2										
Reactivity (R)	0										
NOTES											

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PCB

POLYCHLORINATED BIPHENYL

Common Synonyms PCB Chlorinated biphenyl Aroclor		Only liquid to solid powder Sinks in water	Light yellow liquid or white powder	Weak odor
Fire		Combustible		
Exposure		LIQUID OR SOLID Irritating to skin and eyes		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE See Response Manual Handbook, CG 446-4 If leakage, spill, or discharge must be cleaned up, it should be removed Chemically and physically as soon as		2. LABELS No hazard label required Only Federal Requirement		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Aroclor, Chlorinated biphenyls, Halogenated biphenyls, Polychlorobiphenyls 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $C_{12}H_{10}Cl_n$ 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid or solid 4.2 Color: Pale yellow liquid or white solid 4.3 Odor: Pungent, irritating		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Use usual protective garments 5.2 Symptoms Following Exposure: Nausea, dizziness, headache 5.3 Treatment for Exposure: N/A. Wash with soap and water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, oral rat LD50 = 1990 mg/kg 5.7 Late Toxicity: Causes chromosomal abnormalities in rats, birth defects in birds 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and cause eye and lung injury. They cannot be tolerated even at low concentrations 5.9 Liquid or Solid Irritant Characteristics: Irritation with serious cases of burns 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: 226°F 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: None 6.5 Special Hazards of Combustion Products: Irritating smoke and gas 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.2% ppm for 96 hours (114 mg/l fresh water) 0.04% ppm for 96 hours (40 mg/l fresh water) 8.2 Waterlow Toxicity: 1.0% (100 ppm) or less 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: High
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Monsanto Industrial Chemicals Co. Eastman Organic Chemicals Nalco Chemicals Solutia Inc.
10. SHIPPING INFORMATION 10.1 Grades or Purities: as advertised liquid, some solids which are primarily in the solid form (200 mesh weight) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-1 II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Not listed 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.0 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas) Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

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PPI

POLYMETHYLENE POLYPHENYL ISOCYANATE

Common Synonyms		Liquid	Dark brown	Weak odor
PAPI		Sinks in water		
Fire		Combustible Containers may explode in fire		
		LIQUID POISONOUS IF SWALLOWED Irritating to skin and eyes		
Exposure				
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4 Issue warning: poison water contaminant Restrict access Should be removed (Chemical and physical treatment)		2. LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: PAPI 3.2 Coast Guard Compatibility Classification: Toxic waste 3.3 Chemical Formula: <chem>C12H10N4O4</chem> and poison 3.4 IMCO/United Nations Numerical Designation: 6.1		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Dark brown 4.3 Odor: Very weak		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Air filter or gas canister mask, goggles, face shield, rubber gloves and, if possible, rubber boots, protective suit and mask				
5.2 Symptoms Following Exposure: Inhalation causes throat burning, chest discomfort and reduced pulmonary function; when cough and sputum is associated with irritation of throat, eyes and skin. Ingestion causes irritation of mouth and stomach				
5.3 Treatment for Exposure: For moderate to severe inhalation exposures to this compound INITIAL ACTION: remove victim to fresh air and encourage nasal respiration. If breathing is stopped, oxygen can be given by qualified personnel. IF SEVERE: immediately wash with large amounts water. If at least 10 min. SKIN: flush immediately with water. If persistent, treat with first aid guidelines for burns, shock and wash with soap and water. INGESTION: induce vomiting if at least 15 min. giving activated charcoal (10g/kg) if possible. If severe, treat with a qualitative and quantitative analysis of the compound				
5.4 Toxicity by Inhalation (Threshold Limit Value): 0.02 ppm				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade I LD-50 is 1.5 g/kg				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Vapor and liquid are irritating such that personnel will not usually tolerate moderate or high concentrations				
5.9 Liquid or Solid Irritant Characteristics: Causes irritating to the skin and the degree burns short exposure may cause second degree burns in some exposure				
Odor Threshold: Data not available				

6 FIRE HAZARDS

- 6.1 Flash Point: 475 F (246 C)
- 6.2 Flammable Limits in Air: Not pertinent
- 6.3 Fire Extinguishing Agents: Dry chemical
or carbon dioxide
- 6.4 Fire Extinguishing Agents Not to be Used:
Not pertinent
- 6.5 Special Hazards of Combustion Products:
Not pertinent
- 6.6 Behavior in Fire: Containers may explode
- 6.7 Ignition Temperature: Data not available
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Data not available

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD):
Data not available
- 8.4 Food Chain Concentration Potential:
None

9 SELECTED MANUFACTURERS

The following companies
Polymer Chemicals Division
P.O. Box 600
Dallas, Texas 75201

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Reacts slowly
forming heavy foam and liberating carbon
dioxide gas. Dangerous pressure can
build up if container is sealed
- 7.2 Reactivity with Common Materials: No
hazardous reaction when mixed with
acids
- 7.3 Stability During Transport: Stable if kept
sealed and dry
- 7.4 Neutralizing Agents for Acids and
Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: 99% methylene
bisphenol A plus 99% polymer
- 10.2 Storage Temperature: 15-25 F
- 10.3 Inert Atmosphere: Low pressure dry
nitrogen
- 10.4 Venting: Safety relief

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446.3
NOX

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
- 13.2 Molecular Weight: 400 (approx)
- 13.3 Boiling Point at 1 atm:
(92°) = 200 C = 473°K
- 13.4 Freezing Point: Not pertinent
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.2 at 25°C (liquids)
- 13.8 Liquid Surface Tension:
Data not available
- 13.9 Liquid-Water Interfacial Tension:
Not pertinent
- 13.10 Vapor (Gas) Specific Gravity:
Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas):
Not pertinent
- 13.12 Latent Heat of Vaporization:
Not pertinent
- 13.13 Heat of Combustion: (calculated from Btu/lb
= 7,200 cal/g = 300 kcal/kg)
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 7 and 8)

NOTES

PPA

POLYPHOSPHORIC ACID

Common Synonyms (condensed phosphoric acid)	Liquid Colorless Odorless Sinks and mixes with water
Fire	Not flammable Flammable gas may be produced on contact with metal
Exposure	LIQUID Will burn skin and eyes Harmful if swallowed
Water Pollution	Dangerous to aquatic life at high concentrations May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Response Vocabulary Handbook, CG 445-4 1.1 Spill/Leak Response 1.2 Release Assessment 1.3 Decontamination	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: condensed phosphoric acid 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $P_2O_5H_2O_4$ 3.4 IMCO United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Odorless
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Respirator, gloves, eye protection, protective clothing 5.2 Symptoms Following Exposure: Irritation to skin, eyes, and respiratory tract; severe irritation to eyes and respiratory tract if swallowed 5.3 Treatment for Exposure: INGESTION: Do not induce vomiting. Give water to drink. If swallowed, give 1-2 glasses of water. If swallowed, give 1-2 glasses of water. If swallowed, give 1-2 glasses of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not listed 5.5 Short-Term Inhalation Limits: Not listed 5.6 Toxicity by Ingestion: Irritation to the digestive tract 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not listed 5.9 Liquid or Solid Irritant Characteristics: Irritation to skin, eyes, and respiratory tract if swallowed 5.10 Odor Threshold: Not listed	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: Not pertinent (24 hr LC50 for fish) 8.2 Waterfowl Toxicity: Not applicable 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts with water, forming phosphoric acid and releasing heat 7.2 Reactivity with Common Materials: Reacts with metals, forming phosphides 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not applicable 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS A. B. C. Chemicals, Inc. American Chemical Society Monsanto Chemicals Eastman Chemical Company Agricultural Chemicals Bayer Corporation F. W. Woolbright & Co. New York, N.Y. 10017
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 445-7 A.P.A.	10. SHIPPING INFORMATION 10.1 Grades or Purity: Not applicable 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not applicable 10.4 Venting: Open or pressure-relieving
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: 221°C (430°F) 13.4 Freezing Point: 18°C (64°F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.68 (at 15°C) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

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PLP

POLYPROPYLENE

Common Synonyms Propene polymer		Solid	Tan to white	Odorless
Floats on water				
Fire	Combustible			
Exposure	DUST Not harmful			
	SOLID Not harmful			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes			
1 RESPONSE TO DISCHARGE See Response to Materials Reg. 2000, CG 440.4 Mechanical discharge		2 LABELS N. No and other required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Propene polymer 3.2 Coast Guard Compatibility Classification: 11000 3.3 Chemical Formula: C_3H_6 or C_3H_4 where n is 2 or 3 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Tan to white 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Eye protection 5.2 Symptoms Following Exposure: No apparent effects 5.3 Treatment for Exposure: None required 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8 WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS Dow Chemical Corp. 100 Superior Avenue Cleveland, Ohio 44114 East Chemical 100 West End South Houston, Texas 77002 Amoco Chemical Corp. 30 East Randolph Drive Chicago, Illinois 60601	
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 440.3 II		10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open	
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transporters: Not listed 12.3 NFPA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: Not listed 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.90 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	

NOTES

PGC

POLYPROPYLENE GLYCOL

Common Synonyms are: Polyoxypropylene glycol Polyoxypropylene glycol Plurac A polyol		Liquid	Colorless	Odorless or mild sweet odor
		May float or sink in water		
Fire	Combustible			
Exposure	LIQUID Irritating to eyes. Harmful if swallowed			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant Mechanical containment Should be removed Disperse and flush		2. LABELS as listed required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Polyoxypropylene glycol Polyoxypropylene ether PPG-4 Plurac [®] polyol Polyoxypropylene glycol's P400 to P4000 Thionol PPG 3.2 Coast Guard Compatibility Classification: Alcohols (6) 3.3 Chemical Formula: $\text{HO}(\text{CH}_2\text{CH}(\text{CH}_3)\text{O}(\text{CH}_2\text{CH}(\text{CH}_3)\text{O}))_n\text{H}$ n averages 2-44 <i>(Continued on Page 4)</i>		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light yellow 4.3 Odor: None, slight sweet faint ether like		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety glasses or face shield, rubber gloves 5.2 Symptoms Following Exposure: The compound has a very low toxicity. Few if any symptoms will be observed. Contact of liquid with eyes causes slight transient pain and irritation similar to that caused by a mild soap. 5.3 Treatment for Exposure: EYES: flush with water until mild irritation is gone. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: depends on molecular weight Grade 1 LD ₅₀ = 150 mg/kg (rats) Grade 1 LD ₅₀ = 15 g/kg Grade 0 LD ₅₀ > 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS

- 6.1 **Flash Point:** 190-195 F (90-90 C)
 6.2 **Flammable Limits in Air:** Not pertinent
 6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
 6.5 **Special Hazards of Combustion Products:** Not pertinent
 6.6 **Behavior in Fire:** Not pertinent
 6.7 **Ignition Temperature:** Data not available
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Data not available

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterlow Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

1. Union Carbide Corp.
 Chemicals and Plastics Division
 270 Park Avenue
 New York, N.Y. 10017
 2. BASF Wyandotte Corporation
 Industrial Chemicals Group
 1669 Route Avenue
 Wyandotte, Mich. 48192
 3. Dow Chemical Co.
 Midland, Mich. 48640

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:** No reaction
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

10. SHIPPING INFORMATION

- 10.1 **Grades or Purity:**
 Low mol. wt. (insoluble in water)
 Medium mol. wt. (2% soluble in water)
 High mol. wt. (insoluble in water)
 10.2 **Storage Temperature:** Below 140 F
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Open (flame arrester)

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 H-1, X-1

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed
 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
 12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid
 13.2 **Molecular Weight:** Variable (200 to 2000)
 13.3 **Boiling Point at 1 atm:** Not pertinent (to compounds)
 13.4 **Freezing Point:** -22 to -55 F
 = -30 to -50 C = 233 to 213 K
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 0.912 at 20 C (liquid)
 13.8 **Liquid Surface Tension:** Data not available
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 13.12 **Latent Heat of Vaporization:** Not pertinent
 13.13 **Heat of Combustion:** -14,200 Btu/lb
 = -7,300 cal/g = -30 X 10³ J/kg
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** Not pertinent
 13.16 **Heat of Polymerization:** Not pertinent
Continued on page 5 and 6

3 CHEMICAL DESIGNATIONS (Cont'd)

- 3.4 **IMCO/United Nations Numerical Designation:** Not listed

PGM

POLYPROPYLENE GLYCOL METHYL ETHER

Common Synonyms Polyoxypropylene glycol methyl ether PAG (polyoxypropylene glycol) methyl ether	Liquid	Colorless	Odorless
	Mixes with water		
Fire	Fire data not available		
Exposure	LIQUID Irritating to skin and eyes		
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Polyoxypropylene glycol methyl ether Polyoxypropylene glycol methyl ether 3.2 Coast Guard Compatibility Classification: Glycol ether 3.3 Chemical Formula: $C_3H_8O_3$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: None	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: Low toxicity. In high concentrations may be mildly anesthetic. Direct eye contact produces slight irritation 5.3 Treatment for Exposure: Remove victim from exposure 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas, Irritant) Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Hazard to skin considered minor 5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS 6.1 Flash Point Data not available 6.2 Flammable Limits in Air Data not available 6.3 Fire Extinguishing Agents Data not available 6.4 Fire Extinguishing Agents Not to be Used Data not available 6.5 Special Hazards of Combustion Products Not pertinent 6.6 Behavior in Fire Not pertinent 6.7 Ignition Temperature Data not available 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity Data not available 8.2 Waterfowl Toxicity Data not available 8.3 Biological Oxygen Demand (BOD) Data not available 8.4 Food Chain Concentration Potential None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water No reaction 7.2 Reactivity with Common Materials No reaction 7.3 Stability During Transport Stable 7.4 Neutralizing Agents for Acids and Caustics Not pertinent 7.5 Polymerization Not pertinent 7.6 Inhibitor of Polymerization Not pertinent	9 SELECTED MANUFACTURERS Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017 (For bulk shipment)
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A P Q	10 SHIPPING INFORMATION 10.1 Grades or Purity Technical 10.2 Storage Temperature Ambient 10.3 Inert Atmosphere No requirement 10.4 Venting Open
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight Data not available 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point Not pertinent 13.5 Critical Temperature Not pertinent 13.6 Critical Pressure Not pertinent 13.7 Specific Gravity (test 10-20 at 20°C liquid) 13.8 Liquid Surface Tension Not pertinent 13.9 Liquid-Water Interfacial Tension Not pertinent 13.10 Vapor (Gas) Specific Gravity Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas) (test 10-20) 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion (test 10-20) 4800 Btu/lb (= 6000 cal/g = 25.2 X 10³ J/kg) 13.14 Heat of Decomposition Not pertinent 13.15 Heat of Solution Not pertinent 13.16 Heat of Polymerization Not pertinent
NOTES	

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PTM

POTASSIUM, METALLIC

Common Synonyms	Subst	Silver white	Odorless
Reacts violently with water Flammable gas is produced			
Fire	Combustible IGNITES WHEN EXPOSED TO WATER OR MOISTURE Flammable gas is produced on contact with water		
Exposure	SOLID Will burn skin and eyes		
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability corrosive Restrict access Disperse and flush		2. LABELS  	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: K 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Silvery white 4.3 Odor: None	
5. HEALTH HAZARDS 5.1 Personal protective equipment: Goggles or eye shield, rubber gloves 5.2 Symptoms Following Exposure: Contact with eyes or skin causes severe burn 5.3 Treatment for Exposure: EYES or SKIN: flush with water; treat caustic burns 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Not pertinent 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent			

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Graphite and sodium chloride 6.4 Fire Extinguishing Agents Not to be Used: Water, foam, carbon dioxide or halogenated hydrocarbons 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: Reacts violently with water, forming flammable and explosive hydrogen gas. May ignite spontaneously in air. 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 80 ppm/24 hr. (mosquitoes in 11 m. fresh water) 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently to form flammable hydrogen gas and a strong caustic solution. 7.2 Reactivity with Common Materials: May ignite combustible materials if they are dry. 7.3 Stability During Transport: Stable if protected from air and moisture. 7.4 Neutralizing Agents for Acids and Caustics: Caustic formed by reaction with water should be flushed with water; other area can be rinsed with dilute acetic acid. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Keweenaw Industries, Inc. 220 East 42 St. New York, N.Y. 10017 2. Gallard-Schlesinger Chemical Mfg. Co. 384 Mincola Ave. Carle Place, N.Y. 11514 3. Ventron Corp. P.O. Box 159 Gardner, Mass. 01915
	10. SHIPPING INFORMATION 10.1 Grades or Purities: Commercial 99.9% (Shipped under oil) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Inerted 10.4 Venting: Pressure/vacuum
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) RR	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Solid 13.2 Molecular Weight: 39 13.3 Boiling Point at 1 atm.: 425°C = 794°C = 1047°K 13.4 Freezing Point: 63°F = 6°C = 273°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.86 at 20°C (solids) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -2,093 Btu/lb = -1,113 cal/g = -46.57 × 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -2,104 Btu/lb = -1,169 cal/g = -49.91 × 10³ J/kg 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable solid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

(Continued on page 5 and 6)

PAS

POTASSIUM ARSENATE

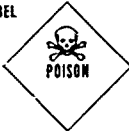
Common Synonyms Macquer's Salt Potassium acid arsenate Potassium dihydrogen arsenate		Solid Mixes with water	White	Odorless
Fire		Not flammable		
		DUST POISONOUS IF INHALED OR SWALLOWED Irritating to eyes, nose and throat SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE See Response Methods Handbook (CG 446-4) Issue warning: poison: water contaminant Restrict access Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Macquer's salt; Potassium acid arsenate; Potassium dihydrogen arsenate 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: KH_2AsO_4 3.4 IMCO/United Nations Numerical Designation: 6.1 16**		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator; rubber gloves 5.2 Symptoms Following Exposure: Dust may irritate eyes. Ingestion or severe exposure by inhalation can cause burning of throat and mouth and initial pain, vomiting, diarrhea with hemorrhage, dehydration, jaundice and collapse. 5.3 Treatment for Exposure: EYES: flush with water to remove dust. INGESTION: immediately induce evacuation of intestinal tract by inducing vomiting (using gastric lavage and saline cathartics; see physician at once) consider possible development of arsenic poisoning. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m ³ (as arsenic) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: May be acute, nephritic, arsenic poisoning may develop 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 240 ppm as As; 16 hr. minnows survived 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Data not available
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: No pertine 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Platts and Bauer, Inc. 12604 Northern Boulevard Flushing, N. Y. 11368 2. Cerac, Inc. 13460 W. Silver Spring Rd. Menomonee Falls, Wis. 53051 3. Fielding Chemical Co. Forrest and Halladay Street Jersey City, N. J. 07305
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook (CG 446-3)) NN	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 230.04 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 50°F = 28.9°C = 268.1°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.3 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 49 Btu/lb = 27 cal/g = 113 x 10³ J/kg 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

(Continued on page 540)

PBO

POTASSIUM BINOXALATE

Common Synonyms Potassium acid oxalate Salt of sorrel Sal acetosella		Solid	White	Odorless
		Sinks in water		
Fire	Not flammable			
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing, difficult breathing, or loss of consciousness SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness			
Water Pollution	Effect of low concentrations on aquatic life if unknown May be dangerous if it enters water intakes			
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-1 Issue warning: "poison water" contaminant Restrict access Disperse and flush		2. LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Potassium acid oxalate Sal acetosella; Salt of sorrel 3.2 Coast Guard Competibility Classification: Not listed 3.3 Chemical Formula: KHC_2O_4 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes burning pain in throat, esophagus and stomach, exposed areas of mucous membrane turn white, vomiting, severe pulsing, weak pulse, and cardiac irregular collapse. If death is delayed, neuromuscular symptoms develop. Contact with dust irritates eyes and may cause mild irritation to skin. 5.3 Treatment for Exposure: INHALATION: move to fresh air; if exposure to dust is severe, get medical attention. INGESTION: give immediately by mouth a dilute solution of any soluble calcium salt (calcium lactate in water), or a solution of even milk; large amounts of Ca are required; administer gastric lavage with dilute lime water; consult physician; watch for edema of the glottis and edema of the larynx; if esophagus EYES: flush with water for at least 15 min. SKIN: wash well with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3, LD ₅₀ 500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Odorless				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Below 50°C dissolves in water and reacts to form the much less soluble potassium tetraoxalate which separates out 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. J. I. Baker Chemical Co. Philipsburg, N. J. 08865 2. Fiedling Chemical Co. P. O. Box 21 Jersey City, N. J. 07303
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) H 355	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poison Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 128.11 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.01 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
6 included on page 5 and 6	
NOTES	

PCR

POTASSIUM CHLORATE

Common Synonyms	
Potrate Chlorate of potassium Chlorate of potash	Solid White Odorless Mixes with water
Fire	Not flammable. May cause fire on contact with combustibles. POISONOUS GASES ARE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat SOLID Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445-4)	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Chlorate of potash Chlorate of potassium, potassium 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $KClO_3$ 3.4 IMCO/United Nations Numerical Designation: 5.1, 1455	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, rubber gloves, goggles, protective clothing to prevent contact with skin 5.2 Symptoms Following Exposure: Inhalation of dust can irritate nose and throat. Contact with eyes or skin causes irritation. Ingestion causes abdominal pain, nausea, vomiting, exotoxic collapse. 5.3 Treatment for Exposure: EYES: Flush with water for at least 15 min. SKIN: Wash with soap and water. INGESTION: dilute by drinking sips of salty water to induce vomiting. Call physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, LD ₅₀ 0.5 to 5 g/kg 5.7 Acute Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable, but may cause fire upon contact with ordinary combustibles. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Water on adjacent fires. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Low fumes are formed in fires. 6.6 Behavior in Fire: Decomposes when heated to form oxygen, which increases severity of fire. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No contact with combustible material may cause fire. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Pennwalt Corporation Chemicals Division Three Parkway Philadelphia, Pa. 19102 2. Hooker Chemical Corporation Specialty Chemicals Division P. O. Box 344 Niagara Falls, N. Y. 14302 3. Mallinckrodt Chemical Works Industrial Chemicals Division Second and Mallinckrodt Streets P. O. Box 549 St. Louis, Mo. 63160
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 445-3) NN	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 97%+ Reagent, Purified 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 NAS Hazard Rating for Bulk Water Transportation: Not tested 12.3 NFPA Hazard Classifications: Category Classification Health Hazard (Blue) 2 Flammability (Red) 1 Reactivity (Yellow) 2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 122.6 13.3 Boiling Point, at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point M.P. = -56°C = 217°K 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.44 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: -176 Btu/lb = -95 cal/g = -4.1 x 10 ³ J/kg 13.15 Heat of Solution: 147 Btu/lb = 81 cal/g = 3.4 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent
NOTES	

(Continued on pages 7 and 8)

PCH

POTASSIUM CHROMATE

Common Synonyms Potassium chromate (VI) Neutral potassium chromate		Solid	Bright yellow	Odorless
		Sinks and mixes with water		
Fire		Not flammable Will increase the intensity of a fire May cause fire on contact with combustibles		
		DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing		
Exposure		SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness		
Water Pollution		HAZARDOUS TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods in handbook, CG 444-3) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Neutral potassium chromate, Potassium chromate (VI) 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: K_2CrO_4 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Bright yellow 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: H ₂ of Mines approved filter type respirator, close fitting safety goggles, rubber boots and apron, safety hat, face shield 5.2 Symptoms Following Exposure: Inhalation causes local irritation of mucous membranes, continuing nose irritation can result in perforation of nasal septum. Ingestion may cause violent gastroenteritis, circulatory collapse, vertigo, coma and, in nephritis, ingestion of excess quantities can be fatal. Contact with eyes causes severe irritation and conjunctivitis. Repeated prolonged exposure to dust, mist, or solutions may cause dermatitis; contact with breaks in the skin may cause chrome sore, appearing as slow healing, hard, red ulcers which leave the area vulnerable to infection. 5.3 Treatment for Exposure: INHALATION: move to fresh air; INGESTION: give large amount of water, induce vomiting, treat peripheral vascular shock, get medical attention; EYES: flush with water for at least 15 min., get medical attention; SKIN: flush with water if irritation persists, get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ as hexavalent Cr 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade III LD ₅₀ 50-500 mg/kg 5.7 Late Toxicity: Lung cancer may occur 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable but may intensify fire 6.2 Flammable Limit in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: May increase intensity of fire if in contact with combustible materials. Cool containers and spilled material with plenty of water. 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: 45.6 ppm 96 hr fathead minnow, 11 hr soft water 4.8 ppm 96 hr silver salmon toxic salt water *Time period not specified 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Plants can absorb compound from water and pass it on up the food chain. Bioconcentrative up to 2,000 fold. Not likely to be a problem in a spill situation.	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: In contact with combustible materials may cause fire 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1 Allied Chemical Corp. P.O. Box 1087R Morristown, N.J. 07960 2 J. T. Baker Chemical Co. Phillipsburg, N.J. 08865 3 Guillard Schiesinger Chemical Mfg. Co. 584 Mineola Ave. Carle Place, N.Y. 11514	
		10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent, 99% (P. Technical) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	
11. HAZARD ASSESSMENT CODE See HAZARD ASSESSMENT HANDBOOK, CG 444-3 NN		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 194.20 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.73 at 15°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed			
NOTES 1. In solid or water solution			

PTC

POTASSIUM CYANIDE

Common Synonyms: Solid crystals White Almond odor Sinks and mixes with water	
Fire	Not flammable
 Exposure	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to eyes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Response Manual, Hazardous Materials, 100-100-1 In case of spillage: Risk classes: Toxicity class: Chemical and physical hazards	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Cyanide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: KCN 3.4 IMCO United Nations Numerical Designation: 1500	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Like hydrogen cyanide (b) (6)
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Wear clothing as in U.S. Bureau of Mines provided description when handling. (b) (6) (c) (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100) (101) (102) (103) (104) (105) (106) (107) (108) (109) (110) (111) (112) (113) (114) (115) (116) (117) (118) (119) (120) (121) (122) (123) (124) (125) (126) (127) (128) (129) (130) (131) (132) (133) (134) (135) (136) (137) (138) (139) (140) (141) (142) (143) (144) (145) (146) (147) (148) (149) (150) (151) (152) (153) (154) (155) (156) (157) (158) (159) (160) (161) (162) (163) (164) (165) (166) (167) (168) (169) (170) (171) (172) (173) (174) (175) (176) (177) (178) (179) (180) (181) (182) 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PDT

POTASSIUM DICHLORO-S-TRIAZINETRIONE

Common Synonyms Potassium dichlorotriazinetrione		Solid	White	Chlorine-like odor
		Mixes with water		
Fire	Not flammable May cause fire on contact with combustibles POISONOUS GASES MAY BE PRODUCED IN FIRE			
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes. Harmful if swallowed			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes			
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4 Issue warning - oxidizing material water contaminant Restrict access Dispose and flush		2 LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: P. Gasin P-chlorotriazinetrione 3.2 Coast Guard Compatibility Classification Not applicable 3.3 Chemical Formula: KCl3N3O3 3.4 IMCO/United Nations Numerical Designation: 1.1		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Chlorine-like		
HEALTH HAZARDS				
5.1 Personal Protective Equipment: Dust mask or chemical filter mask, goggles, rubber gloves and other protective clothing to protect entire body from skin contact				
5.2 Symptoms Following Exposure: Dust causes sneezing, coughing, sore throat, irritation to the eyes and nose, itching and redness of skin. Ingestion causes burns of mouth and stomach				
5.3 Treatment for Exposure: INHALATION: remove person to clean air; EYES: irrigate with running water for 15 min.; on physician; SKIN: flush with water; INGESTION: induce vomiting and call physician				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade 2.1 Data not available				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Not pertinent				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS

- 6.1 Flash Point: Not flammable, but may cause fire upon contact with hot bare combustibles
- 6.2 Flammable Limits in Air: Not pertinent
- 6.3 Fire Extinguishing Agents: Water
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
- 6.5 Special Hazards of Combustion Products: May form toxic chlorine and other gases in fire
- 6.6 Behavior in Fire: Decomposition can be initiated with a heat source and can propagate throughout the mass with the evolution of dense fumes
- 6.7 Ignition Temperature: Not pertinent
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Forms a weak solution; the reaction is not violent
- 7.2 Reactivity with Common Materials: Contact with most inorganic materials, organic matter, or easily chlorinated or oxidized materials may result in fire. Avoid oil, grease, sawdust, floor sweeping, other easily oxidized organic compounds
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterway Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): None
- 8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1 M Co. Corp.
Industrial Chemical Division
633 Third Avenue
New York, N. Y. 10017

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Technical 99.9% available chlorine
- 10.2 Storage Temperature: Cool, ambient
- 10.3 Inert Atmosphere: Not required
- 10.4 Venting: Pressure vacuum

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446.2
NS

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Oxidizing material
- 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 1 |
| Reactivity (Yellow) | 2 |

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm.: Solid
- 13.2 Molecular Weight: 266.1
- 13.3 Boiling Point at 1 atm.: Not pertinent (decomposes)
- 13.4 Freezing Point: Not pertinent
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 0.96 at 20°C (solid)
- 13.8 Liquid Surface Tension: Not pertinent
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: Not pertinent
- 13.14 Heat of Decomposition: Data not available
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

NOTES

PTD

POTASSIUM DICHROMATE

Common Synonyms Potassium Dichromate Bi-chrome		Solid crystals Red to orange Odorless Sinks and mixes with water
Fire	Not flammable May cause fire in contact with combustibles	
Exposure	IRIT Irritating to eyes, nose, and throat If inhaled, will cause difficult breathing SOLIDS Will burn skin and eyes If swallowed, will cause nausea, vomiting, or loss of consciousness	
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes	
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-4 Follow all applicable Federal, State, and local laws		2. LABELS No hazard label required (Under Federal Regulations)
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Potassium dichromate Bi-chrome 3.2 Coast Guard Compatibility Classification: No applicable 3.3 Chemical Formula: $K_2Cr_2O_7$ 3.4 INCO United Nations Numerical Designation: 15-052		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Orange-red 4.3 Odor: Odorless
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved dust mask, protective clothing, gloves, and shoes 5.2 Symptoms Following Exposure: High irritation to skin and mucous membranes. May cause difficulty breathing if inhaled. May cause nausea, vomiting, or loss of consciousness if swallowed. 5.3 Treatment for Exposure: INGESTION: Have victim drink water or milk. Do not induce vomiting. INHALATION: Have victim move to fresh air. If breathing is difficult, give oxygen. SKIN: Wash with plenty of water. If irritation persists, seek medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): No per cent 5.5 Short-Term Inhalation Limits: No per cent 5.6 Toxicity by Ingestion: Grade III (Moderately Hazardous) 5.7 Late Toxicity: No known delayed effects 5.8 Vapor (Gas) Irritant Characteristics: Due to irritation of mucous membranes of the nose, throat, and lungs. May cause difficulty breathing. 5.9 Liquid or Solid Irritant Characteristics: No known irritant effects on skin and clothing. 5.10 Odor Threshold: No per cent		

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point: No data		8.1 Aquatic Toxicity: No data	
6.2 Flammable Limits in Air: No data		8.2 Waterfowl Toxicity: No data	
6.3 Fire Extinguishing Agents: Use water		8.3 Biological Oxygen Demand (BOD): No data	
6.4 Fire Extinguishing Agents Not to be Used: No per cent		8.4 Food Chain Concentration Potential: No data	
6.5 Special Hazards of Combustion Products: No per cent			
6.6 Behavior in Fire: May cause fire in contact with combustibles		9 SELECTED MANUFACTURERS	
6.7 Ignition Temperature: No data		Allied Chemical Co.	
6.8 Electrical Hazard: No data		Federal Chemical D.	
6.9 Burning Rate: No data		Matheson Chemical Co.	
		DuPont Chemical Co.	
		National Chemical D.	
		Hercules Inc.	
		Kanto Chemical Co.	
		Matheson Chemical Co.	
		Federal Chemical D.	
		Standard Chemical Co.	
		National Chemical Co.	
7 CHEMICAL REACTIVITY			
7.1 Reactivity with Water: No data		10 SHIPPING INFORMATION	
7.2 Reactivity with Common Materials: No data		10.1 Grades or Purity: 99.9%	
7.3 Stability During Transport: No data		10.2 Storage Temperature: Ambient	
7.4 Neutralizing Agents for Acids and Caustics: No per cent		10.3 Inert Atmosphere: No data	
7.5 Polymerization: No per cent		10.4 Venting: Open	
7.6 Inhibitor of Polymerization: No per cent			
11 HAZARD ASSESSMENT CODE		13 PHYSICAL AND CHEMICAL PROPERTIES	
See Hazard Assessment Handbook, CG 444-4		13.1 Physical State at 15°C and 1 atm: Solid	
NN		13.2 Molecular Weight: 294.18	
		13.3 Boiling Point at 1 atm: Decomposes	
		13.4 Freezing Point: 355.1 K (82°C)	
		13.5 Critical Temperature: No data	
		13.6 Critical Pressure: No data	
		13.7 Specific Gravity: 2.67 (at 20°C)	
		13.8 Liquid Surface Tension: No data	
		13.9 Liquid-Water Interfacial Tension: No data	
		13.10 Vapor (Gas) Specific Gravity: No data	
		13.11 Ratio of Specific Heats of Vapor (Gas): No per cent	
		13.12 Latent Heat of Vaporization: No data	
		13.13 Heat of Combustion: No data	
		13.14 Heat of Decomposition: No data	
		13.15 Heat of Solution: No data	
		13.16 Heat of Polymerization: No per cent	
12 HAZARD CLASSIFICATIONS			
12.1 Code of Federal Regulations: ORM-A			
12.2 HAS Hazard Rating for Bulk Water Transportation: No data			
12.3 NFPA Hazard Classifications:			
Category	Classification		
Health Hazard	2		
Flammability	2		
Reactivity	2		
NOTES			

REVISED 1978

PTH

POTASSIUM HYDROXIDE

Common Synonyms Caustic potash Lye	Solid crystals or watery liquid White solid or colorless liquid Odorless Solid sinks and mixes slowly with water. Liquid mixes with water.
Fire	Not flammable Flammable gas may be produced on contact with metals May cause fire on contact with moisture and combustibles
Exposure	DUST OR MIST Irritating to eyes, nose, and throat Harmful if inhaled SOLID OR LIQUID Will burn skin and eyes Harmful if swallowed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Response Methods Handbook (1-444-4) Toxic Flammable May be corrosive Disposal: Landfill	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Caustic potash 3.2 Coast Guard Competibility Classification: Not applicable 3.3 Chemical Formula: KOH 3.4 IMCO United Nations Numerical Designation: 1454	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Wear protective clothing and gloves. Avoid contact with skin and eyes. 5.2 Symptoms Following Exposure: Irritation to eyes, nose, and throat; coughing; difficulty breathing. 5.3 Treatment for Exposure: If inhaled, move to fresh air. If on skin, wash with water. If in eyes, flush with water for 15 minutes. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not applicable 5.5 Short-Term Inhalation Limits: Not applicable 5.6 Toxicity by Ingestion (Grade 1 oral rat LD50 = 364 mg/kg) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not applicable 5.9 Liquid or Solid Irritant Characteristics: Not applicable 5.10 Odor Threshold: Not applicable	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not applicable 6.3 Fire Extinguishing Agents: Not applicable 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not applicable 6.7 Ignition Temperature: Not applicable 6.8 Electrical Hazard: Not applicable 6.9 Burning Rate: Not applicable	8 WATER POLLUTION 8.1 Aquatic Toxicity: Skipper 24-hour LC50 for 110-foot water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
9 SELECTED MANUFACTURERS Diamond Shamrock Corp. Fertilizer Chemicals Division 5000 North Central Express Blvd. Cincinnati, OH 45215 Monsanto Monsanto Industrial Chemicals Co. 800 North Lindbergh Blvd. St. Louis, MO 63106 American Potash & Chemical Corp. Hooker Chemical Corp. Industrial Chemical Division Niagara Falls, N.Y. 14302	
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Does not react with water under normal conditions 7.2 Reactivity with Common Materials: Will react with acids, alcohols, and organic compounds 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Fertilizers, acids, and other neutralizing agents 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook (1-444-3) NN	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 56.1 13.3 Boiling Point at 1 atm: Not applicable 13.4 Freezing Point: Not applicable 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: Not applicable 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not applicable 13.14 Heat of Decomposition: Not applicable 13.15 Heat of Solution: Not applicable 13.16 Heat of Polymerization: Not applicable
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive Material 12.2 HAS Hazard Rating for Bulk Water Transportation: Not applicable 12.3 NFPA Hazard Classifications: Category Classification Health Hazard: Not applicable Flammability: Not applicable Reactivity: Not applicable	
NOTES	

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PTI

POTASSIUM IODIDE

Common Synonyms		Solid crystals	White	Odorless
		Sinks and mixes with water		
Fire	Not flammable			
Exposure	SOLID Harmful if swallowed			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes			
1 RESPONSE TO DISCHARGE See Appendix 1 for Discharge Procedures Discharge to water: Not permitted Discharge to land: Not permitted		2 LABELS See Appendix 2 for Labeling Requirements GHS 05: Corrosive GHS 09: Hazardous to the Environment		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Not pertinent 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: KI 3.4 IMCO United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Not pertinent 5.2 Symptoms Following Exposure: Not pertinent 5.3 Treatment for Exposure: Not pertinent 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Not pertinent 5.7 Late Toxicity: Not pertinent 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Not pertinent 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS

- 6.1 Flash Point: Not pertinent
6.2 Flammable Limits in Air: Not pertinent
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: Not pertinent
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Not pertinent
8.2 Waterfowl Toxicity: Not pertinent
8.3 Biological Oxygen Demand (BOD): Not pertinent
8.4 Food Chain Concentration Potential: Not pertinent

9 SELECTED MANUFACTURERS

Acros Organics
Aldrich Chemical Company
Mallinckrodt Inc.
Kanto Chemical Co.
Hazardous Waste
Fisher Scientific
Fisher Chemical Division
Mallinckrodt Chemical Works
Fisher Chemical Division
Fisher Chemical Division
Fisher Chemical Division

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Not pertinent
7.2 Reactivity with Common Materials: Not pertinent
7.3 Stability During Transport: Not pertinent
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: USP ACS Reagent
10.2 Storage Temperature: Not pertinent
10.3 Inert Atmosphere: Not required
10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

SS

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 166.01
13.3 Boiling Point at 1 atm: Very high
13.4 Freezing Point: 126.8°C (518°F) ± 0.5°C
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 3.13 at 15°C (60°F)
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Not pertinent
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

NOTES

PTS

POTASSIUM OXALATE

Common Synonyms Potassium oxalate monohydrate		Solid	White	Odorless
Sinks and mixes with water				
Fire	Not flammable			
	DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness.			
Exposure				
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE See Response Memory Handbook, CG 446-4 Toxic warning label contains hazard response and flush.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Potassium oxalate monohydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $K_2C_2O_4 \cdot H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White to gray 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved for respiratory protection, gloves, goggles, and eye wash. 5.2 Symptoms Following Exposure: Irritation of skin can cause redness, itching, and burning. Ingestion causes burning pain in throat, esophagus, and stomach; epinephrine, 1 mg, is recommended. Vomiting may be required. Weak pulse and cardiovascular collapse may result. Death is delayed neuro-muscular symptoms develop. Contact with eyes may cause irritation. 5.3 Treatment for Exposure: EXPOSURE: INHALATION: Remove victim to fresh air. If exposure has occurred, get medical attention. INHALATION: Call for medical attention. Have victim drink 3 fluid ounces of water. If victim is unconscious, large amounts of water are required. Administer gastric lavage with water. If victim is unconscious, the gastric lavage should be delayed. INHALATION: If victim is unconscious, have medical attention. SKIN: Wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data is available. 5.5 Short-Term Inhalation Limits: Data is available. 5.6 Toxicity by Ingestion: Toxic if swallowed. 5.7 Late Toxicity: Data is available. 5.8 Vapor (Gas) Irritant Characteristics: Data is available. 5.9 Liquid or Solid Irritant Characteristics: Data is available. 5.10 Odor Threshold: Not listed.				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: Not applicable.	8.1	Acute Toxicity: Data is available.
6.2	Flammable Limits in Air: Not applicable.	8.2	Waterlow Toxicity: Data is available.
6.3	Fire Extinguishing Agents: Not pertinent.	8.3	Biological Oxygen Demand (BOD): Data is available.
6.4	Fire Extinguishing Agents Not to be Used: Not pertinent.	8.4	Food Chain Concentration: Potential None.
6.5	Special Hazards of Combustion Products:		
6.6	Behavior in Fire: Not applicable. When heated, it decomposes to form carbon monoxide and carbon dioxide.		
6.7	Ignition Temperature: Not pertinent.		
6.8	Electrical Hazard: Not pertinent.		
6.9	Burning Rate: Not pertinent.		
		9 SELECTED MANUFACTURERS	
		Pfizer Chemicals Div. New York, N.Y. 10017	
		J. T. Baker Chemical Co. Philadelphia, N.J. 19104	
		Crane & Sons Chemicals, Inc. 154 Minnesota Ave. Catic Place, N.Y. 10014	
7 CHEMICAL REACTIVITY			
7.1	Reactivity with Water: Not applicable.		
7.2	Reactivity with Common Materials:		
7.3	Stability During Transport: Stable.		
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent.		
7.5	Polymerization: Not pertinent.		
7.6	Inhibitor of Polymerization: Not pertinent.		
		10 SHIPPING INFORMATION	
		10.1 Grades or Purity: Research only.	
		10.2 Storage Temperature: Ambient.	
		10.3 Inert Atmosphere: Not applicable.	
		10.4 Venting: None.	
11 HAZARD ASSESSMENT CODE		13 PHYSICAL AND CHEMICAL PROPERTIES	
See Hazard Assessment Handbook, CG 446-3		13.1 Physical State at 15°C and 1 atm: Solid.	
NA		13.2 Molecular Weight: 146.24.	
		13.3 Boiling Point at 1 atm: Not pertinent (decomposes).	
		13.4 Freezing Point: Not pertinent.	
		13.5 Critical Temperature: Not pertinent.	
		13.6 Critical Pressure: Not pertinent.	
		13.7 Specific Gravity: 1.44 (solid at 25°C).	
		13.8 Liquid Surface Tension: Not pertinent.	
		13.9 Liquid-Water Interfacial Tension: Not pertinent.	
		13.10 Vapor (Gas) Specific Gravity: Not pertinent.	
		13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.	
		13.12 Latent Heat of Vaporization: Not pertinent.	
		13.13 Heat of Combustion: Not pertinent.	
		13.14 Heat of Decomposition: Not pertinent.	
		13.15 Heat of Solution: Not pertinent.	
		13.16 Heat of Polymerization: Not pertinent.	
12 HAZARD CLASSIFICATIONS			
12.1	Code of Federal Regulations: Poison Class B.		
12.2	NAS Hazard Rating for Bulk Water Transportation: Not listed.		
12.3	NFPA Hazard Classifications: Not listed.		
NOTES			

PTP

POTASSIUM PERMANGANATE

Common Synonyms Solid crystals Dark purple Odorless Sinks and mixes slowly with water	
Fire Not flammable. Containers may explode in fire. May cause fire and explosion on contact with combustibles.	
Exposure SOLID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness.	
HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 666.4 Avoid washing water contamination. Dispense and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Not applicable. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $KMnO_4$. 3.4 IMCO United Nations Numerical Designation: 5.1 (2.4).	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Dark purple to black. 4.3 Odor: None.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, gloves, apron, and mask. 5.2 Symptoms Following Exposure: Burns and irritation to skin, eyes, and respiratory tract. Ingestion causes nausea, vomiting, and loss of consciousness. 5.3 Treatment for Exposure: INGESTION: Induce vomiting. If unconscious, do not induce vomiting. Call a physician. EYES: Flush with water. SKIN: Wash with soap and water. INHALATION: Move to fresh air. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not permitted. 5.5 Short-Term Inhalation Limits: Not permitted. 5.6 Toxicity by Ingestion: Irritant (LD ₅₀ 1.1 g/kg, 200 g/mouse). 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Not permitted. 5.9 Liquid or Solid Irritant Characteristics: Irritant (LD ₅₀ 1.1 g/kg, 200 g/mouse). 5.10 Odor Threshold: Not permitted.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Foam, water, soda ash with water. 6.4 Fire Extinguishing Agents Not to be Used: Not permitted. 6.5 Special Hazards of Combustion Products: Not permitted. 6.6 Behavior in Fire: May cause explosion on contact with combustibles. Containers may explode. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazard: Not permitted. 6.9 Burning Rate: Not flammable.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 34 ppm 48 h. (except 11% fresh water). 8.2 Waterford Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive. 7.2 Reactivity with Common Materials: Avoid contact with acids, bases, and organic materials. May cause explosion on contact with organic materials. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not permitted. 7.5 Polymerization: Not permitted. 7.6 Inhibitor of Polymerization: Not permitted.	9. SELECTED MANUFACTURERS 1. Carr Chemicals, Inc., 1000 N. 1st St., LaSalle, Ill. 61301. 2. Carr Chemicals Corp., 1000 N. 1st St., LaSalle, Ill. 61301. 3. Carr Chemicals Corp., 1000 N. 1st St., LaSalle, Ill. 61301.								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 666.3 55	10. SHIPPING INFORMATION 10.1 Grades or Purity: 1 NF, 3 except 5.1 (2.4). 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not permitted. 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard</td> <td>Not permitted</td> </tr> <tr> <td>Flammability</td> <td>Not permitted</td> </tr> <tr> <td>Reactivity</td> <td>Not permitted</td> </tr> </tbody> </table>	Category	Classification	Health Hazard	Not permitted	Flammability	Not permitted	Reactivity	Not permitted	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 158.04. 13.3 Boiling Point at 1 atm: Decomposes. 13.4 Freezing Point: 13.6°C (56.5°F). 13.5 Critical Temperature: Not permitted. 13.6 Critical Pressure: Not permitted. 13.7 Specific Gravity: 2.70 at 15°C (solid). 13.8 Liquid Surface Tension: Not permitted. 13.9 Liquid-Water Interfacial Tension: Not permitted. 13.10 Vapor (Gas) Specific Gravity: Not permitted. 13.11 Ratio of Specific Heats of Vapor (Gas): Not permitted. 13.12 Latent Heat of Vaporization: Not permitted. 13.13 Heat of Combustion: Not permitted. 13.14 Heat of Decomposition: Not permitted. 13.15 Heat of Solution: Not permitted. 13.16 Heat of Polymerization: Not permitted.
Category	Classification								
Health Hazard	Not permitted								
Flammability	Not permitted								
Reactivity	Not permitted								
NOTES 1. Continued on page 7 and 8.									

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POP

POTASSIUM PEROXIDE

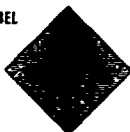
Common Synonyms Potassium superoxide	Solid (powder) Yellow Odorless Sinks and mixes violently with water
Fire	Not flammable Will increase the intensity of a fire May cause fire on contact with combustibles
Exposure	CAUTION: MEDICAL AID DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If in contact with eyes, nose or other water-soluble tissues, flush immediately with plenty of water for at least 15 minutes. SOLID Will burn skin and eyes. If swallowed will cause nausea
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intake. Needs to be neutralized with dilute acetic acid before disposal.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning: oxidizing material Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Potassium superoxide 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: K_2O_2 3.4 IMCO/United Nations Numerical Designation: 5.1, 1491	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Powder 4.2 Color: Yellow 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation causes respiratory irritation. Ingestion causes severe burns of mouth and stomach. Contact with eyes or skin causes irritation and caustic burns. 5.3 Treatment for Exposure: INHALATION: remove from exposure, support respiration. INGESTION: give large amount of water, do NOT induce vomiting, get medical attention. EYES: irrigate with large quantities of water for at least 15 min., get medical attention for caustic burns. SKIN: flush with water, treat caustic burns. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Flood with water from a protected area. 6.4 Fire Extinguishing Agents Not to be Used: A small amount of water may cause explosions. 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: Increases intensity of fire and can start fires when in contact with organic combustibles. 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 80 ppm, 24 hr, musquitofish, 11 m, fresh water. 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently with liberation of heat and oxygen and the formation of caustic solution. 7.2 Reactivity with Common Materials: Can form explosive and self-igniting mixtures with wood or other combustible materials. 7.3 Stability During Transport: Stable if kept dry. 7.4 Neutralizing Agents for Acids and Caustics: Following reaction with water, caustic formed can be flushed away with water and area rinsed with dilute acetic acid. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902 2 Ventron, Inc. P.O. Box 159 Beverly, Mass. 01915 3 Gallard Schlessinger Chemical Mfg. Co. 584 Mincola Ave. Carle Place, N.Y. 11514								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) RR	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial Pure 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material, solid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table data-bbox="965 1474 1204 1561"> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 110 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 914°F = 490°C = 763°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: > 1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	3								
Flammability (Red)	0								
Reactivity (Yellow)	2								
NOTES									

(Continued on pages 5 and 6)

PRP

PROPANE

Common Synonyms		Liquefied compressed gas. Colorless. Odorless—may have skunk odor added.																																					
		Liquid floats and boils on water. Flammable stable vapor cloud is produced.																																					
NEUTRAL TO ACIDITY NON-FLAMMABLE NON-TOXIC NON-CORROSIVE NON-IRRITANT NON-POISONOUS NON-REACTIVE NON-EXPLOSIVE NON-FLUORINATED NON-HALOGENATED NON-METALLIC NON-ORGANIC NON-POLYMERIZABLE NON-SOLUBLE NON-VOLATILE																																							
Fire		FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. NEUTRAL TO ACIDITY NON-FLAMMABLE NON-TOXIC NON-CORROSIVE NON-IRRITANT NON-POISONOUS NON-REACTIVE NON-EXPLOSIVE NON-FLUORINATED NON-HALOGENATED NON-METALLIC NON-ORGANIC NON-POLYMERIZABLE NON-SOLUBLE NON-VOLATILE																																					
Exposure		VAPOR Not irritating to eyes, nose or throat. If inhaled, will cause dizziness, difficult breathing, or loss of consciousness. LIQUID May cause frostbite. NEUTRAL TO ACIDITY NON-FLAMMABLE NON-TOXIC NON-CORROSIVE NON-IRRITANT NON-POISONOUS NON-REACTIVE NON-EXPLOSIVE NON-FLUORINATED NON-HALOGENATED NON-METALLIC NON-ORGANIC NON-POLYMERIZABLE NON-SOLUBLE NON-VOLATILE																																					
Water Pollution		Not harmful to aquatic life.																																					
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446.4) Issue warning—high flammability. Restrict access. Evacuate area.		2 LABEL 																																					
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Dimethylmethane. 3.2 Coast Guard Compatibility Classification: Paraffin. 3.3 Chemical Formula: C_3H_8 . 3.4 IMCO/United Nations Numerical Designation: 2012.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied compressed gas. 4.2 Color: Colorless. 4.3 Odor: Faint gassy.																																					
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus for high concentrations of gas. 5.2 Symptoms Following Exposure: Vaporizing liquid may cause frostbite. Concentrations in air greater than 10% cause dizziness in a few minutes. 1% concentrations give the same effect in 10 min. High concentrations cause asphyxiation. 5.3 Treatment for Exposure: Remove to open air. If victim is overcome by gas, apply artificial respiration. Do not use mouth-to-mouth if confused. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1000 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Not pertinent. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin because it evaporates quickly. 5.10 Odor Threshold: 1000–20,000 ppm.																																							
6 FIRE HAZARDS 6.1 Flash Point: -186.1°C . 6.2 Flammable Limits in Air: 2.1–9.5%. 6.3 Fire Extinguishing Agents: Stop flow of gas. For small fires use dry chemicals. Cool adjacent areas with water spray. 6.4 Fire Extinguishing Agents Not to be Used: Water. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Containers may explode. Vapor is heavier than air and may travel a long distance to a source of ignition and flash back. 6.7 Ignition Temperature: 540°C . 6.8 Electrical Hazard: Class I, Group D. 6.9 Burning Rate: 8.5 in./min.																																							
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.																																							
8 WATER POLLUTION 8.1 Aquatic Toxicity: None. 8.2 Waterfowl Toxicity: None. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.																																							
9 SELECTED MANUFACTURERS 1. Adams, Richfield, ARCOC Chemical Co. Division, 200 S. Broad St., Philadelphia, Pa. 19101. 2. Mobil Chemical Co., North American Division, Beaumont, Texas 77704. 3. Union Carbide Corp., Linde Division, 270 Park Ave., New York, N. Y. 10017.																																							
10. SHIPPING INFORMATION 10.1 Grades or Purity wt. % Purity 99.95+ Technical 99.95+ 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Safety relief.																																							
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446.3) ABCD11G																																							
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas. 12.2 NAS Hazard Rating for Bulk Water Transportation. <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>+</td></tr><tr><td>Health</td><td>0</td></tr><tr><td>Vapor Irritant</td><td>0</td></tr><tr><td>Liquid or Solid Irritant</td><td>0</td></tr><tr><td>Poisons</td><td>0</td></tr><tr><td>Water Pollution</td><td>0</td></tr><tr><td>Human Toxicity</td><td>0</td></tr><tr><td>Aquatic Toxicity</td><td>0</td></tr><tr><td>Aesthetic Effect</td><td>0</td></tr><tr><td>Reactivity</td><td>0</td></tr><tr><td>Other Chemicals</td><td>0</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></tbody></table> 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>4</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></tbody></table>				Category	Rating	Fire	+	Health	0	Vapor Irritant	0	Liquid or Solid Irritant	0	Poisons	0	Water Pollution	0	Human Toxicity	0	Aquatic Toxicity	0	Aesthetic Effect	0	Reactivity	0	Other Chemicals	0	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	4	Reactivity (Yellow)	0
Category	Rating																																						
Fire	+																																						
Health	0																																						
Vapor Irritant	0																																						
Liquid or Solid Irritant	0																																						
Poisons	0																																						
Water Pollution	0																																						
Human Toxicity	0																																						
Aquatic Toxicity	0																																						
Aesthetic Effect	0																																						
Reactivity	0																																						
Other Chemicals	0																																						
Water	0																																						
Self Reaction	0																																						
Category	Classification																																						
Health Hazard (Blue)	1																																						
Flammability (Red)	4																																						
Reactivity (Yellow)	0																																						
13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas. 13.2 Molecular Weight: 44.09. 13.3 Boiling Point at 1 atm: -42.1°C (-42.7°C = 231.1°K). 13.4 Freezing Point: -187.6°C (-187.6°C = 85.5°K). 13.5 Critical Temperature: -142.01°C = -96.67°F = 176.53°K . 13.6 Critical Pressure: 616.5 psia = 41.94 atm = 4.249 MN/m ² . 13.7 Specific Gravity: 0.506 at $+50^{\circ}\text{C}$ (liquid). 13.8 Liquid Surface Tension: 16 dynes/cm = 0.016 N/m at -47°C . 13.9 Liquid-Water Interfacial Tension: 150 dynes/cm = 0.015 N/m at $+50^{\circ}\text{C}$. 13.10 Vapor (Gas) Specific Gravity: 1.5. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.30. 13.12 Latent Heat of Vaporization: 353.2 Btu/lb = 101.8 cal/g = 4.262×10^5 J/kg. 13.13 Heat of Combustion: -19.762 Btu/lb = $-10,980$ cal/g = -460.13×10^3 J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.																																							
Continued on pages 5 and 6.																																							
NOTES																																							

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PLT

beta-PROPIOLACTONE

Common Synonyms beta-Propiolactone Betapropione Propionolide 2-Oxetanone Hydroxylic acid beta-lactone	Liquid Colorless Irritating odor Mixes with water
Fire Combustible Containers may explode in fire	
 Exposure	LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE See Response Methods Handbook (CG 446-4) Issue warning: poison water contaminant Restrict access Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: Betapropione, Hydroxylic acid, beta lactone, 2-Oxetanone, Propionolide, beta-Propionolactone 32 Coast Guard Compatibility Classification: Monomers (14) 33 Chemical Formula: $C_3H_4O_2$ 34 IMCO/United Nations Numerical Designation: 6.1	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Pungent, acrid, irritating
5 HEALTH HAZARDS 51 Personal Protective Equipment: Air mask or organic canister mask, goggles or face shield, rubber gloves, protective clothing to prevent all contact with skin. 52 Symptoms Following Exposure: Inhalation causes irritation of nose, throat, and respiratory tract. Contact of liquid with eyes causes irritation and tears. Contact with skin causes irritation and blistering. Ingestion causes burns of mouth and stomach. 53 Treatment for Exposure: Get medical attention following all exposures to this compound. INHALATION: move victim to fresh air; if breathing has stopped, give artificial respiration. EYES: flush continuously with water for at least 15 min. SKIN: flush with water; if blistering occurs, alert physician to fact that fluid from blister will cause additional blistering of adjacent skin. INGESTION: give large amount of water and induce vomiting. 54 Toxicity by Inhalation (Threshold Limit Value): 0.0 ppm. Because of the high incidence of cancer, either in man or animals, no exposure or contact by any route (respiratory, oral or skin) should be permitted. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Grade 3 oral LD ₅₀ = 50 mg/kg rat. 57 Late Toxicity: Because of the high incidence of cancer, either in man or animals, no exposure or contact by any route (respiratory, oral or skin) should be permitted. 58 Vapor (Gas) Irritant Characteristics: Vapors are moderately irritating such that personnel will not usually tolerate moderate or high concentrations. 59 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant. May cause pain and second degree burns after a few minutes contact. 510 Odor Threshold: Data not available.	

6 FIRE HAZARDS 61 Flash Point: 165 F (74 C) 62 Flammable Limits in Air: 2.9% (LFL) 63 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Vapors of unburned material are very toxic. 66 Behavior in Fire: Containers may explode. 67 Ignition Temperature: Data not available. 68 Electrical Hazard: Data not available. 69 Burning Rate: Data not available.	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available. 82 Waterfowl Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): Data not available. 84 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 71 Reactivity with Water: Slow, non-hazardous reaction to form beta-hydroxypropionic acid. 72 Reactivity with Common Materials: No reaction. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Not pertinent. 75 Polymerization: Can polymerize and rupture container, especially at elevated temperatures. At 22 C (72 F) polymerizes each day. 76 Inhibitor of Polymerization: None used.	9. SELECTED MANUFACTURERS 1 Celanese Chemical Company 245 Park Avenue New York, N.Y. 10017 2 Diamond Shamrock Chemical Corp. Nopco Chemical Division Morristown, N.J. 07960 3 Eastman Kodak Co. Eastman Organic Chemicals Rochester, N.Y. 14650																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook (CG 446-3)) APQ	10. SHIPPING INFORMATION 101 Grades or Purity: 97+ % 102 Storage Temperature: Below 60 F 103 Inert Atmosphere: No requirement. 104 Venting: Pressure, vacuum.																																				
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Poisonous liquid, Class B. 122 NAS Hazard Rating for Bulk Water Transportation <table data-bbox="999 1410 1240 1672"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>1</td></tr> <tr><td>Health</td><td>1</td></tr> <tr><td>Vapor Irritant</td><td>1</td></tr> <tr><td>Liquid or Solid Irritant</td><td>1</td></tr> <tr><td>Poison</td><td>1</td></tr> <tr><td>Water Pollution</td><td>1</td></tr> <tr><td>Human Toxicity</td><td>1</td></tr> <tr><td>Aquatic Toxicity</td><td>1</td></tr> <tr><td>Aesthetic Effect</td><td>1</td></tr> <tr><td>Reactivity</td><td>1</td></tr> <tr><td>Other Chemical</td><td>1</td></tr> <tr><td>Water</td><td>1</td></tr> <tr><td>Self Reaction</td><td>1</td></tr> </tbody> </table> 123 NFPA Hazard Classifications <table data-bbox="999 1694 1240 1782"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>1</td></tr> <tr><td>Flammability (Red)</td><td>2</td></tr> <tr><td>Reactivity (Yellow)</td><td>1</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poison	1	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	1	Reactivity	1	Other Chemical	1	Water	1	Self Reaction	1	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	1	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: 72.1 133 Boiling Point at 1 atm: Not pertinent (decomposes) 134 Freezing Point: -28.1 F = -33.4 C = 239.8 K 135 Critical Temperature: Not pertinent. 136 Critical Pressure: Not pertinent. 137 Specific Gravity: 1.45 at 20 C (liquid) 138 Liquid Surface Tension (dyne/cm): 22 dyne/cm = 0.022 N/m at 20 C 139 Liquid-Water Interfacial Tension (dyne/cm): 25 dyne/cm = 0.025 N/m at 20 C 1310 Vapor (Gas) Specific Gravity: 2.5 1311 Ratio of Specific Heats of Vapor (Gas): 1.089 1312 Latent Heat of Vaporization: Not pertinent. 1313 Heat of Combustion: 8,510 Btu/lb = 4,730 cal/g = 198 x 10 ³ J/kg 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: Not pertinent. 1316 Heat of Polymerization: Data not available.
Category	Rating																																				
Fire	1																																				
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NOTES																																					

(Continued on pages 5 and 6)

PAD

PROPIONALDEHYDE

Common Synonyms Propionaldehyde Propionic aldehyde Methyl acrylate Propenal Propyl aldehyde	Liquid Colorless Sulfurating, unpleasant odor Floats and mixes slowly with water. Flammable, irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	CALL FORMULA 400 VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea or vomiting. LIQUID Irritating to skin and eyes. Harmful if swallowed. ENVIRONMENTAL LETHAL TO FISH AND AQUATIC LIFE.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4. Issue warning: high flammability. Evacuate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Methylacryaldehyde, Propionaldehyde, Propenal, Propionic aldehyde, Propylaldehyde. 3.2 Coast Guard Compatibility Classification: Methyl. 3.3 Chemical Formula: C_3H_6O . 3.4 IMCO United Nations Numerical Designation: 3.2 (2.2).	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Pungent, unpleasant, sulfurating.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supplied mask for high vapor concentrations; plastic gloves; goggles. 5.2 Symptoms Following Exposure: Vapors will irritate nose and throat and may cause nausea and vomiting. Liquid causes severe irritation. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air; give oxygen and breathing is difficult, call a physician. EYES: Flush with plenty of water; call a physician immediately. SKIN: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2.1 (DANGER) is appropriate. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation, such that personnel will find high concentrations intolerable. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain on a hand, reddening of the skin. 5.10 Odor Threshold:	

6. FIRE HAZARDS 6.1 Flash Point: $-27^{\circ}\text{F} (-32^{\circ}\text{C})$. 6.2 Flammable Limits in Air: 2.6% - 16.1%. 6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires; alcohol type foam for large fires. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to source of ignition and flashback. 6.7 Ignition Temperature: 495°F . 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 4.4 in./min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 95% of theoretical in 5 days. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: May occur in presence of acid or caustics. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Eastman Kodak Co. Texas Eastman Co. Division Longview, Tex. 75601. 2. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017.																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3. A-P-Q	10. SHIPPING INFORMATION 10.1 Grades or Purity: 97%+. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: One atmosphere per pressure above.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation <table data-bbox="902 1459 1163 1736"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>3</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Effect</td><td>2</td></tr> <tr><td>Liquid or Solid Irritant</td><td>3</td></tr> <tr><td>Poisons</td><td>2</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>2</td></tr> <tr><td>Aquatic Toxicity</td><td>2</td></tr> <tr><td>Aesthetic Effect</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>2</td></tr> <tr><td>Water</td><td></td></tr> <tr><td>Self-Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="902 1747 1163 1847"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>2</td></tr> <tr><td>Flammability (Red)</td><td>3</td></tr> <tr><td>Reactivity (Yellow)</td><td>1</td></tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Effect	2	Liquid or Solid Irritant	3	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	2	Water		Self-Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 58.06. 13.3 Boiling Point at 1 atm: $118.4^{\circ}\text{F} = 48.0^{\circ}\text{C} = 321.2^{\circ}\text{K}$. 13.4 Freezing Point: $-12.1^{\circ}\text{F} = -20^{\circ}\text{C} = 193.1^{\circ}\text{K}$. 13.5 Critical Temperature: $433.1^{\circ}\text{F} = 223^{\circ}\text{C} = 496^{\circ}\text{K}$. 13.6 Critical Pressure: 680 psia = 47 atm = 4.8 MN/m ² . 13.7 Specific Gravity: 0.805 at 20°C (liquid). 13.8 Liquid Surface Tension: 23.4 dynes/cm = 0.0234 N/m at 20°C . 13.9 Liquid-Water Interfacial Tension: 29 dynes/cm = 0.029 N/m at 22.7°C . 13.10 Vapor (Gas) Specific Gravity: 2.0. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.126. 13.12 Latent Heat of Vaporization: 21.8 Btu/lb = $12^{\circ}\text{cal/g} = 4.90 \times 10^4 \text{ J/kg}$. 13.13 Heat of Combustion: $-12,470 \text{ Btu/lb} = -6910 \text{ cal/g} = -2901 \times 10^3 \text{ J/kg}$. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: (est.) 9 Btu/lb = $5 \text{ cal/g} = 0.2 \times 10^5 \text{ J/kg}$. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
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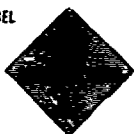
PROPIONIC ACID

Common Synonyms Propionic acid Ethanoic carboxylic acid		Liquid Colorless Sharp rancid odor																																									
Mixes with water. Irritating vapor is produced.																																											
Fire																																											
Combustible Vapor: Irritating to nose and throat Liquid: Will burn skin and eyes. Harmful if swallowed																																											
Exposure																																											
Water Pollution Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.																																											
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Dispose and flush.		2. LABEL																																									
3 CHEMICAL DESIGNATIONS 31 Synonyms: Ethanoic carboxylic acid, Methylic acid, Propanoic acid. 32 Coast Guard Compatibility Classification: Organic acid. 33 Chemical Formula: C₃H₇COOH 34 IMCO United Nations Numerical Designation: 301145		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid. 42 Color: Colorless. 43 Odor: Sharp irritating, slightly pungent rancid.																																									
5 HEALTH HAZARDS 51 Personal Protective Equipment: Air supplied mask for high vapor concentrations. Plastic gloves, goggles or face shield. 52 Symptoms Following Exposure: Liquid causes skin and eye burns. Vapors may irritate eyes, nose and throat, but should not cause systemic illness. 53 Treatment for Exposure: INHALATION: remove victim to fresh air. INGESTION: have victim drink water or milk, do NOT induce vomiting. SKIN OR EYE CONTACT: immediately flush with plenty of water for at least 15 minutes; get medical care for eyes; remove contaminated clothing. 54 Toxicity by Inhalation (Threshold Limit Value): 10 ppm. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Grade 2, oral rat LD₅₀ = 2.6 g/kg. 57 Late Toxicity: None. 58 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 59 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant; may cause first and second degree burns after a few minute contact. 510 Odor Threshold: Data not available.																																											
6 FIRE HAZARDS 61 Flash Point: 132°F (50°C) (closed cup) 62 Flammable Limits in Air: 2.9% (LFL) - 14.8% (UFL) 63 Fire Extinguishing Agents: Water, carbon dioxide, dry chemical or alcohol foam. 64 Fire Extinguishing Agents Not to be Used: Not pertinent. 65 Special Hazards of Combustion Products: Not pertinent. 66 Behavior in Fire: Not pertinent. 67 Ignition Temperature: 1105°F. 68 Electrical Hazard: Not pertinent. 69 Burning Rate: 2.2 in/min.																																											
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: Corrodes ordinary steel and many other metals, but reaction is not hazardous. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Dilute with water, then neutralize with lime or soda ash. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.																																											
8 WATER POLLUTION 81 Aquatic Toxicity: >1000 mg/L 48 hr LC50 for larvae in fresh water. 82 Waterway Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): 8.5 days. 84 Food Chain Concentration Potential: None.																																											
9. SELECTED MANUFACTURERS 1 Celanese Corp. Celanese Chemical Co. 245 Park Ave. New York, N.Y. 10017 2 Eastman Kodak Co. Tennessee Eastman Chemical Division Kingsport, Tenn. 37662 3 Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																																											
10 SHIPPING INFORMATION 101 Grades or Purity: 99+%. 102 Storage Temperature: Ambient. 103 Inert Atmosphere: No requirement. 104 Venting: Open flame arresters.																																											
11 HAZARD ASSESSMENT CODE See Table 1, Appendix 1, 446-1 A P Q		12 HAZARD RATINGS 121 Code of Federal Regulations: Corrosive Material. 122 NAS Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>0</td></tr><tr><td>Health</td><td>0</td></tr><tr><td>Vapor Irritant</td><td>2</td></tr><tr><td>Liquid or Solid Irritant</td><td>3</td></tr><tr><td>Poisons</td><td>2</td></tr><tr><td>Water Pollution</td><td>0</td></tr><tr><td>Human Toxicity</td><td>2</td></tr><tr><td>Aquatic Toxicity</td><td>2</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td>0</td></tr><tr><td>Other Chemicals</td><td>2</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></tbody></table> 123 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Class</th><th>Rating</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>2</td><td></td></tr><tr><td>Flammability (Red)</td><td>2</td><td></td></tr><tr><td>Reactivity (Yellow)</td><td>0</td><td></td></tr></tbody></table>		Category	Rating	Fire	0	Health	0	Vapor Irritant	2	Liquid or Solid Irritant	3	Poisons	2	Water Pollution	0	Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity	0	Other Chemicals	2	Water	0	Self Reaction	0	Category	Class	Rating	Health Hazard (Blue)	2		Flammability (Red)	2		Reactivity (Yellow)	0	
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Reactivity (Yellow)	0																																										
13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid. 132 Molecular Weight: 74.08. 133 Boiling Point at 1 atm: 205.4°F = 140.5°C = 413.5°K. 134 Freezing Point: -4.9°F = -20.7°C = 252.5°K. 135 Critical Temperature: 642°F = 339°C = 612°K. 136 Critical Pressure: 479 psia = 33.2 atm = 3.37 MN/m². 137 Specific Gravity: 0.985 at 20°C (liquids). 138 Liquid Surface Tension: 26.2 dynes/cm = 0.0262 N/m at 25°C. 139 Liquid-Water Interfacial Tension: Not pertinent. 1310 Vapor (Gas) Specific Gravity: Not pertinent. 1311 Ratio of Specific Heats of Vapor (Gas): 1.103. 1312 Latent Heat of Vaporization: 245 Btu/lb = 136 cal/g = 5.76 x 10³ J/kg. 1313 Heat of Combustion: -8,883 Btu/lb = -4,935 cal/g = 206.6 x 10³ J/kg. 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: Not pertinent. 1316 Heat of Polymerization: Not pertinent.																																											
NOTES Chemical Safety Data Sheet																																											

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PAT

n-PROPYL ACETATE

Common Synonyms: Acetic acid n-propyl ester	Liquid Colorless Mild odor Floats on water. Flammable irritating vapor is produced.
1. Flammable: White for 100 ppm 2. Irritant: White for 100 ppm 3. Corrosive: White for 100 ppm 4. Toxic: White for 100 ppm 5. Hazardous: White for 100 ppm	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. (See NFPA 704 for details)
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, dizziness or loss of consciousness. LIQUID Irritating to skin and eyes. Harmful if swallowed. IF IN EYES Flush with water for 15 minutes.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 476-1) Toxic warning: High flammability. Evacuate area.	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetic acid, n-propyl ester. 3.2 Coast Guard Compatibility Classification: Ester. 3.3 Chemical Formula: CH ₃ COOCH ₂ CH ₂ CH ₃ . 3.4 IMCO United Nations Numerical Designation: 12.12.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Mild, fruity.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supplied mask when vapors are in excess of safe shield protective glove. 5.2 Symptoms Following Exposure: Contact with skin and eyes causes no serious injury. High vapor concentrations will be irritating and will cause nausea, vomiting and dizziness, a slight loss of consciousness. 5.3 Treatment for Exposure: INHALE: Move victim to fresh air. Give artificial respiration if breathing has stopped. Give oxygen if breathing is difficult. SKIN: WASH WITH WATER. 5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm. 5.5 Short-Term Inhalation Limits: 200 ppm for 60 min. 5.6 Toxicity by Ingestion: Grade 1 ED ₀₁ (100 mg/kg). 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes. Inexplosive system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If ingested on clothing and allowed to remain, may cause smothering and reddening of the skin. 5.10 Odor Threshold: 70 mg/m ³ .	

6 FIRE HAZARDS 6.1 Flash Point: 100°C (212°F). 6.2 Flammable Limits in Air: 1.5-10%. 6.3 Fire Extinguishing Agents: Carbon dioxide, dry chemical (for small fires), foam (for large fires). 6.4 Fire Extinguishing Agents Not to be Used: Water may be used on small fires. 6.5 Special Hazards of Combustion Products: None known. 6.6 Behavior in Fire: None known. 6.7 Ignition Temperature: 540°F. 6.8 Electrical Hazard: None known. 6.9 Burning Rate: Data not available.	8 WATER POLLUTION 8.1 Aquatic Toxicity: 520 ppm/24 hr/breath (crump, TL _m). 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 62% of theoretical in 5 days/freshwater. 8.4 Food Chain Concentration Potential: None.																												
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Celanese Corp. Celanese Chemical Division 240 Park Ave. New York, N.Y. 10017. 2. Eastman Kodak Co. Tennessee Eastman Co. Division Kingsport, Tenn. 37602. 3. Eastman Kodak Co. Chemical and Plastics Div. 240 Park Ave. New York, N.Y. 10017.																												
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 476-2) A P Q-T-L	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.5%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not required. 10.4 Venting: Operate under positive pressure vacuum.																												
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td></td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td></td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other's Reactions</td><td>0</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed.	Category	Rating	Fire	1	Health		Vapor Irritant		Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity		Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other's Reactions	0	Water	0	Self Reaction	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 102.14. 13.3 Boiling Point at 1 atm: 114.9°C (238.8°F). 13.4 Freezing Point: -119.1°C (-222.4°F). 13.5 Critical Temperature: 291.1°C (556.0°F). 13.6 Critical Pressure: 35.0 atm (3.5 MPa). 13.7 Specific Gravity (20°C/20°C liquid): 0.894. 13.8 Liquid Surface Tension: 23.4 dynes/cm (0.024 N/m) at 20°C. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.07. 13.12 Latent Heat of Vaporization: 14.5 Btu/lb (33.4 kJ/kg) at 100°F. 13.13 Heat of Combustion: Data not available. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	1																												
Health																													
Vapor Irritant																													
Liquid or Solid Irritant	1																												
Poisons	2																												
Water Pollution																													
Human Toxicity																													
Aquatic Toxicity	2																												
Aesthetic Effect	2																												
Reactivity																													
Other's Reactions	0																												
Water	0																												
Self Reaction	0																												
NOTES																													

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PAL

n-PROPYL ALCOHOL

Common Synonym(s) Propyl alcohol 1-Propanol	Liquid Colorless Alcohol odor Mixes with water. Flammable; irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause nausea, dizziness, or headache. LIQUID Will burn eyes. Harmful if swallowed.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444, 4.) Toxic warning: High flammability. Spill: Flush and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Propyl alcohol 1-Propanol Propylalcohol 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ 3.4 IMCO United Nations Numerical Designation: 12-1274	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Resembling that of ethyl alcohol
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supplied respirator in high concentrations; goggles or face shield; plastic gloves. 5.2 Symptoms Following Exposure: Contact with eyes irritates; can cause burns. Vapor irritates nose and throat. In high concentrations may cause nausea, dizziness, headache, and stupor. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air; call a physician. SKIN: If ON CONTACT, flush at once with plenty of water; get medical care for eyes. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not ppm. 5.5 Short-Term Inhalation Limits: 400 ppm for 10 min. 5.6 Toxicity by Ingestion: Grade 2.1 Data not available. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes irritation to the eyes and respiratory system at present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless in water. 5.10 Odor Threshold: 30 ppm.	

6. FIRE HAZARDS 6.1 Flash Point: 111°F (44°C) 6.2 Flammable Limits in Air: 2.1 - 13.5 6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires; alcohol foam for large fires. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 700°F 6.8 Electrical Hazard: Class I, Group D. 6.9 Burning Rate: 2.9 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 500 ppm; 24 hr; goldfish died; fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 0.47 lbs/lb in 5 days. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Celanese Chemical Co. 245 Park Ave. New York, N.Y. 10017 2. Eastman Kodak Co. Texas Eastman Co. Division Fort Worth, Tex. 76106 3. Union Carbide Corp. Chemicals & Plastics Division 270 Park Ave. New York, N.Y. 10017																												
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444, 3. A P Q	10. SHIPPING INFORMATION 10.1 Grades or Purities: 99.9%+ 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arresters.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>+</td></tr> <tr> <td>Health</td><td>+</td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>0</td></tr> <tr> <td>Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td>2</td></tr> <tr> <td>Human Toxicity</td><td>2</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Aesthetic Effect</td><td>+</td></tr> <tr> <td>Reactivity</td><td>2</td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not used.	Category	Rating	Fire	+	Health	+	Vapor Irritant	1	Liquid or Solid Irritant	0	Poisons	2	Water Pollution	2	Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	+	Reactivity	2	Other Chemicals	2	Water	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 60.10 13.3 Boiling Point at 1 atm: $207.0^\circ\text{F} = 97.2^\circ\text{C} = 370.4^\circ\text{K}$ 13.4 Freezing Point: $-189.2^\circ\text{F} = -128.2^\circ\text{C} = 147.0^\circ\text{K}$ 13.5 Critical Temperature: $506.5^\circ\text{F} = 263.6^\circ\text{C} = 536.5^\circ\text{K}$ 13.6 Critical Pressure: $780 \text{ psia} = 52.7 \text{ atm} = 5.2 \text{ MN/m}^2$ 13.7 Specific Gravity: 0.803 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 2.1 13.11 Ratio of Specific Heats of Vapor (Gas): 1.107 13.12 Latent Heat of Vaporization: $262 \text{ Btu/lb} = 262 \text{ kcal/kg} = 6.8 \text{ MJ/kg}$ 13.13 Heat of Combustion: $-13,130 \text{ Btu/lb}$ $= -7,804 \text{ cal/g} = 30.5 \text{ kJ/g}$ 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 100 Btu/lb $= 5.0 \text{ cal/g} = 0.2 \text{ kJ/kg}$ 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	+																												
Health	+																												
Vapor Irritant	1																												
Liquid or Solid Irritant	0																												
Poisons	2																												
Water Pollution	2																												
Human Toxicity	2																												
Aquatic Toxicity	2																												
Aesthetic Effect	+																												
Reactivity	2																												
Other Chemicals	2																												
Water	0																												
Self Reaction	0																												
NOTES																													

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PPL

PROPYLENE

Common Synonyms: Propylene Methylpropylene	Liquefied compressed gas Colorless Mild odor Fluents and foams on water. Flammable, visible vapor cloud is produced.
Fire	FLAMMABLE Container may explode in fire. Flashback along vapor trail may occur. May explode if ignited in an enclosed area.
Exposure	VAPOR If inhaled, will cause dizziness or loss of consciousness. LIQUID Will cause frostbite.
Water Pollution	Not harmful to aquatic life.
1. RESPONSE TO DISCHARGE See Response Methods Manual, CG 444-4. Issue warning: high flammability. Evacuate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Methylpropylene Propylene 3.2 Coast Guard Compatibility Classification: CH 1.1 3.3 Chemical Formula: C ₃ H ₆ (200 H) 3.4 IMCO United Nations Numerical Designation: 2010	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquefied gas 4.2 Color: Colorless 4.3 Odor: Weak, gas
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor cartridge or air supply, self-contained breathing apparatus, liquid protective clothing, eye protection. 5.2 Symptoms Following Exposure: Moderate concentration may cause dizziness, headache, and unconsciousness. Contact with liquefied propylene may cause freezing burns. 5.3 Treatment for Exposure: INHALATION: Remove victim from exposure. Breathing apparatus or artificial respiration if necessary. Give oxygen and artificial respiration if needed. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1000 ppm 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Not pertinent. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: Not appreciable hazard. Practically harmless to the skin because of evaporative quality. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: -121°C (-196°F) 6.2 Flammable Limits in Air: 2.1% - 11.1% 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Container may explode. Vapor is heavier than air and may travel considerable distances from source of ignition and flash back. 6.7 Ignition Temperature: 427°C (800°F) 6.8 Electrical Hazard: Class I Group II 6.9 Burning Rate: 1.1 m/min (liquid)	8. WATER POLLUTION 8.1 Aquatic Toxicity: None. 8.2 Waterfowl Toxicity: None. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Dow Chemical Co. Midland Methyls Exxon Chemical Co. Hess Inc. Union Carbide Corp. Chemical and Physical Division 270 Park Ave. New York, N.Y. 10017																												
11. HAZARD ASSESSMENT CODE See Material Assessment Manual, CG 444-4. ABC DUE	10. SHIPPING INFORMATION 10.1 Grades or Purity: Chemical 99.9% polymerization grade, repeated 99.9% propylene concentration 99.9% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required. 10.4 Venting: Safety relief.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Fire</td><td>2</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Toxicity</td><td>1</td></tr><tr><td>Liquid or Solid Toxicity</td><td></td></tr><tr><td>Poisons</td><td></td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td></td></tr><tr><td>Acute Toxicity</td><td>1</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td></td></tr><tr><td>Water</td><td>1</td></tr><tr><td>Self-Reaction</td><td>1</td></tr></tbody></table>	Category	Rating	Fire	2	Health		Vapor Toxicity	1	Liquid or Solid Toxicity		Poisons		Water Pollution		Human Toxicity	1	Aquatic Toxicity		Acute Toxicity	1	Reactivity		Other Chemicals		Water	1	Self-Reaction	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 42.08 13.3 Boiling Point at 1 atm: -42.1°C (-43.8°F) = 225.1 K 13.4 Freezing Point: -187.6°C (-285.7°F) = 85.6 K 13.5 Critical Temperature: 96.7°C (206.1°F) = 369.8 K 13.6 Critical Pressure: 4.6 MPa = 45.9 atm = 687.5 MN/m ² 13.7 Specific Gravity: 0.503 at -42°C (liquid) 13.8 Liquid Surface Tension: 18.7 dynes/cm = 0.0187 N/m at -42°C 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 1.4 13.11 Ratio of Specific Heats of Vapor (Gas): 1.02 13.12 Latent Heat of Vaporization: 37.8 kJ/mol = 9.04 kcal/mol = 31.1 J/g 13.13 Heat of Combustion: -49.692 kJ/mol = -11.941 kcal/mol = 44.848 J/g 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	2																												
Health																													
Vapor Toxicity	1																												
Liquid or Solid Toxicity																													
Poisons																													
Water Pollution																													
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Reactivity																													
Other Chemicals																													
Water	1																												
Self-Reaction	1																												
NOTES																													

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PBP

PROPYLENE BUTYLENE POLYMER

Common Synonyms		Liquid	
Fire		Fire data not available	
Exposure		Exposure data not available	
Water Pollution		Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE (See Response Numbers Handbook, CG 444-4, Data not available)		2. LABELS (See Hazard Labels Handbook, CG 444-3, Data not available)	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Data not available. 3.2 Coast Guard Compatibility Classification: Olefin. 3.3 Chemical Formula: Not applicable. 3.4 IMCO United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Data not available. 4.3 Odor: Data not available.	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Data not available. 5.2 Symptoms Following Exposure: Data not available. 5.3 Treatment for Exposure: Data not available. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.			

6. FIRE HAZARDS 6.1 Flash Point: Data not available. 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Data not available. 6.4 Fire Extinguishing Agents Not to be Used: Data not available. 6.5 Special Hazards of Combustion Products: Data not available. 6.6 Behavior in Fire: Data not available. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Data not available.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterway Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not pertinent. 7.2 Reactivity with Common Materials: Not pertinent. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS A. American Petroleum Institute B. Chemical Abstracts C. Chemical Engineering D. Chemical Manufacturers Association E. Chemical Manufacturers Association F. Chemical Manufacturers Association G. Chemical Manufacturers Association H. Chemical Manufacturers Association I. Chemical Manufacturers Association J. Chemical Manufacturers Association K. Chemical Manufacturers Association L. Chemical Manufacturers Association M. Chemical Manufacturers Association N. Chemical Manufacturers Association O. Chemical Manufacturers Association P. Chemical Manufacturers Association Q. Chemical Manufacturers Association R. Chemical Manufacturers Association S. Chemical Manufacturers Association T. Chemical Manufacturers Association U. Chemical Manufacturers Association V. Chemical Manufacturers Association W. Chemical Manufacturers Association X. Chemical Manufacturers Association Y. Chemical Manufacturers Association Z. Chemical Manufacturers Association	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-2) V 1.1		10. SHIPPING INFORMATION 10.1 Grades or Purity: Data not available. 10.2 Storage Temperature: Not pertinent. 10.3 Inert Atmosphere: Not pertinent. 10.4 Venting: (Type)	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: Not pertinent. 13.3 Boiling Point at 1 atm: Not listed. 13.4 Freezing Point: Not listed. 13.5 Critical Temperature: Not listed. 13.6 Critical Pressure: Not listed. 13.7 Specific Gravity: Data not available. 13.8 Liquid Surface Tension: Not listed. 13.9 Liquid-Water Interfacial Tension: Not listed. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not listed. 13.14 Heat of Decomposition: Not listed. 13.15 Heat of Solution: Not listed. 13.16 Heat of Polymerization: Not listed.	
NOTES			

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PPG

PROPYLENE GLYCOL

Common Synonyms: 1. Propylene glycol 1.2 Dihydroxypropane		Thick liquid	Colorless	Odorless
		Mixes with water		
Fire	Combustible			
Exposure	Not harmful			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water bodies.			
1. RESPONSE TO DISCHARGE See Response Materials Manual, page 1-2-4-4 (See page 1-2-4-4)		2. LABELS See Response Materials Manual, page 1-2-4-4 (See page 1-2-4-4)		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,2-Dihydroxypropane 1,2-Propanediol 2 Propanediol 3.2 Coast Guard Compatibility Classification: 1 3.3 Chemical Formula: C ₃ H ₈ O ₂ HOCH ₂ CH ₂ CH ₂ OH 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: None 5.2 Symptoms Following Exposure: None 5.3 Treatment for Exposure: None 5.4 Toxicity by Inhalation (Threshold Limit Value): Not listed 5.5 Short-Term Inhalation Limits: Not listed 5.6 Toxicity by Ingestion: None 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: None				

6 FIRE HAZARDS 6.1 Flash Point: 210 F (99 C) 6.2 Flammable Limits in Air: 2.4-12.5% 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide, halon 6.4 Fire Extinguishing Agents Not to Be Used: None 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: None 6.7 Ignition Temperature: 700 F 6.8 Electrical Hazard: None 6.9 Burning Rate: None		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 2.2% of theoretical in 5 days 8.4 Food Chain Concentration Potential: None																							
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: None 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS Dow Chemical Co. Midland Mainland Phillips Corp. Shell Chemicals Union Carbide Corp. Chemical and Plastics Division 270 Park Ave. New York, N.Y. 10017																							
		10 SHIPPING INFORMATION 10.1 Grades or Purity: USP Reference Standard 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Other Containers																							
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, page 1-2-4-4-4 N P Q		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 76.09 13.3 Boiling Point at 1 atm: 369.9 F (193.8 C) 13.4 Freezing Point: -116.3 F (-82.1 C) 13.5 Critical Temperature: Not listed 13.6 Critical Pressure: Not listed 13.7 Specific Gravity: 1.04 (20°C) 13.8 Liquid Surface Tension: 36.5 dyne/cm (20°C) 13.9 Liquid-Water Interfacial Tension: Not listed 13.10 Vapor (Gas) Specific Gravity: Not listed 13.11 Ratio of Specific Heats of Vapor (G_v): Not listed 13.12 Latent Heat of Vaporization: 10.1 Btu/lb (23.9 kJ/kg) 13.13 Heat of Combustion: 16,100 Btu/lb (37,700 kJ/kg) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																							
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><thead><tr><th>Category</th><th>Rating</th></tr></thead><tbody><tr><td>Health</td><td>1</td></tr><tr><td>Environment</td><td>1</td></tr><tr><td>Reactivity</td><td>1</td></tr><tr><td>Waste</td><td>1</td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Reactivity</td><td>1</td></tr><tr><td>Waste</td><td>1</td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr></tbody></table> 12.3 NFPA Hazard Classification: Not listed		Category	Rating	Health	1	Environment	1	Reactivity	1	Waste	1	Human Toxicity	1	Aquatic Toxicity	1	Reactivity	1	Waste	1	Human Toxicity	1	Aquatic Toxicity	1		
Category	Rating																								
Health	1																								
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Reactivity	1																								
Waste	1																								
Human Toxicity	1																								
Aquatic Toxicity	1																								
NOTES																									

PME

PROPYLENE GLYCOL METHYL ETHER

Common Semantics
Articles: 2 paragraphs
about PM
and 338

1. **Introduction**

(continued)

وہی ہے

Wiederum ist die zweite Zeile in der ersten Spalte zu lesen.

Five

FLAMMABLE

Flashback, along vapor trail may occur
Vapor may explode if ignited in an enclosed area

Exposure

1400R

limb'ing to c-r, now and then?

1148

Intuitive is also a good

Water Pollution

[Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water supply.

Will be determined if it exists in any way.

1. RESPONSE TO DISCHARGE

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

2 LABEL



3 CHEMICAL DESIGNATIONS

- 3.1 **Synonyms:** Dioxane-4-IR
Dioxane-PM
Methylene 2-propenyl
- 3.2 **COSY Guard Compatibility Classification:**
Type 1 (see 3.1)
- 3.3 **Chemical Formula:** C₈H₁₀O₂ H₂O 47
- 3.4 **HSO United Nations Numerical Designation:** Not used

4. OBSERVABLE CHARACTERISTICS

- 4.1 Physical State (as shipped): 1 barrel
4.2 Color: 1 barrel
4.3 Odor: 1 barrel

5 HEALTH HAZARDS

- 5.1 **Personal Protective Equipment:** Safety goggles, protective clothing
- 5.2 **Symptoms Following Exposure:** Irritation of skin, eyes, and mouth
- 5.3 **Treatment for Exposure:** Flush with water; remove clothing; wash skin; use contaminated clothing and wash with water
- 5.4 **Toxicity by Inhalation (Threshold Limit Value):** 100 ppm
- 5.5 **Short-Term Inhalation Limits:** Data not available
- 5.6 **Toxicity by Ingestion:** Irritation of the digestive system
- 5.7 **Late Toxicity:** Data not available
- 5.8 **Vapor (Gas) Irritant Characteristics:** Vapors cause moderate irritation to the eyes, nose, and throat at high concentrations; unpleasant at elevated temperatures
- 5.9 **Liquid or Solid Irritant Characteristics:** Moderate hazard; irritation to the skin is not permanent, may cause stinging and reddening of the skin
- 5.10 **Odor Threshold:** Data not available

6 FIRE HAZARDS

- 61 Flash Point: 100°F
- 62 Flammable Limits in Air: 1.1% - 7.6%
- 63 Fire Extinguishing Agents: Water, foam, dry chemical
- 64 Fire Extinguishing Agents Not to be Used: None
- 65 Special Hazards of Combustion Products: None
- 66 Behavior in Fire: None
- 67 Ignition Temperature: 1000°F
- 68 Electrical Hazard: None
- 69 Burning Rate: None

8. WATER POLLUTION

- 8.1 Aquatic Toxicity (Dose-response)
- 8.2 Waterfowl Toxicity (Dose-response)
- 8.3 Biological Oxygen Demand (BOD) (Dose-response)
- 8.4 Food Chain Concentration Potential

9. SELECTED MANUFACTURERS

$$\begin{aligned} D &= C^2 - 2C \\ M &= M - 2C \\ C &= C - 1 \\ 4N &= 2B \\ A &= 10 - 2C^2 \end{aligned}$$

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: \ \ \ \
- 7.2 Reactivity with Common Materials: \ \ \ \
- 7.3 Stability During Transport: \ \ \ \
- 7.4 Neutralizing Agents for Acids and Caustics: \ \ \ \
- 7.5 Polymerization: \ \ \ \
- 7.6 Inhibitor of Polymerization: \ \ \ \

10. SHIPPING INFORMATION

- *0 Grades or Purity: Technical
*02 Storage Temperature: Room
103 Inert Atmosphere: No requirement
*04 Venting: Open to the atmosphere

11 HAZARD ASSESSMENT CODE

AP 0

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable Liquid
- 12.2 HAS Hazard Rating for Bulk Water Transportation: Not rated
- 12.3 ATPA Hazard Classifications: Not rated

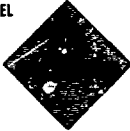
13. PHYSICAL AND CHEMICAL PROPERTIES

- *13.1 Physical State at 15°C and 1 atm: N_2 and O_2
- *13.2 Molecular Weight: $M = 28$
- *13.3 Boiling Point at 1 atm: $T_b = 196.1^\circ C = 77.3^\circ K$
- *13.4 Freezing Point: N/A
- *13.5 Critical Temperature: $T_c = 220.1^\circ C = 493.2^\circ K$
- *13.6 Critical Pressure: $P_c = 33.5$ atm
- *13.7 Specific Gravity: $\rho_{sp} = 1.25$
- *13.8 Liquid Surface Tension: N/A
- *13.9 Liquid-Water Interfacial Tension: N/A
- *13.10 Vapor (Gas) Specific Gravity: N/A
- *13.11 Ratio of Specific Heats of Vapor (Gas): $\gamma = 1.4$
- *13.12 Latent Heat of Vaporization: $h_{fg} = 473.1 \text{ kJ/kg} = 107 \text{ Btu/lb}$
- *13.13 Heat of Combustion: $h_{cp} = 43,600 \text{ Btu/lb} = 10,042 \text{ kJ/kg}$
- *13.14 Heat of Decomposition: N/A
- *13.15 Heat of Solution: $h_{cs} = 9 \text{ Btu/lb} = 0.21 \times 10^3 \text{ kJ/kg}$
- *13.16 Heat of Polymerization: N/A

NOTES

POX

PROPYLENE OXIDE

Common Synonyms Propylene oxide 1,2-Epoxypropane Propylene oxide	Liquid Colorless Sweet, alcohol odor Mixes with water. Flammable, irritant. Vapor is produced.
Fire	FLAMMABLE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Fire extinguishers: Carbon dioxide, or dry chemical for small fires; alcohol or polymer foam for large fires.
Exposure	VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause headache, nausea, vomiting, or loss of consciousness. LIQUID Will burn skin and eyes. Harmful if swallowed. EFFECTS Irritation of skin and eyes. If swallowed, may cause secondary burns on long exposure.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Manual Handbook, CG 446-4) Toxic warning Restrict access Evacuate area	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,2-Epoxypropane; Methyl oxirane; Propylene oxide. 3.2 Coast Guard Compatibility Classification: Miscellaneous. 3.3 Chemical Formula: CH ₃ CH(OH) ₂ . 3.4 IMO/United Nations Numerical Designation: 3.1 (280)	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Ethereal characteristic, sweet, alcoholic, like natural gas.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supplied mask, rubber or plastic gloves, vapor proof goggles. 5.2 Symptoms Following Exposure: Inhalation may produce headache, nausea, vomiting, and unconsciousness; mild depression of central nervous system; lung irritation. Slight irritation to skin, but covered contact may cause burn. Very irritating to eyes. 5.3 Treatment for Exposure: INHALATION: Remove person to fresh air immediately. Keep quiet and warm. Call a physician if breathing stops. Start artificial respiration. SKIN OR EYE CONTACT: Immediately flush with plenty of water for at least 15 min. Immediately remove contaminated clothing. Wash hands thoroughly to prevent confining product to skin. For eyes get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2. LD ₅₀ 8 to 9 g/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Causes irritation of the skin and first degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: 200 ppm.	

5. FIRE HAZARDS

- 6.1 **Flash Point:** 35°F (C) = -20°F (C)
 6.2 **Flammable Limits in Air:** 2.1 - 13.5%
 6.3 **Fire Extinguishing Agents:** Carbon dioxide, or dry chemical for small fires; alcohol or polymer foam for large fires.
 6.4 **Fire Extinguishing Agents Not to be Used:** Water may be ineffective.
 6.5 **Special Hazards of Combustion Products:** Not pertinent.
 6.6 **Behavior in Fire:** Containers may explode. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
 6.7 **Ignition Temperature:** 569°F
 6.8 **Electrical Hazard:** Class I, Group B.
 6.9 **Relief Rate:** 33 mm/min.

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction.
 7.2 **Reactivity with Common Materials:** No reaction.
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
 7.5 **Polymerization:** May occur due to high temperatures; contamination with alkynes, aqueous acids, amines, and acids, alcohols.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available.
 8.2 **Waterflow Toxicity:** Data not available.
 8.3 **Biological Oxygen Demand (BOD):** Data not available.
 8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

1. BASF Wyandotte Corp.
 Wyandotte, Mich. 48192
 2. Dow Chemical Co.
 Midland, Mich. 48640
 3. Oxychem Corp.
 120 Alexander St.
 Princeton, N.J. 08540

10. SHIPPING INFORMATION

- 10.1 **Grades or Purity:** 99.99% (must contain no acetylene).
 10.2 **Storage Temperature:** Ambient.
 10.3 **Inert Atmosphere:** Inerted.
 10.4 **Venting:** Safety relief.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 A P Q R S

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Flammable liquid.
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	4
Health	
Vapor Irritant	3
Liquid or Solid Irritant	2
Poisons	2
Water Pollution	
Human Toxicity	2
Aquatic Toxicity	1
Acute Effect	1
Reactivity	
Other Chemicals	3
Water	1
Self Reaction	3

12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	4
Reactivity (Yellow)	2

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid.
 13.2 **Molecular Weight:** 58.08.
 13.3 **Boiling Point at 1 atm:** 93.7°F = 34.3°C = 302°K.
 13.4 **Freezing Point:** -109.4°F = -111.9°C = 161.3°K.
 13.5 **Critical Temperature:** 408.4°F = 209.1°C = 482.3°K.
 13.6 **Critical Pressure:** 714 psia = 48.6 atm = 4.92 MN/m².
 13.7 **Specific Gravity:** 0.830 at 20°C (liquid).
 13.8 **Liquid Surface Tension:** 24.5 dynes/cm = 0.0245 N/m at 15°C.
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
 13.10 **Vapor (Gas) Specific Gravity:** 2.0.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.133.
 13.12 **Latent Heat of Vaporization:** 205 Btu/lb = 114 cal/g = 4.77 × 10³ J/kg.
 13.13 **Heat of Combustion:** -13,000 Btu/lb = -7,221 cal/g = -302.3 × 10³ J/kg.
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution (test):** 19 Btu/lb = 11 cal/g = 0.45 × 10³ J/kg.
 13.16 **Heat of Polymerization:** Not pertinent.

(Continued on pages 5 and 6)

NOTES

PTT

PROPYLENE TETRAMER

Common Synonyms Dodecene (non-linear) Tetragroup line	Liquid Colorless Floats on water
Fire	Combustible (See Response Methods Handbook CG 446-3)
Exposure	See Response Methods Handbook CG 446-3 LIQUID Irritating to skin and eyes Harmful if swallowed (See Response Methods Handbook CG 446-3) INHALATION Irritating to respiratory tract (See Response Methods Handbook CG 446-3) INGESTION Irritating to digestive tract (See Response Methods Handbook CG 446-3)
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-3) Mechanical containment Should be removed Chemical and physical treatment	2 LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Dodecene (non-linear) Tetrapropylene 3.2 Coast Guard Compatibility Classification OPCA 3.3 Chemical Formula: $C_{12}H_{22}$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Data not available
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: No inhalation hazard expected. Aspiration hazard if ingested. Low skin and eye irritation. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air. INGESTION: do NOT lavage or induce vomiting. Give vegetable oil and demulcents. Call physician. EYES: flush with water for 15 min. SKIN: wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 0. LD ₅₀ above 1.5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause stinging and reddening of the skin. 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: 120 F (C) 134 F (C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water fog foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 490 F (C) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Atlantic Refining Co. ARCO Chemical Co. Division 2605 B Street Philadelphia, Pa. 19101 2 Continental Oil Co. Conoco Chemicals Division Park 80 Plaza East Saddle Brook, N.J. 07663 3 Sun Oil Co. St. Davids, Pa. 19087																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A T-1	10 SHIPPING INFORMATION 10.1 Grades or Purity: 98%+ 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame at exit																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation <table data-bbox="907 1444 1142 1724"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>2</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>0</td></tr> <tr> <td>Aquatic Toxicity</td><td>1</td></tr> <tr> <td>Acute Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications <table data-bbox="907 1735 1142 1821"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>0</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	2	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	0	Aquatic Toxicity	1	Acute Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 168.31 13.3 Boiling Point at 1 atm: 365.38 ± 1.455 °C = 458.409 K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.2937 at 20°C (liquid) 13.8 Liquid Surface Tension: 23.9 dynes/cm = 0.0239 N/m at 24°C 13.9 Liquid-Water Interfacial Tension: 44.5 dynes/cm = 0.0445 N/m at 22.7°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization (est): 154 Btu/lb = 58.6 cal/g = 2.45×10^5 J/kg 13.13 Heat Combustion: -19,100 Btu/lb = -10,600 cal/g = -444×10^3 J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	2																																				
Health																																					
Vapor Irritant	1																																				
Liquid or Solid Irritant	1																																				
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NOTES																																					

REVISED 1978

PROPYLENEIMINE, INHIBITED

Common Synonyms Propyleneimine 2-Methylaziridine 2-Methylethyleneimine	Liquid Colorless Strong ammonia-like odor Mixes with water. Flammable, irritating vapor is produced.
AVOID CONTACT WITH SKIN, EYES, OR CLOTHING. IF CONTACT OCCURS, WASH IMMEDIATELY WITH WATER. IF EYES ARE AFFECTED, FLUSH WITH WATER FOR AT LEAST 15 MINUTES. IF INHALED, MOVE TO FRESH AIR. IF SWALLOWED, DO NOT INDUCE VOMITING.	
Fire	FLAMMABLE Irritating gases are produced when heated. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
 Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled will cause nausea, vomiting or difficulty breathing. May cause dizziness. LIQUID POISONOUS IF SWALLOWED. Will burn skin and eyes. May cause dizziness. If swallowed, do not induce vomiting. If in eyes, flush with water for at least 15 minutes. If on skin, remove contaminated clothing and flush with water.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: high flammability, water contaminant, air contaminant. Restrict access. Evacuate area. Dispersed and flush.	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 2-Methylaziridine, 2-Methylethyleneimine, Propyleneimine. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: C_3H_5N 3.4 IMCO/United Nations Numerical Designation: 121921	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Strong ammonia-like
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes vomiting, breathing difficulty, and irritation of eyes, nose, and throat. On prolonged exposure, vapors tend to redden the whites of the eyes. Contact with liquid causes eye irritation, like that caused by strong ammonia. Liquid causes skin burns, which are slow to heal. Ingestion causes burns of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: move victim to fresh air; if he is not breathing, apply artificial respiration; oxygen if breathing is difficult; administer oxygen; call physician. EYES: flush with plenty of water for at least 30 min. and obtain prompt medical attention. SKIN: remove all contaminated clothing and flush with water; rinse with vinegar and water. INGESTION: drink large amounts of milk or water; get prompt medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 2 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4, oral LD_{50} = 19 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: 25°F (0°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may be ineffective 6.5 Special Hazards of Combustion Products: Irritating nitrogen oxides are produced 6.6 Behavior in Fire: Containers may explode 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 4.1 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts slowly to form propanolamine. The reaction is not hazardous. 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable if kept in contact with solid caustic soda (sodium hydroxide) 7.4 Neutralizing Agents for Acids and Caustics: Dilute with water; rinse with vinegar 7.5 Polymerization: Polymerizes explosively when in contact with any acid 7.6 Inhibitor of Polymerization: Solid sodium hydroxide (caustic soda)	9. SELECTED MANUFACTURERS 1. Arayco Incorporated P.O. Box 8 Carlisle, N.J. 07072 2. Polysciences, Inc. Paul Valley Industrial Park Warrington, Pa. 18972 3. Pfaltz and Bauer, Inc. 126-04 Northern Boulevard Flushing, N.Y. 11368
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A O P Q R S Z	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Exclude air 10.4 Venting: Pressure vacuum
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 57.1 13.3 Boiling Point at 1 atm: 151°F = 66°C = 339°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.802 at 25°C (liquid) 13.8 Liquid Surface Tension: (est.) 25 dynes/cm = 0.025 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 2 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available 13.12 Latent Heat of Vaporization: 240 Btu/lb = 139 cal/g = 5.82 × 10 ⁵ J/kg 13.13 Heat of Combustion: (est.) -15,500 Btu/lb = -8,600 cal/g = -360 × 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -140 Btu/lb = -78 cal/g = -3.3 × 10 ⁵ J/kg 13.16 Heat of Polymerization: (est.) -720 Btu/lb = -400 cal/g = -1.7 × 10 ⁵ J/kg
NOTES Continued on pages 5 and 61	

PMN

n-PROPYL MERCAPTAN

Common Synonyms 1 Propanethiol Propane-1-thiol		Liquid	Colorless	Skunk like odor
		Floats on water. Flammable. Irritating vapor is produced.		
No data available on biodegradability. No data available on toxicity to fish.				
Fire		FLASHABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Water may be ineffective.		
Exposure		VAPOR If inhaled will cause difficult breathing. May cause irritation of eyes and skin. If inhaled, move victim to fresh air. If inhaled, seek medical attention. LIQUID Irritating to skin and eyes. Harmful if swallowed. If swallowed, do not induce vomiting. If swallowed, seek medical attention. IF SWALLOWED, DO NOT INDUCE VOMITING. IF SWALLOWED, DRINK WATER OR MILK.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. No data available on biodegradability. No data available on toxicity to fish.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4.) Issue warning: high flammability. water contaminant, air contaminant. restrict access, evacuate area, mechanical containment, should be removed, chemical and physical treatment.		2. LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Propanethiol Propane-1-thiol 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CH ₃ CH ₂ CH ₂ SH 3.4 IMCO/United Nations Numerical Designation: 1.1 1228		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Skunk-like		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves, self contained breathing apparatus or organic canister mask. 5.2 Symptoms Following Exposure: Inhalation causes muscular weakness, convulsions, and respiratory paralysis. High concentrations may cause pulmonary irritation. Contact with liquid causes irritation of eyes and skin. Ingestion causes irritation of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: remove victim from contaminated atmosphere, give artificial respiration and oxygen if needed, observe for premonitory signs of pulmonary edema. EYES: flush with water for 15 min. if irritation persists, see a physician. SKIN: flush with water, wash with soap and water. INGESTION: induce vomiting and follow with gastric lavage. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 1.790 mg/kg (rat). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: 0.0005 ppm.				

6 FIRE HAZARDS 61 Flash Point: < 1°C 62 Flammable Limits in Air: Data not available 63 Fire Extinguishing Agents: Dry chemical foam, carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective 65 Special Hazards of Combustion Products: Toxic sulfur dioxide is generated 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Data not available 68 Electrical Hazard: Data not available 69 Burning Rate: < 1 mm/min	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Pennwalt Corporation Chemicals Division Three Parkway Philadelphia, Pa. 19102 2 Phillips Petroleum Company Chemical Department Special Products Division Bartlesville, Okla. 74004 3 Aldrich Chemical Co. 940 West St. Paul Avenue Milwaukee, Wis. 53233
	10 SHIPPING INFORMATION 101 Grades or Purity: 98+% 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Pressure/vacuum
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3.) A T-U-V-W	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: 76.2 133 Boiling Point at 1 atm: 153°F = 67°C = 340°K 134 Freezing Point: -171°F = -113°C = 160°K 135 Critical Temperature: (est.) 495°F = 257°C = 530°K 136 Critical Pressure: (est.) 667 psia = 45.8 atm = 4.60 MN/m² 137 Specific Gravity: 0.841 at 20°C (liquid) 138 Liquid Surface Tension: 24.7 dyne/cm = 0.0247 N/m at 20°C 139 Liquid-Water Interfacial Tension: (est.) 16 dyne/cm = 0.016 N/m at 20°C 1310 Vapor (Gas) Specific Gravity: 2.6 1311 Ratio of Specific Heats of Vapor (Gas): 1.0784 1312 Latent Heat of Vaporization: 179 Btu/lb = 99 cal/g = 4.16 × 10⁵ J/kg 1313 Heat of Combustion: 15,990 Btu/lb = 8,890 cal/g = 372 × 10⁵ J/kg 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable liquid 122 NFPA Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed	
Continued on pages 5 and 6	
NOTES	

PRD

PYRIDINE

Common Synonyms		Liquid	Colorless to yellow	Sharp nauseating odor
Mixes with water. Poisonous. Flammable vapor is produced.				
AVOID CONTACT WITH SKIN AND EYES. VAPOR MAY IRRITATE EYES, NOSE, AND THROAT.				
Fire		FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.		
Exposure		VAPOR Poisonous if inhaled or if skin is exposed. Irritating to eyes, nose, and throat. LIQUID Poisonous if swallowed or if skin is exposed. Will burn eyes.		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: high flammability. Restrict access. Evacuate area. Dispose and flush.		2. LABEL 		
3 CHEMICAL DESIGNATIONS 31 Synonyms: No common synonyms. 32 Coast Guard Compatibility Classification Aromatic amine 33 Chemical Formula: <chem>C5H5N</chem> 34 IMCO United Nations Numerical Designation: 321222		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Yellow, colorless 43 Odor: Distinct, strong, unpleasant, characteristic, unpleasant, sharp, penetrating, unpleasant.		
5 HEALTH HAZARDS 51 Personal Protective Equipment: As supplied mask or organic vapor, acid gas, and rubber gloves and protective clothing. 52 Symptoms Following Exposure: Vapors irritate eyes and nose. Liquid irritates skin and is absorbed through the skin. Overexposure causes nausea, headache, nervous symptoms, increased urinary frequency. 53 Treatment for Exposure: INHALATION: Remove individual to fresh air. If breathing is difficult, give artificial respiration and oxygen. If necessary, give mouth-to-mouth. If INGESTION: induce vomiting and follow with gastric lavage. SKIN: wash thoroughly with large amounts of water. EYES: flush with large amounts of water. 54 Toxicity by Inhalation (Threshold Limit Value): 1 ppm 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Grade 2 LD₅₀ 5.0 g/kg. 57 Late Toxicity: Liver and kidney damage after ingestion. 58 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such as eye, nose, throat, and high concentrations are corrosive. The effect is temporary. 59 Liquid or Solid Irritant Characteristics: Causes irritation of the skin and first degree burns on short exposure. In contact with skin causes severe burns on long exposure. 510 Odor Threshold: 0.02 ppm				

6 FIRE HAZARDS

61 Flash Point: 68 F (20 C)

62 Flammable Limits in Air: 1.8 - 12.4

63 Fire Extinguishing Agents: Alcohol, foam, dry chemical, or carbon dioxide

64 Fire Extinguishing Agents Not to be Used: Water may be ineffective

65 Special Hazards of Combustion Products: Not pertinent

66 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to source of ignition and flash back

67 Ignition Temperature: 900 F

68 Electrical Hazard: Class I, Group D

69 Burning Rate: 4 mm/min

7 CHEMICAL REACTIVITY

71 Reactivity with Water: No reaction

72 Reactivity with Common Materials: None

73 Stability During Transport: Stable

74 Neutralizing Agents for Acids and Caustics: Flush with water

75 Polymerization: Not pertinent

76 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

81 Aquatic Toxicity: 150 mg/l 96-hr fish TL₅₀ in fresh water

82 Waterlow Toxicity: Data not available

83 Biological Oxygen Demand (BOD): 1.15 - 1.47 lb/lb 5 day

84 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1 Koppers Co., Inc.
Organic Materials Division
Pittsburgh, Pa. 15209

2 Riedel, Inc. and Chemical Corp.
1601 Merchants Bank Bldg.
Indianapolis, Ind. 46204

Warner Lambert Co.
Nepera Chemical Co. Division
Harrison, N.Y. 10926

10 SHIPPING INFORMATION

101 Grades or Purity: Technical Pure

102 Storage Temperature: Ambient

103 Inert Atmosphere: No requirement

104 Venting: Pressure-vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446.3)

APQRN

12. HAZARD CLASSIFICATIONS

121 Code of Federal Regulations: Flammable liquid

122 NAS Hazard Rating for Bulk Water Transportation:

Category	Rating
Fire	3
Health	
Vapor Irritant	2
Liquid or Solid Irritant	2
Poisons	3
Water Pollution	
Human Toxics	2
Aquatic Toxics	2
Aesthetic Effect	3
Reactivity	
Other Chemicals	3
Water	0
Self Reaction	0

123 NFPA Hazard Classifications

Category	Classification
Health Hazard (Blue)	2
Flammability (Red)	3
Reactivity (Yellow)	0

13 PHYSICAL AND CHEMICAL PROPERTIES

131 Physical State at 15°C and 1 atm: Liquid

132 Molecular Weight: 79.10

133 Boiling Point at 1 atm: 239.5 F = 115.5 C = 388.7 K

134 Freezing Point: -44.1 F = -42 C = 231.1 K

135 Critical Temperature: 656.2 F = 346.8 C = 620 K

136 Critical Pressure: 517.3 psia = 55.6 atm = 5.63 MN/m²

137 Specific Gravity: 0.983 at 20 C (liquids)

138 Liquid Surface Tension: 35.0 dyne/cm = 0.035 N/m at 20 C

139 Liquid-Water Interfacial Tension: Not pertinent

1310 Vapor (Gas) Specific Gravity: 2.73

1311 Ratio of Specific Heats of Vapor (Gas): 1.123

1312 Latent Heat of Vaporization: 193 Btu/lb = 102 cal/g = 4.4 x 10⁴ J/kg

1313 Heat of Combustion: -14,390 Btu/lb = -7992 cal/g = -334 x 10⁴ J/kg

1314 Heat of Decomposition: Not pertinent

1315 Heat of Solution: -6.1 - 13 Btu/lb = -7 cal/g = -0.3 x 10⁴ J/kg

1316 Heat of Polymerization: Not pertinent

(See Handbook Pages 5 and 6)

NOTES

REVISED 1978

PYROGALLIC ACID

Common Synonyms Pyrogallol 1,2,3-Benzenetriol 1,2,3-Trihydroxybenzene		Solid	White to Gray	Odorless
		Sinks and mixes with water		

QNL

QUINOLINE

Common Synonyms 1 Benzene Benzene, quinoline Choline 1 Azanaphthalene	Liquid Colorless to brown Strong unpleasant odor Sinks in water
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41 Issue warning - water contaminant Restrict access Mechanical containment Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1 Azanaphthalene 1 Benzene, Benzobiphenylene Choline, Levul 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₁₀ H ₇ N 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to brown 4.3 Odor: Strong, unpleasant
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: U.S. Bu. Mixes approved vapor unit, chemical safety goggles, face shield, rubber gloves, coveralls and/or rubber apron, rubber shoes and boots. 5.2 Symptoms Following Exposure: Vapors are irritative to nose and throat and may cause headaches, dizziness, and nausea if inhaled. Ingestion causes irritation of mouth and stomach; vomiting may occur. Contact with eyes of skin causes irritation. 5.3 Treatment for Exposure, INHALATION: Remove victim to fresh air. INGESTION: Give large amount of water, induce vomiting, get medical attention. EYES: Flush immediately with plenty of water for at least 15 min., call physician. SKIN: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 5, oral LD ₅₀ = 400 mg/kg rats 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor: Threshold, 75 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 225 F (C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fires 6.6 Behavior in Fire: Heat exposure may cause pressure build up in closed containers 6.7 Ignition Temperature: Not listed 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 4.06 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 52-56 ppm 96 hr sunfish/11 _m fresh water 5 ppm 96 hr trout/11 _m fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 1755 5 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Koppers Co., Inc. Organic Materials Div. Koppers Bldg. Pittsburgh, Pa. 15219 2 Eastman Organic Chemicals Rochester, N.Y. 14650 3 Gallard Schlegel Chemical Mfg. Co. 584 Mincola Ave. Carle Place, N.Y. 11814
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent, Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame attestor
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 A L U X X	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 129 13.3 Boiling Point at 1 atm: 499°F = 257°C = 510°K 13.4 Freezing Point: 1°F = -15°C = 258°K 13.5 Critical Temperature: 945°F = 509°C = 782°K 13.6 Critical Pressure: Data not available 13.7 Specific Gravity: 1.05 at 20°C (liquid) 13.8 Liquid Surface Tension: 45.0 dynes/cm = 0.0450 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 4.5 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization, (est.) 155 Btu/lb = 35.6 cal/g = 3.6 x 10 ³ J/kg 13.13 Heat of Combustion: -15,700 Btu/lb = -5,710 cal/g = -65 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

RSC

RESORCINOL

Common Synonyms: 1,3-Benzenediol m-Dihydroxybenzene Resorcinol 1,3-Dihydroxybenzene Dihydroxybenzol	Solid White or off-white Faint odor Sinks and mixes with water	
Fire	Combustible CONTAINERS MAY EXPLODE IN FIRE	
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea or loss of consciousness	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes	
1 RESPONSE TO DISCHARGE (See Response Methods Manual: CG 446-4) Issue warning - water contaminant Disperse and flush	2. LABELS No hazard label required by Code of Federal Regulations	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,3-Benzenediol m-Dihydroxybenzene, 1,3-Dihydroxybenzene, Dihydroxybenzol, Resorcinol 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_6H_4(OH)_2$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White or nearly white 4.3 Odor: Faint characteristic aromatic	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: U.S. Bu. Mines approved respirator, rubber gloves, safety glasses with side shields or chemical goggles, apron or rubber apron 5.2 Symptoms Following Exposure: Inhalation of vapors or dust causes irritation of respiratory tract. Ingestion causes burns of mucous membranes, severe diarrhea, pallor, sweating, weakness, headache, dizziness, tinnitus, shock, and severe convulsions may also cause siderosis of the spleen and tubular injury to the kidney. Contact with eyes causes irritation. Can be absorbed from wounds or through unbroken skin, producing severe dermatitis, methemoglobinemia, exanthisis, convulsions, tachycardia, dyspnea, and death. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; if he is not breathing, give artificial respiration, preferably mouth-to-mouth; if breathing is difficult, give oxygen, call a physician. INGESTION: give activated charcoal, administer castor oil, lavage with water, consult physician. EYES: flush with water for 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 5 g/kg 5.7 Late Toxicity: Produces goiters in rats 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may cause frothing 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: Containers may explode 6.7 Ignition Temperature: 1124 F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 15 ppm - 96 hr LC50 carp, toxic threshold, fresh water 36.4 ppm 48 hr daphnia, 11 pp, fresh water * Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD) 61% 5 days 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Koppers Company, Inc. Koppers Building Pittsburgh, Pa. 15219 2. Eastman Organic Chemicals Rochester, N.Y. 14650 3. Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Manual: CG 446-3) NS	10 SHIPPING INFORMATION 10.1 Grades or Purity: USP 99.5%+ Technical 99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	0	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 110.11 13.3 Boiling Point at 1 atm. (subliming): 311°F = 272°C = 540°K 13.4 Freezing Point: 22°F = 10°C = 282°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.2 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -11,200 Btu/lb = -6,200 cal/g = -259 X 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	0								
Reactivity (Yellow)	0								
NOTES									

SLA

SALICYLIC ACID

Common Synonyms o-Hydroxybenzoic acid Retarder W	Solid White to light tan Odorless Sinks and mixes slowly with water
SAFETY DATA SHEET 1. IDENTIFICATION 2. HAZARD IDENTIFICATION 3. COMPOSITION 4. FIRST AID MEASURES 5. FIRE FIGHTING 6. ACCIDENT PREVENTION 7. STORAGE 8. TRANSPORT 9. DISPOSAL 10. ADDITIONAL INFORMATION	
Fire	Combustible Dust cloud may explode if ignited in an enclosed area Irritating gases may be produced when heated
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause vomiting
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE	2. LABELS
(See Response Methods Handbook CG 446-4) Should be removed Chemical and physical treatment	No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS	4. OBSERVABLE CHARACTERISTICS
3.1 Synonyms: o-Hydroxybenzoic acid Retarder W 3.2 Coast Guard Compatibility Classification Not listed 3.3 Chemical Formula: C₇H₆O₃ 3.4 IMCO/United Nations Numerical Designation: Not listed	4.1 Physical State (as shipped): Solid 4.2 Color: White to very light tan 4.3 Odor: None
5. HEALTH HAZARDS	
5.1 Personal Protective Equipment: Gloves, goggles, respirator for dust, clean body covering clothing 5.2 Symptoms Following Exposure: Inhalation of dust irritates nose and throat. Vomiting may occur spontaneously if large amounts are swallowed. Contact with eyes causes irritation, mild pain and corneal injury which should heal. Prolonged or repeated skin contact may cause marked irritation or even a mild burn 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: induce vomiting and get medical attention promptly. EYES: promptly flush with water for 15 min. and get medical attention. SKIN: wash with soap and water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD₅₀ 0.5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS	8. WATER POLLUTION								
6.1 Flash Point: Not pertinent (combustible solid) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause "chugging" 6.5 Special Hazards of Combustion Products: Irritating vapors of unburned material and phenol may form in fire 6.6 Behavior in Fire: Sublimes and forms vapor or dust that may explode 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8.1 Aquatic Toxicity: 1450 ppm/48 hr. daphnia threshold for immob. fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 141% 5 days 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY	9. SELECTED MANUFACTURERS								
7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	1. Tennessee Chemicals, Inc. Intermediates 42 Turner Place P.O. Box 42 Pineblow, N.J. 08854 2. Monsanto Company 800 North Lindbergh Blvd. St. Louis, Mo. 63166 3. Dow Chemical Co. Midland, Mich. 48640								
11. HAZARD ASSESSMENT CODE	10. SHIPPING INFORMATION								
(See Hazard Assessment Handbook CG 446-2) II	10.1 Grades or Purities: Technical 95+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
12. HAZARD CLASSIFICATIONS	13. PHYSICAL AND CHEMICAL PROPERTIES								
12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>0</td></tr> <tr> <td>Flammability (Red)</td><td>1</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	0	Flammability (Red)	1	Reactivity (Yellow)	0	13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 138.13 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 114°F = 157°C = 430°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.44 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -9420 Btu/lb = -5230 cal/g = -219 X 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	0								
Flammability (Red)	1								
Reactivity (Yellow)	0								
NOTES									

(continued on page 5 and 6)

SLD

SELENIUM DIOXIDE

Common Synonyms Selenium oxide Selenious anhydride		Solid	White	Solar color
		Sinks and mixes with water		
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED			
 <u>Exposure</u>	DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes. If swallowed will cause coughing, nausea, or vomiting			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) Issue warning - poison water contaminant Restrict access Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Selenous anhydride Selenium oxide 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: SeO_2 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Pungent smell		
5. HEALTH HAZARDS <i>This compound is highly toxic if inhaled or ingested.</i> 5.1 Personal Protective Equipment: Dust mask, rubber gloves, protective clothing 5.2 Symptoms Following Exposure: Absorption of selenium may be demonstrated by presence of the element in the urine and by a garlic-like odor of the breath. Inhalation of dust can cause bronchial spasms, symptoms of asphyxiation, and pneumonia. Acute symptoms - ingestion include sternal pain, cough, nausea, pallor, coated tongue, gastrointestinal disorders, hoarseness, and conjunctivitis. Contact with eyes causes irritation. 5.3 Treatment for Exposure: Consult physician after all exposures to this compound. INHALATION: remove victim to fresh air, give oxygen if needed. INGESTION: induce vomiting, follow with gastric lavage and saline cathartics. EYES: flush immediately and thoroughly with water. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.2 mg/m (as selenium) 5.5 Short-Term Inhalation Limits: 0.1 mg/m (as selenium) 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: 11 (0.02) mg/m ³				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Sublimates and forms toxic vapors when heated in fire 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 12 ppm 7 days rough fish, 11 w/ fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: In presence of water will corrode most metals 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS American Hoechst Corp. Somerville, N.J. 08856 Ventron, Inc. P.O. Box 109 Beverly, Mass 01915 Gratiard-Schlesinger Chemicals, Mfg. Co. 544 Monrovia Ave. Carle Place, N.Y. 11514
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 99.99% 10.2 Storage Temperature: Cool, ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 444-3) NS	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 110 13.3 Boiling Point at 1 atm: (calculated) 1040°C (1904°F) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 4.55 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: 12.1 Btu/lb = 6.0 cal/g = 0.25 x 10³ J/kg 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable solid, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES (Continued on page 2 and 3)	

STO

SELENIUM TRIOXIDE

Common Name: Selenium trioxide	Solid White
Fire	Not flammable
 Exposure DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes. If swallowed will cause coughing, nausea and vomiting	
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Large warning: Corrosive water Contain, Fast Restrict Access Dispense and Push	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Selenium trioxide 3.2 Coast Guard Competibility Classification: Not listed 3.3 Chemical Formula: SeO ₃ 3.4 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Data not available
5 HEALTH HAZARDS <i>This compound is highly toxic if inhaled or ingested.</i> 5.1 Personal Protective Equipment: Data not available 5.2 Symptoms Following Exposure: Absorption of selenium may be demonstrated by presence of the element in the urine and by a garlic-like odor of breath. Inhalation can cause bronchial spasms, symptoms of asphyxiation, and pneumonia. Acute symptoms of irritation include sternal pain, cough, nausea, pallor, coated tongue, gastrointestinal disorders, nervousness and conjunctivitis. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: Remove victim to fresh air; give oxygen if necessary. INGESTION: induce vomiting, follow with gastric lavage and saline cathartics. EYES: Flush immediately and thoroughly with water. SKIN: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.2 mg/m ³ (as selenium) 5.5 Short-Term Inhalation Limits: 0.1 mg/m ³ (as selenium) 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously with water to form selenic acid solution 7.2 Reactivity with Common Materials: Corrodes all metals when moisture is present 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water or mix with dilute solution of sodium bicarbonate soda ash 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS General Schenker Chemical Mfg. Co. 154 Menden Ave. Carle Place, N.Y. 11734 2. Platts and Bauer, Inc. 751 Bedford Ave. Stamford, Conn. 06902
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-7 RR	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial; shipped as a 40% solution in water (selenic acid) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive solid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 12 13.3 Boiling Point at 1 atm: Not pertinent; decomposes 13.4 Freezing Point: 244°F = 123°C = 397°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.6 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
NOTES	

Continued on page 7 and 8

STC

SILICON TETRACHLORIDE

Common Synonyms Silicon chloride	Liquid Colorless to light yellow Suffocating odor Reacts violently with water. Irritating gas is produced on contact with water.
Fire	Not flammable
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled will cause difficult breathing. LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Memoirs Handbook, CG 446-A Evacuate, containing air contaminants. Restrict access. Evacuate area. Dispense and flush with water.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Silicon chloride 3.2 Coast Guard Competibility Classification: To be developed 3.3 Chemical Formula: SiCl_4 3.4 IMCO/United Nations Numerical Designation: 1502	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Suffocating, acid
5. HEALTH HAZARDS	
5.1 Personal Protective Equipment: Acid canister type gas mask or self-contained breathing apparatus, goggles or face shield, rubber gloves, other protective clothing to prevent contact with skin.	
5.2 Symptoms Following Exposure: Irritation causes severe irritation of upper respiratory tract resulting in coughing, choking, and a feeling of suffocation. Continued inhalation may produce edema of the nose, throat, and trachea. If inhaled deeply, edema of the lungs may occur. Contact of liquid with eyes causes severe irritation and pain. Burns may cause permanent visual impairment. Liquid may cause severe burns to skin. Repeated skin contact with dilute solutions of germanic tetrachloride vapors may cause dermatitis. Ingestion causes severe internal injury with pain in the throat and stomach, intense thirst, difficulty in swallowing, nausea, vomiting, and diarrhea. In severe cases, collapse and unconsciousness may result.	
5.3 Treatment for Exposure: For moderate to severe exposure, first aid consists of INITIAL ALLEVATION, removing victim from contaminated atmosphere, if breathing has ceased, start respiration with resuscitator. Oxygen should only be administered by an experienced person when authorized by a physician. Keep patient warm and comfortable. EYES: Immediately flush with large quantities of running water for a minimum of 15 min. Continue irrigation for an additional 15 min. if physician is not available. SKIN: Immediately flush affected area with water. Severe or extensive burns may be caused by silicon tetrachloride, producing shock symptoms (rapid pulse, sweating and collapse). Keep patient comfortably warm. INHALATION: If patient is conscious, give large amounts of the water or milk. If unconscious, plain water should be given. If neither of these is available, do NOT give oil or sodium carbonate or make any attempt to induce vomiting. If patient is unconscious, do not give anything but ensure there is no obstruction to breathing. Tongue should be kept forward and false teeth removed, he will be less likely to aspirate vomitus if placed in a face-downward position.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Water or foam on adjacent fires 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Contact with water or steam applied to adjacent fires will produce irritating fumes of hydrogen chloride 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously with water to evolve hydrogen chloride (hydrochloric acid) 7.2 Reactivity with Common Materials: In presence of moisture or flammable metals the reaction is not violent 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flood with water or use with sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Stauffer Chemical Company Industrial Chemical Division Westport, Conn. 06880 2. Union Carbide Corporation Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017 3. Dynamit Nobel of America, Inc. 105 Street and Court Norwalk, N.Y. 06855																												
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-B A 02	10. SHIPPING INFORMATION 10.1 Grade or Purity: Technical 99.99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Dry air 10.4 Venting: Pressure vacuum																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive 12.2 NAS Hazard Rating to Bulk Water Transportation: <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td>4</td></tr> <tr> <td>Vapor Irritant</td><td>4</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td>Poison</td><td>4</td></tr> <tr> <td>Water Pollution</td><td>4</td></tr> <tr> <td>Human Toxicity</td><td>4</td></tr> <tr> <td>Aquatic Toxicity</td><td>4</td></tr> <tr> <td>Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td>4</td></tr> <tr> <td>Other Chemicals</td><td>4</td></tr> <tr> <td>Water</td><td>4</td></tr> <tr> <td>Self-Reactive</td><td>4</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health	4	Vapor Irritant	4	Liquid or Solid Irritant	4	Poison	4	Water Pollution	4	Human Toxicity	4	Aquatic Toxicity	4	Aesthetic Effect	2	Reactivity	4	Other Chemicals	4	Water	4	Self-Reactive	4	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 236.0 13.3 Boiling Point at 1 atm: $57.7^\circ\text{C} = 135.9^\circ\text{F}$ 13.4 Freezing Point: $-40.5^\circ\text{C} = -40.9^\circ\text{F}$ 13.5 Critical Temperature: $272.5^\circ\text{C} = 518.5^\circ\text{F}$ 13.6 Critical Pressure: 48.2 psia = 3.65 atm = 3.72 MN/m ² 13.7 Specific Gravity: 1.48 at 20°C (liquid) 13.8 Liquid Surface Tension: 19.6 dyne/cm = 0.0196 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 3.86 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available 13.12 Latent Heat of Vaporization: 74.2 Btu/lb = 41.2 cal/g = 1.73 x 10 ⁵ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -42 Btu/lb = -42 cal/g = -1.7 x 10 ⁵ J/kg 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	1																												
Health	4																												
Vapor Irritant	4																												
Liquid or Solid Irritant	4																												
Poison	4																												
Water Pollution	4																												
Human Toxicity	4																												
Aquatic Toxicity	4																												
Aesthetic Effect	2																												
Reactivity	4																												
Other Chemicals	4																												
Water	4																												
Self-Reactive	4																												
12.3 NFPA Hazard Classifications: Not listed	5. HEALTH HAZARDS (Cont'd) 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 LD ₅₀ <50 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available																												

(continued on page 1 and 2)

(continued on page 2)

SVA

SILVER ACETATE

Common Synonyms	
Solid	White to gray
Sinks in water	
Fire	
Not flammable	
 Exposure	DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing.
	SOLID Irritating to skin and eyes. Harmful if swallowed.
Water Pollution Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444.4 Do not wash up in water until advised. Report to local health department. Dispose as instructed.	
2. LABELS See Response Methods Handbook, CG 444.4 No hazard label required by Federal or State Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Not common synonyms. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: <chem>CH3COOAg</chem> 3.4 IMCO/United Nations Numerical Designation: Not listed.	
4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: White to gray. 4.3 Odor: None.	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Hand mask, goggles or face shield, protective gloves. 5.2 Symptoms Following Exposure: Inhalation: Irritation to nose and throat. Contact with eyes or skin causes irritation. If swallowed for a long period, ingestion of silver compounds can cause permanent discoloration of skin (argyria). 5.3 Treatment for Exposure: INHALATION: Move to fresh air. INGESTION: Give large amount of water. Advise attending physician to flush with water for 1 hour. Avoid SKIN: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ . 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS

- 6.1 Flash Point: Not listed.
 6.2 Flammable Limits in Air: Not listed.
 6.3 Fire Extinguishing Agents: Not listed.
 6.4 Fire Extinguishing Agents Not to be Used: Not listed.
 6.5 Special Hazards of Combustion Products:
 6.6 Behavior in Fire:
 6.7 Ignition Temperature: Not listed.
 6.8 Electrical Hazard: Not pertinent.
 6.9 Burning Rate: Not listed.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
 8.2 Waterlow Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): Data not available.
 8.4 Food Chain Concentration Potential: Not listed.

9 SELECTED MANUFACTURERS

AKA Chemicals
 American Metal Works
 Aldrich Chemical
 Alfa Chemical
 F.W. Bell
 Hove & May
 J.T. Baker Chemical
 Phillipsburg Chemical

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Not listed.
 7.2 Reactivity with Common Materials:
 7.3 Stability During Transport: Not listed.
 7.4 Neutralizing Agents for Acids and Caustics: Not listed.
 7.5 Polymerization: Not listed.
 7.6 Inhibitor of Polymerization: Not pertinent.

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Commercial, Purified.
 10.2 Storage Temperature: Ambient.
 10.3 Inert Atmosphere: Not applicable.
 10.4 Venting: None.

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 444.3
 HHS

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed.
 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed.
 12.3 NFPA Hazard Classifications: Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid.
 13.2 Molecular Weight: 166.9.
 13.3 Boiling Point at 1 atm: Not pertinent.
 13.4 Freezing Point: Not pertinent.
 13.5 Critical Temperature: Not pertinent.
 13.6 Critical Pressure: Not pertinent.
 13.7 Specific Gravity: 3.26 at 20°C (solid).
 13.8 Liquid Surface Tension: Not pertinent.
 13.9 Liquid-Water Interfacial Tension: Not pertinent.
 13.10 Vapor (Gas) Specific Gravity: Not pertinent.
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.
 13.12 Latent Heat of Vaporization: Not pertinent.
 13.13 Heat of Combustion: Not pertinent.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: Not pertinent.

NOTES

SVC

SILVER CARBONATE

Common Synonyms		Solid	Yellow to brown	Odorless
		Soluble in water		
Fire		Not flammable		
Exposure		DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. Harmful if swallowed.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous, if it enters water intakes.		
1. RESPONSE TO DISCHARGE		2. LABELS		
(See Response Methods Handbook, CG 446-4)		No hazard label required by Code of Federal Regulations.		
Issue warning - water contamination. Should be removed. Chemical and physical treatment.				
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: No common synonyms.		4.1 Physical State (as shipped): Solid.		
3.2 Coast Guard Comp. Classification: Not listed.		4.2 Color: Yellow to brown.		
3.3 Chemical Formula: Ag_2CO_3 .		4.3 Odor: None.		
3.4 IMCO/United Nations Numerical Designation: Not listed.				
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: mask, goggles or face shield, rubber gloves.				
5.2 Symptoms Following Exposure: Contact with eyes causes irritation. If continued for a long period ingestion or inhalation of silver compounds can cause permanent discoloration of the skin, lungs, etc.				
5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting. EYES: flush with water - at least 15 min. SKIN: flush with water - wash with soap and water.				
5.4 Toxicity by Inhalation (Threshold Limit Value): 0.01 mg/m ³ .				
5.5 Short-Term Inhalation Limits: Data not available.				
5.6 Toxicity by Ingestion: Data not available.				
5.7 Late Toxicity: Data not available.				
5.8 Vapor (Gas) Irritant Characteristics: Data not available.				
5.9 Liquid or Solid Irritant Characteristics: Data not available.				
5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS		8. WATER POLLUTION	
6.1 Flash Point: Not determined.		8.1 Aquatic Toxicity: Data not available.	
6.2 Flammable Limits in Air: Not determined.		8.2 Waterford Toxicity: Data not available.	
6.3 Fire Extinguishing Agents: Not pertinent.		8.3 Biochemical Oxygen Demand (BOD): None.	
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent.		8.4 Food Chain Concentration Potential: None.	
6.5 Special Hazards of Combustion Products: Not pertinent.			
6.6 Behavior in Fire: Decomposes and yields silver and carbon dioxide, the reaction is not hazardous.			
6.7 Ignition Temperature: Not determined.			
6.8 Electrical Hazard: Not pertinent.			
6.9 Burning Rate: Not determined.			
		9. SELECTED MANUFACTURERS	
		R. N. S. Corporation 400 New Mill River Rd. Arden, N.Y. 10902.	
		J. I. Baker Chemical Co. Phillipsburg, N.J. 08865.	
		Gailard Sublimed Chemical Mfg. Co. 124 Main Ave. Little Place, N.Y. 13344.	
7. CHEMICAL REACTIVITY			
7.1 Reactivity with Water: No reaction.			
7.2 Reactivity with Common Materials:			
7.3 Stability During Transport: Stable.			
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent.			
7.5 Polymerization: Not pertinent.			
7.6 Inhibitor of Polymerization: Not pertinent.			
		10. SHIPPING INFORMATION	
		10.1 Grades or Purity: Reagent grade.	
		10.2 Storage Temperature: Ambient.	
		10.3 Inert Atmosphere: No requirement.	
		10.4 Venting: Open.	
11. HAZARD ASSESSMENT CODE		13. PHYSICAL AND CHEMICAL PROPERTIES	
(See Hazard Assessment Handbook, CG 446-3)		13.1 Physical State at 15°C and 1 atm: Solid.	
II		13.2 Molecular Weight: 275.74.	
		13.3 Boiling Point at 1 atm: Not pertinent.	
		13.4 Freezing Point: Not pertinent.	
		13.5 Critical Temperature: Not pertinent.	
		13.6 Critical Pressure: Not pertinent.	
		13.7 Specific Gravity: Not pertinent.	
		13.8 Liquid Surface Tension: Not pertinent.	
		13.9 Liquid-Water Interfacial Tension: Not pertinent.	
		13.10 Vapor (Gas) Specific Gravity: Not pertinent.	
		13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.	
		13.12 Latent Heat of Vaporization: Not pertinent.	
		13.13 Heat of Combustion: Not pertinent.	
		13.14 Heat of Decomposition: Not pertinent.	
		13.15 Heat of Solution: Not pertinent.	
		13.16 Heat of Polymerization: Not pertinent.	
12. HAZARD CLASSIFICATIONS			
12.1 Code of Federal Regulations: Not listed.			
12.2 IATA Hazard Rating for Bulk Water Transportation: Not listed.			
12.3 NFPA Hazard Classifications: Not listed.			

SVF

SILVER FLUORIDE

Common Synonyms Argentous fluoride Silver monofluoride		Solid	Yellow to gray	Odorless
		Sinks and mixes with water		
Fire		Not flammable		
Exposure		DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1 RESPONSE TO DISCHARGE (See Response Methods Manual, 1-1-1, 446-4)		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS		4 OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: Argentous fluoride Silver monofluoride		4.1 Physical State (as shipped): Solid		
3.2 Coast Guard Compatibility Classification Not listed		4.2 Color: Yellow to gray		
3.3 Chemical Formula: AgF		4.3 Odor: None		
3.4 IMCO/United Nations Numerical Designation: Not listed				
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves				
5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion may cause vomiting, salty taste, abdominal pain, dizziness, convulsions, collapse, thirst, disturbed vision and renal toxic nephritis. Contact with eyes causes irritation. Skin may be blackened on prolonged exposure.				
5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: get medical attention at once, give large amount of water and induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water.				
5.4 Toxicity by Inhalation (Threshold Limit Value): 0.01 mg/m ³				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Data not available				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS

- 6.1 Flash Point: Not flammable
 6.2 Flammable Limits in Air: Not flammable
 6.3 Fire Extinguishing Agents: Not pertinent
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
 6.5 Special Hazards of Combustion Products: Not pertinent
 6.6 Behavior in Fire
 6.7 Ignition Temperature: Not pertinent
 6.8 Electrical Hazard: Not pertinent
 6.9 Burning Rate: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
 8.2 Water/Jowl Toxicity: Data not available
 8.3 Biological Oxygen Demand (BOD): None
 8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

1. Ozark Mahoning Co.
1870 South Boulder
Tulsa, Okla. 74119
 2. Ventron Inc.
P.O. Box 159
Beverly, Mass. 01915
 3. Gallard Schiesinger Chemical Mfg. Co.
584 Mineola Ave.
Clark, Place, N.Y. 11514

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
 7.2 Reactivity with Common Materials
 7.3 Stability During Transport: Stable
 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
 7.5 Polymerization: Not pertinent
 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Commercial
Pure 99.9%
 10.2 Storage Temperature: Ambient
 10.3 Inert Atmosphere: No requirement
 10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
HSS

12. PHYSICAL AND CHEMICAL PROPERTIES

- 12.1 Physical State at 15°C and 1 atm: Solid
 12.2 Molecular Weight: 126.9
 12.3 Boiling Point at 1 atm: 2118°F = 1159°C = 1,432°K
 12.4 Freezing Point: Not pertinent
 12.5 Critical Temperature: Not pertinent
 12.6 Critical Pressure: Not pertinent
 12.7 Specific Gravity: 5.92 at 20°C (solid)
 12.8 Liquid Surface Tension: Not pertinent
 12.9 Liquid-Water Interfacial Tension: Not pertinent
 12.10 Vapor (Gas) Specific Gravity: Not pertinent
 12.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
 12.12 Latent Heat of Vaporization: Not pertinent
 12.13 Heat of Combustion: Not pertinent
 12.14 Heat of Decomposition: Not pertinent
 12.15 Heat of Solution: Not pertinent
 12.16 Heat of Polymerization: Not pertinent

(Continued on page 5 and 6)

NOTES

SVI	SILVER IODATE
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SVI	SILVER IODATE
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Common Synonyms		Solid	White	Odorless
		Sinks in water		
Aerial: 1000 ft. (305 m) - 1000 ft. (305 m) Surface: 1000 ft. (305 m) - 1000 ft. (305 m) Bottom: 1000 ft. (305 m) - 1000 ft. (305 m)				
Fire		Not flammable		
Exposure		CAUTION: FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If on skin, wash with plenty of water. If on clothing, remove clothing and wash with plenty of water. SOLID Irritating to skin and eyes. Harmful if swallowed. If swallowed, do not induce vomiting. If conscious, give plenty of water. If unconscious, give plenty of water. If swallowed, do not induce vomiting. If conscious, give plenty of water. If unconscious, give plenty of water.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Do not discharge into water.		
1. RESPONSE TO DISCHARGE See Response Methods Handbook (CG 446-4) Issue warning - water contaminant Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: AgIO ₃ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Contact with eyes causes irritation. If continued for a long period ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria) 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.01 mg/m ³ 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS	8 WATER POLLUTION
61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire 67 Ignition Temperature: Not pertinent 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not pertinent	81 Aquatic Toxicity: Data not available 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): None 84 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY	9. SELECTED MANUFACTURERS
71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	1. R. S. Corporation 690 New Market River Rd Ardsley, N. Y. 10502 2. Gallard Schlenker Chemical Mfg. Co. 884 Mincola Ave. Carle Place, N. Y. 11514 3. Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902
11 HAZARD ASSESSMENT CODE	10 SHIPPING INFORMATION
(See Hazard Assessment Handbook CG 445-2) II	101 Grades or Purity: Commercial 99+% 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open
12. HAZARD CLASSIFICATIONS	13. PHYSICAL AND CHEMICAL PROPERTIES
121 Code of Federal Regulations: Not listed 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed	131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 282.1 133 Boiling Point at 1 atm: Not pertinent (decomposes) 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.53 at 25°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
NOTES	<i>(Continued on pages 5 and 6)</i>

SVN

SILVER NITRATE

Common Synonyms Lunar caustic	Solid crystals Colorless to grayish black Odorless Sinks and mixes with water
1. IDENTIFICATION 1.1 NAME OF CHEMICAL: SILVER NITRATE 1.2 CAS NO.: 7764-38-2 1.3 EC NO.: 231-735-0 1.4 OTHER NAMES: LUNAR CAUSTIC	
Fire	Not flammable
Exposure	ALL FORMS OF EXPOSURE ARE HARMFUL. SOLIDS Irritating to skin and eyes Harmful if swallowed LIQUIDS Irritating to skin and eyes Harmful if swallowed POISONOUS Ingestion of solid or liquid is harmful. Swallowing of solid or liquid is dangerous.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Response Methods Handbook - CG 446-41 Issue warning - water contamination Should be removed	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Lunar caustic 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: AgNO ₃ 3.4 IMCO United Nations Numerical Designation: 1.1 1493	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Colorless 4.3 Odor: Odorless
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield; rubber gloves 5.2 Symptoms Following Exposure: Concentrated solutions will produce irritation, ulceration and discoloration of the skin; also causes severe irritation of the eyes. Ingestion will produce violent abdominal pain and other gastro-intestinal symptoms. 5.3 Treatment for Exposure: INGESTION: Gastric lavage with dilute solution of sodium chloride followed by cathartics and emetics. Other treatment is symptomatic. SKIN: Wash promptly. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 500 to 800 mg/kg 5.7 Lethality: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not volatile 5.9 Liquid or Solid Irritant Characteristics: Burns skin on prolonged contact 5.10 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Increases flammability of combustibles 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8 WATER POLLUTION 8.1 Aquatic Toxicity: 0.44 mg/l 48 hr. salmon fry; decidedly toxic/fresh water 0.01-0.1 ppm: *paracestrous inhibits egg develop. salt water *Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Data not available								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Eastman Kodak Co. Eastman Organic Chemicals Division Rochester, N. Y. 14650 2. Inghard Minerals and Chemicals Corp. Silver Products Dept. 231 New Jersey Railroad Ave. Menlo Park, N. J. 08817 3. Mallinckrodt Chemical Works Industrial Chemicals Division 2nd and Mallinckrodt Sts. St. Louis, Mo. 63160								
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook - CG 446-21 SS	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent 99.84% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	0	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 169.87 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: 414°K = 212°C = 484°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 4.35 at 19°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gr): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	0								
Reactivity (Yellow)	0								
NOTES									

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SVO

SILVER OXIDE

Common Synonyms Argentous oxide		Solid	Brown black	Odorless
		Sinks in water		
1. Synonyms: Argentous oxide, Silver oxide, Silver sesquioxide, Silver suboxide, Silver sesquioxide, Silver suboxide, Silver sesquioxide, Silver suboxide.				
Fire	Not flammable			
Exposure	NOT FOR MEDICAL USE DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. Harmful if swallowed.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Argentous oxide. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: Ag ₂ O. 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: Brownish black. 4.3 Odor: None.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves. 5.2 Symptoms Following Exposure: Contact with eyes causes mild irritation. If continued for a long period, ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria). 5.3 Treatment for Exposure: EYES: Flush with water. SKIN: Flush with water, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.01 mg/m. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 5.5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: (Odorless).				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Decomposes into metallic silver and oxygen. If large quantities are involved, the oxygen might increase the intensity of the fire. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterway Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902 2. Gallard-Schlesinger Chemical Mfg. Co. 584 Mineola Ave. Castle Place, N.Y. 11514 3. Fisher Scientific Co. 711 Forbes Ave. Pittsburgh, Pa. 15219.	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II		10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 99+%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 231.8. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 7.14 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.	
NOTES			

(Continued on page 5 and 6)

SVS

SILVER SULFATE

Common Synonyms		Solid	White to gray	Odorless
		Sinks and mixes with water		
HAZARD IDENTIFICATION				
Signal Word: DANGER				
Hazard Statements: H302, H312, H332, H360Df, H410				
Precise Description: This material is a white to gray solid. It is odorless and sinks and mixes with water. It is harmful to aquatic life in very low concentrations. It may be dangerous if it enters water intakes.				
Fire	Not flammable			
Exposure	HAZARD IDENTIFICATION			
	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing			
	SOLID Irritating to skin and eyes Harmful if swallowed			
	HAZARD STATEMENTS H302, H312, H332, H360Df, H410			
	PRECISE DESCRIPTION This material is a white to gray solid. It is odorless and sinks and mixes with water. It is harmful to aquatic life in very low concentrations. It may be dangerous if it enters water intakes.			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445.4)		2 LABELS		
Issue warning: water contaminant Restrict access Should be removed Chemical and physical treatment		No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS		4 OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: No common synonyms		4.1 Physical State (as shipped): Solid		
3.2 Coast Guard Compatibility Classification: Not listed		4.2 Color: White to gray		
3.3 Chemical Formula: Ag ₂ SO ₄		4.3 Odor: None		
3.4 IMCO/United Nations Numerical Designation: Not listed				
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves				
5.2 Symptoms Following Exposure: Contact with eyes causes irritation. If continued for a long period ingestion or inhalation of silver compounds can cause permanent discoloration of the skin (argyria)				
5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water				
5.4 Toxicity by Inhalation (Threshold Limit Value): 0.01 mg/m ³				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Data not available				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

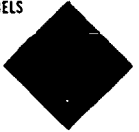
6. FIRE HAZARDS 6.1 Flash Point Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.4 ppm/48 hr. barnacles lethal 90% salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water No reaction 7.2 Reactivity with Common Materials 7.3 Stability During Transport Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. R S A Corporation 690 Saw Mill River Rd Ardsley, N.Y. 10502 2. J. T. Baker Chemical Co Phillipsburg, N.J. 08865 3. Ventron, Inc. P.O. Box 159 Beverly, Mass. 01915
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 445.3) H 355	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 311.80 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 5.45 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	

Continued on pages 5 and 6

NOTES

SDU

SODIUM

Common Synonyms	Soft solid under kerosene Silver to grayish white Odorless Fluents and reacts violently with water. Flammable gas is produced.
AVOID CONTACT WITH SOLID. Keep away from fire and heat. Do not use water. Do not use dry powder. Do not use dry powder.	
Fire	FLAMMABLE FIRE MAY START ON CONTACT WITH AIR Flammable gas formed on contact with water or moisture. Will catch fire on contact with water or moisture. DO NOT USE WATER EXTINGUISH WITH DRY POWDER OR INERT GAS.
Exposure	ALL FORMS MEDICAL AID SOLID Will burn skin and eyes. May be dangerous if it enters water intakes. May be dangerous if it enters water intakes.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE See Section of Material Safety Data Sheet (MSDS) 9 Issue warning - high flammability Restrict access Evacuate area Chemical and physical treatment	2 LABELS  
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: Na 3.4 IMCO United Nations Numerical Designation: 4.1 1429	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Soft solid or liquid 4.2 Color: Silvery white, changing to gray on exposure to air 4.3 Odor: Odorless
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Maximum protective clothing, gloves and face shield 5.2 Symptoms Following Exposure: Severe burns caused by burning metal plus by gases and solids formed by reaction with moisture on skin 5.3 Treatment for Exposure: SKIN Wash off immediately with large amounts of water. If in eyes, flush with water for 15 minutes. If in mouth, do not swallow. Call a doctor. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Not pertinent 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not volatile 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry soda ash, graphite, salt, or other approved dry powder, such as dry limestone 6.4 Fire Extinguishing Agents Not to be Used: Water, carbon dioxide, or halogenated extinguishing agents 6.5 Special Hazards of Combustion Products: Products of burning Na are highly irritating to skin, eyes, and mucous membranes 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 250 °F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Not pertinent 8.2 Waterfowl Toxicity: Not pertinent 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently with formation of flammable hydrogen gas and caustic soda solution. A fire often occurs. 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: After reaction with water, caustic soda formed can be diluted with water and neutralized with acetic acid. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. E. I. du Pont de Nemours and Co., Inc., Electrochemical Dept., Wilmington, Del. 19880 2. Ethel Corp., Industrial Chemicals Division, 481 Florida, Baton Rouge, La. 70801 3. RMI Company, State Rd., Ashland, Ohio 44814								
11 HAZARD ASSESSMENT CODE See Section 9, Hazard Assessment Code (HAC) 9 RR C	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial grade, 99.9% 10.2 Storage Temperature: 240° - 250° F (115° - 121° C) ambient conditions 10.3 Inert Atmosphere: In a nitrogen or argon dry liquid, under kerosene if stored 10.4 Venting: Pressure vacuum								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable solid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>W</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	W	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 22.99 13.3 Boiling Point at 1 atm: 1627 °F = 887 °C = 1156 °K 13.4 Freezing Point: 207 °F = 97 °C = 370 °K 13.5 Critical Temperature: 1612 °F = 872 °C = 1145 °K 13.6 Critical Pressure: 5480 psia = 34.6 atm = 34.6 MPa 13.7 Specific Gravity: 0.971 at 20 °C (68 °F) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	2								
Reactivity (Yellow)	W								
NOTES C = hard matter, white									

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6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Irritating vapors may be generated 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8 WATER POLLUTION 8.1 Aquatic Toxicity: 5.6 p.p.m (100% SAB)/96 hr/bluegill/TL m/ fresh water 8.2 ppm/96 hr/winter flounder/TL m/ salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 4%, 5 days 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Colgate Palmolive Co 300 Park Ave New York, N. Y. 10022 2 Lever Bros. Co 390 Park Ave New York, N. Y. 10022 3 Witco Chemical Corp Organic Division 1914 S. Kilbourn Ave Chicago Ill 60623
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 448-3) SS	10 SHIPPING INFORMATION 10.1 Grades or Purity: Vary with each manufacturer and with intended use. Some is shipped as a thick, concentrated water solution, some as a solid, often mixed with other solids such as sodium phosphate. Ordinary household detergents are good examples of this substance. 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid or solid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.0 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 4 and 5)

NOTES

SAS

SODIUM ALKYL SULFATES

Common Synonyms: Sodium hydrogen alkyl sulfate		Solid or thick liquid Pale yellow Faint detergent odor Mixes with water. Soap bubbles may be produced.
May be dangerous when in contact with skin and eyes. Avoid contact with eyes and skin.		
Fire	Not flammable	
Exposure	CAUTION: IRRITANT LIQUID OR SOLID Irritating to skin and eyes. If swallowed, will cause nausea or vomiting. Avoid contact with skin and eyes. If contact occurs, flush with water for at least 15 minutes. If swallowed, drink water and seek medical attention. If inhaled, move to fresh air and seek medical attention.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Do not discharge into water bodies.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4. Issue warning: water contaminant. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required. Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Sodium hydrogen alkyl sulfate. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $C_{12}H_{25}OSO_3Na$. 3.4 IMCO United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): 1 quart of solid. 4.2 Color: Colorless to pale yellow. 4.3 Odor: Weak detergent.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: In general, these chemicals have a mild irritant effect on skin. Repeated skin contact with concentrated solutions may cause dermatitis. Ingestion may cause gastrointestinal irritation, vomiting, and diarrhea. 5.3 Treatment for Exposure: INGESTION: induce vomiting and follow with gastric lavage. SKIN: wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limit: Not pertinent. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 5 to 5 g/kg. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Non-volatile. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing, and allowed to remain, may cause smearing and reddening of the skin. 5.10 Odor Threshold: Not pertinent.		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: May produce irritating vapors. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not flammable.		8. WATER POLLUTION 8.1 Aquatic Toxicity: 100 ppm for 96 hours in soft water. 8.2 Waterfowl Toxicity: 100 ppm for 96 hours. 8.3 Biological Oxygen Demand (BOD): 100 ppm for 5 days. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. E. I. du Pont de Nemours & Co., Inc. DuPont Chemical Division Wilmington, DE 19880 2. Morton Chemical Co. DuPont Chemical Division 1901 Warren St. Kansas City, MO 64106 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, NY 10017
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.4. NS		10. SHIPPING INFORMATION 10.1 Grades or Purity: Varies with each manufacturer and with intended use. Some is shipped as a thick concentrated water solution, some as a solid often mixed with free solids such as sodium phosphate. Common household detergent are good examples of this substance. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid or solid. 13.2 Molecular Weight: Not pertinent. 13.3 Boiling Point at 1 atm: Decomposes. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: Data not available. 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES		

SAM

SODIUM AMIDE

Common Synonyms Sodiumamide	Solid	Colorless	Odorless
Sinks and reacts violently with water			
Fire	FLAMMABLE POISONOUS GAS IS PRODUCED IN FIRE		
Exposure	SOLID Will burn skin and eyes		
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes		
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-1. Issue warning: "extremely flammable". Restrict access. Should be removed. Disperse and flush.		2. LABELS  	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Sodiumamide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: NaNH_2 3.4 IMCO/United Nations Numerical Designations: 4.3, 4.24		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Gray 4.3 Color: Free ammonia	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Face shield or face shield if ventilation is poor; gloves and shoes 5.2 Symptoms Following Exposure: Ammonia gas formed by reaction of solid with moisture irritates eyes and skin. Solid causes caustic burns of eyes and skin. Free ammonia irritates mouth and stomach. In contact with acids, soda and may cause peritonitis or tetanus. 5.3 Treatment for Exposure: INGESTION: Give water. Do not induce vomiting. If swallowed, do not induce vomiting. Call doctor. SKIN OR EYES: Flush with water. Do not induce vomiting. Call doctor. VAPOR: Get to fresh air. Call doctor. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Oral Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Only that of ammonia formed by reaction of solid with moisture in air. 5.9 Liquid or Solid Irritant Characteristics: Ammonia gas and soda are irritants. 5.10 Odor Threshold: Not pertinent			

6 FIRE HAZARDS 6.1 Flash Point: Flammable solid 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry powder, graphite, salt, or other recommended dry powders, such as fire extinguishers 6.4 Fire Extinguishing Agents Not to be Used: Water 6.5 Special Hazards of Combustion Products: Toxic and irritating gases may be formed 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None	
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently and frequently but controllably. Exothermic reaction 7.2 Reactivity with Common Materials: Data not available 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Caustic solution formed by reaction with water can be diluted with water and/or neutralized by acidic acid 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. Farcher Research Laboratories, Inc. 4702 E. 1st St. Wilmington, DE 2. Fox Chemical, Inc. P.O. Box 54 New York, NY 10043 3. Ventron Corp. Alfa Products Division Beverly, Mass. 01915	
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 RA		10 SHIPPING INFORMATION 10.1 Grades or Purity: Pure, Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Must be dry 10.4 Venting: Sealed containers must be stored in well-ventilated area	
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable solid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 39.0 13.3 Boiling Point at 1 atm: 752.1 = 479.0 °C = 892.2 °F 13.4 Freezing Point: 410.1 = 210.0 °C = 406.0 °F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.37 at 20 °C (68 °F) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
NOTES			

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SDA

SODIUM ARSENATE

Common Synonyms Sodium arsenate, dibasic Disodium arsenate heptahydrate		Solid	White	Odorless
		Sinks and mixes with water		
FIRE				
Fire		Not flammable		
EXPOSURE				
Exposure		DUST Irritating to eyes, nose and throat If inhaled will cause difficult breathing SOLID Irritating to skin and eyes If swallowed will cause coughing, nausea, vomiting or loss of consciousness		
WATER POLLUTION				
Water Pollution		Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning: poison water contaminant Restrict access Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Disodium arsenate heptahydrate; Sodium arsenate dibasic 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{Na}_2\text{HAsO}_4 \cdot 7\text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: 6.1 16X		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation of massive doses can cause laryngitis, bronchitis. Ingestion causes constriction in throat and difficulty in swallowing, also causes burning and pain, vomiting, profuse diarrhea, dehydration, cyanosis, coma, convulsions, and death. Contact with eyes causes irritation. Contact with skin causes various skin eruptions, more often as a late manifestation of chronic poisoning. 5.3 Treatment for Exposure: INHALATION: remove victim from exposure, support respiration. INGESTION: gastric lavage with water, followed by 1 glass of milk, consult physician. EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m ³ as arsenic 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 LD ₅₀ <40 mg/kg 5.7 Late Toxicity: Possible carcinogenic effects on skin and lungs 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazards: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 243 ppm: 96-hour LC50 for rainbow trout 12 ppm: 7 days goldfish, 14 ppm: 96-hour LC50 *Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Bioconcentration only 49 fold, not likely to be a problem in spill situation
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. J. T. Baker Chemical Co. Phillipsburg, N. J. 08065 2. Gallard-Schlesinger Chemical Mfg. Co. 584 Mincola Ave. Carlisle, Pa. 15114 3. Fisher Scientific Co. 711 Forbes Ave. Pittsburgh, Pa. 15219
11. HAZARD ASSESSMENT CODE (See HAZARD ASSESSMENT Handbook, CG 446-3) 66	10. SHIPPING INFORMATION 10.1 Grades or Purities: Reagent, Technical 95+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous, solid, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 312 13.3 Boiling Point at 1 atm: (decomposes) 346°F = 120°C = 453°K 13.4 Freezing Point: 135°F = 57°C = 330°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.87 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES (Continued on pages 5 and 6)	

SAZ

SODIUM AZIDE

Common Synonyms		Solid	White	Odorless
		Mixes with water		
Fire		Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED Containers may explode in fire		
 <u>Exposure</u>		DUST POISONOUS IF INHALED SOLID POISONOUS IF SWALLOWED		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444-4) To seawater: In water contaminant Restrict access Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 31 Synonyms: Hydrazoic acid sodium salt 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: NaN ₃ 34 IMCO/United Nations Chemical Designation: 6.1 16A		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: White 43 Odor: None		
5. HEALTH HAZARDS				
51 Personal Protective Equipment: Dust mask, protective clothing, goggles				
52 Symptoms Following Exposure: Inhalation or ingestion causes dizziness, weakness, blurred vision, slight chestiness/breath, and feeling of going to faint, moderate reduction of blood pressure and headache. Contact with eyes or skin causes irritation.				
53 Treatment for Exposure: Give a person weakness, pallor, or low blood pressure is observed. INHALATION: remove victim to fresh air, call for first aid, call a doctor. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. INGESTION: if a large amount of water is available, vomiting at once, get medical attention.				
54 Toxicity by Inhalation (Threshold Limit Value): Data not available				
55 Short-Term Inhalation: Limit: Data not available				
56 Toxicity by Ingestion: Grade 1: oral LD ₅₀ = 27 mg/kg (technica				
57 Late Toxicity: Potential stages of salmonella DNA				
58 Vapor (Gas) Irritant Characteristics: Data not available				
59 Liquid or Solid Irritant Characteristics: Data not available				
510 Odor Threshold: Not pertinent				

6. FIRE HAZARDS

- 61 Flash Point: Not flammable
62 Flammable Limits in Air: Not flammable
63 Fire Extinguishing Agents: Not pertinent
64 Fire Extinguishing Agents Not to be Used: Not pertinent
65 Special Hazards of Combustion Products: May form toxic hydrazoic acid fumes in fire
66 Behavior in Fire: Containers may explode
67 Ignition Temperature: Not pertinent
68 Electrical Hazard: Not pertinent
69 Burning Rate: Not pertinent

8. WATER POLLUTION

- 81 Aquatic Toxicity: 1 ppm 24 hr bluegill 11 m trout water
82 Waterfowl Toxicity: Data not available
83 Biological Oxygen Demand (BOD): None
84 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

- 1 Eastman Chemical Co., Inc.
117 Broadway Street
Newark, N.J. 07102
2 Eastman Kodak Co.
Eastman Organic Chemicals
Rochester, N.Y. 14650
3 PCE, Inc.
P.O. Box 1460
Gainesville, Tex. 76902

7. CHEMICAL REACTIVITY

- 71 Reactivity with Water: Dissolves to form an alkaline solution. The reaction is not hazardous.
72 Reactivity with Common Materials: Forms explosion sensitive materials with some metals such as lead, silver, mercury, and copper.
73 Stability During Transport: Stable unless in contact with acids.
74 Neutralizing Agents for Acids and Caustics: Not pertinent.
75 Polymerization: Not pertinent.
76 Inhibitor of Polymerization: Not pertinent.

10. SHIPPING INFORMATION

- 101 Grade or Purity: Pure 99+ %
Practical grade
102 Storage Temperature: Ambient
103 Inert Atmosphere: No requirement
104 Venting: Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Manual, CG 444-3
NN

12. HAZARD CLASSIFICATIONS

- 121 Code of Federal Regulations: Poisonous, Class B
122 NAS Hazard Rating for Bulk Water Transportation: Not listed
123 NFPA Hazard Classifications: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 131 Physical State at 15°C and 1 atm: Solid
Molecular Weight: 65
Boiling Point at 1 atm: Not pertinent (decomposes)
Freezing Point: Not pertinent
135 Critical Temperature: Not pertinent
136 Critical Pressure: Not pertinent
137 Specific Gravity: 1.85 at 20°C (solid)
138 Liquid Surface Tension: Not pertinent
139 Liquid-Water Interfacial Tension: Not pertinent
1310 Vapor (Gas) Specific Gravity: Not pertinent
1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent
1312 Latent Heat of Vaporization: Not pertinent
1313 Heat of Combustion: Not pertinent
1314 Heat of Decomposition: Not pertinent
1315 Heat of Solution: Not pertinent
1316 Heat of Polymerization: Not pertinent

(Continued on pages 3 and 4)

NOTES

SBS

SODIUM BISULFITE

Common Synonyms Sodium acid sulfite Sodium metabisulfite		Solid powder or granules. White. Odorless to irritating odor. Sinks and mixes with water.
Fire	Not flammable.	
Exposure	DUST Harmful if inhaled. SOLID Irritating to skin and eyes. Harmful if swallowed.	
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 440.4 Environmental water contamination: Dispense and flush.		2. LABELS No hazard labels required by U.S. Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Sodium acid sulfite Sodium metabisulfite Sodium pyrosulfite 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: NaHSO_3 $\text{Na}_2\text{S}_2\text{O}_5$ 3.4 IMCO United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: White. 4.3 Odor: Pungent odor; strong, distinctive when moist.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles, gloves, shoes. 5.2 Symptoms Following Exposure: Powder is irritating to skin, nose and eyes, and can irritate skin. Ingestion may cause irritation of stomach. Very rarely, doses cause vomiting, diarrhea, depression, and death. 5.3 Treatment for Exposure: INHALATION OR INGESTION: get medical attention as soon as possible. SKIN: wash with plenty of water. EYES: flush with plenty of water for at least 15 min. and get medical attention as soon as possible. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 3 (LD ₅₀) 1.5 g/kg. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Not significant. 5.9 Liquid or Solid Irritant Characteristics: Irritates skin and mucous membranes. 5.10 Odor Threshold: Not pertinent.		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not flammable. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not flammable.		8. WATER POLLUTION 8.1 Aquatic Toxicity: 29 ppm, 24 hr. & 96 hr. rainbow trout. 11 ppm, 96 hr. daphnia. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Reacts chemically with dissolved oxygen, even in absence of aerobic organisms. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Bases: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Industrial Chemical Division Morristown, N.J. 07960 2. Morton, Co. Morton Industrial Chemical Co. 500 North Lindbergh Blvd. St. Louis, Mo. 63102 3. Allied Chemical Inc. 340 West Norfolk Rd. Portsmouth, Va. 23704
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 440.4 NN		10. SHIPPING INFORMATION 10.1 Grades or Purity: As manufactured (97-100%). 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: OPM B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 144.04. 13.3 Boiling Point at 1 atm: Decomposes. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.45 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES		

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SDB

SODIUM BORATE

Common Synonyms: Sodium tetraborate anhydrous Borax anhydrous Sodium borate Sodium perborate		Solid	White	Odorless
		Sinks and mixes slowly with water		
Fire	Not flammable			
Exposure	DUST Irritating to eyes, nose and throat SOLID Irritating to skin and eyes If swallowed will cause headache, dizziness, nausea or vomiting			
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE See Response Methods for Oil Spills, CG 660-11 Disperse and Flush		2. LABELS No hazard label required by Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Borax anhydrous Sodium borate Sodium perborate Sodium tetraborate anhydrous 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: Na ₂ B ₄ O ₇ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Dust mask and goggles or face shield				
5.2 Symptoms Following Exposure: No adverse effects from inhaling borax have been reported. Irritation may cause acute or chronic effects. Initial symptoms are nausea, vomiting, and diarrhea. These may be followed by weakness, depression, headaches, vertigo, drowsiness, cramps, legs and loss of hair. Shock may follow ingestion of large doses, and may interfere with breathing. Eye contact with powder or solution may cause irritation. No chronic effects have been recognized, but continued contact should be avoided. If skin irritation may result from contact with powder or strong solutions, the latter may cause local dermatitis on prolonged contact, and if skin is broken enough boron may be absorbed to cause boron poisoning symptoms are similar to those for ingestion.				
5.3 Treatment for Exposure: INHALATION: move to fresh air, call physician immediately, give mouth-to-mouth resuscitation if breathing has ceased, give oxygen if authorized by physician, keep victim warm. INGESTION: get medical attention quickly, if victim is conscious, give warm salt or soapy water to induce vomiting, repeat until vomiting ceases, additional water may be given to wash out stomach. EYES: get medical attention quickly, flush with copious amounts of water for at least 15 min. If physician is not available, flushing extends up to 1 hr. SKIN: flush with water, remove contaminated clothing under shower, do not use chemical neutralizers, get medical attention, gases burn is minor.				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ = 1.5 g/kg				

Continued on page 2

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable
 6.2 **Flammable Limits in Air:** Not flammable
 6.3 **Fire Extinguishing Agents:** Not pertinent
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
 6.5 **Special Hazards of Combustion Products:** Not pertinent
 6.6 **Behavior in Fire:** Compound may cause glass material to melt, may flow in large quantities and adhere to hot surfaces elsewhere
 6.7 **Ignition Temperature:** Not pertinent
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterfowl Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Not pertinent
 8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. National Chemical Industries Chemical Division
 2. Weyburn Chemicals
 3. J. T. Baker Chemical Company
 4. J. T. Baker Chemical Company
 5. J. T. Baker Chemical Company
 6. J. T. Baker Chemical Company
 7. J. T. Baker Chemical Company
 8. J. T. Baker Chemical Company
 9. J. T. Baker Chemical Company
 10. J. T. Baker Chemical Company

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:**
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Corrosives:** Not pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

10 SHIPPING INFORMATION

- 10.1 **Grade or Purity:** In addition to anhydrous sodium borate, there are pentahydrate and decahydrate forms. Commercial grades are labeled as such. The decahydrate is known as borax. Grades 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** Not required
 10.4 **Venting:** None

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 660-11
 NA

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid
 13.2 **Molecular Weight:** 201.36
 13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
 13.4 **Freezing Point:** Not pertinent
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 1.72 at 20°C (solid)
 13.8 **Liquid Surface Tension:** Not pertinent
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 13.12 **Latent Heat of Vaporization:** Not pertinent
 13.13 **Heat of Combustion:** Not pertinent
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** -14.7 kJ/mol (solid)
 13.16 **Heat of Polymerization:** Not pertinent

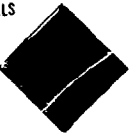
Continued on page 2

5 HEALTH HAZARDS (Cont'd)

- 5.7 **Late Toxicity:** Data not available
 5.8 **Vapor (Gas) Irritant Characteristics:** Data not available
 5.9 **Liquid or Solid Irritant Characteristics:** Data not available
 5.10 **Odor Threshold:** Data not available

SBH

SODIUM BOROHYDRIDE

Common Synonyms Borohydride	Solid powder or pellets White Colorless Solu's dissolves with water. Flammable gas is produced.
Fire	Combustible Flammable, explosive gas may be produced on contact with metals, acids or when heated.
Exposure	DUST Harmful if inhaled SOLID Irritating to skin and eyes Harmful if swallowed or if skin is exposed
Water Pollution	Effect of low concentration on aquatic life is unknown May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, EW 445-4)	2 LABELS  
3 CHEMICAL DESIGNATIONS 31 Synonyms: No common synonyms 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: NaBH_4 34 IMCO, United Nations Numerical Designation: 451426	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid cr. solution in caustic soda 42 Color: White 43 Odor: Odorless
5 HEALTH HAZARDS 51 Personal Protective Equipment: Goggles, rubber gloves, and protective clothing 52 Symptoms Following Exposure: Solid irritates skin. If ingested, can form large volume of gas and lead to a gas embolism. 53 Treatment for Exposure: INGESTION: do NOT induce vomiting; give dilute, neutral lemon juice, milk, or oil; call a doctor. SKIN AND EYES: flood with large amount of water. 54 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 55 Short-Term Inhalation Limits: Not pertinent 56 Toxicity by Ingestion: Very toxic reaction with acid in stomach. Considered toxic because of boron content. 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Non volatile 59 Liquid or Solid Irritant Characteristics: Irritates skin 60 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 61 Flash Point: Flammable solid 62 Flammable Limits in Air: Not pertinent 63 Fire Extinguishing Agents: Carbon dioxide, soda ash, sodium chloride powders 64 Fire Extinguishing Agents Not to be Used: Water, carbon dioxide, or halonated extinguishing agents 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Decomposes and produces highly flammable hydrogen gas 67 Ignition Temperature: Not pertinent 68 Electrical Hazard: Data not available 69 Burning Rate: Not pertinent	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 71 Reactivity with Water: Reacts to form flammable hydrogen gas 72 Reactivity with Common Materials: Reacts with acids to form toxic, flammable diborane gas. Slowly corrodes glass. 73 Stability During Transport: Stable, unless mixed with acids or overheated, when flammable hydrogen gas is formed. 74 Neutralizing Agents for Acids and Caustics: Caustic formed by reaction with water can be diluted and/or neutralized with acetic acid. 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Caltech Chemical Co. Caltech, Pa. 16024 2. Ventron Corp. Alta Products Division Beverly, Mass. 01915
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CS 416-3) RR C	10 SHIPPING INFORMATION 101 Grades or Purity: 98.98% minimum purity dry powder, pellets, 12% solution in 4% aqueous sodium hydroxide 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Sealed containers must be stored in well ventilated area
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable solid 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 37.83 133 Boiling Point at 1 atm: Decomposes 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.074 at 20°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
NOTES	

REVISED 1978

SCD

SODIUM CACODYLATE

Common Synonyms Sodium dimethylarsenate Arsecidite Arsocidite Arsecidite Phytar		Solid or solution Mixes with water	White solid or colorless to light yellow solution	Odorless
AVOID CONTACT WITH SOLID AND DUST. SOLID POISONOUS IF INHALED IRITATING TO EYES MAY BE DANGEROUS IF IT ENTERS WATER INTAKES MAY BE DANGEROUS IF IT ENTERS WATER INTAKES				
Fire		Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED		
 <u>Exposure</u>		VAPOR OR DUST POISONOUS IF INHALED Irritating to eyes MAY BE DANGEROUS IF IT ENTERS WATER INTAKES MAY BE DANGEROUS IF IT ENTERS WATER INTAKES LIQUID OR SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes MAY BE DANGEROUS IF IT ENTERS WATER INTAKES MAY BE DANGEROUS IF IT ENTERS WATER INTAKES MAY BE DANGEROUS IF IT ENTERS WATER INTAKES MAY BE DANGEROUS IF IT ENTERS WATER INTAKES		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes MAY BE DANGEROUS IF IT ENTERS WATER INTAKES		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison water contaminant Restrict access Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 31 Synonyms: Arsecidite, Arsecidite, Arsocidite, Phytar 160, Phytar 500, Sodium dimethylarsenate 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: (CH ₃) ₂ AsOONa 34 IMCO/United Nations Numerical Designation: 6.1/1688		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid or water solutions 42 Color: Colorless to light yellow 43 Odor: None		
5. HEALTH HAZARDS 51 Personal Protective Equipment: Goggles or face shield, dust mask, rubber gloves 52 Symptoms Following Exposure: Dust may irritate eyes. Ingestion or excessive inhalation causes irritation of stomach and intestines with nausea, vomiting, diarrhea, shock, rapid pulse, coma 53 Treatment for Exposure: INHALATION: remove victim from exposure; call physician EYES: flush with water. SKIN: flush with water and wash well with soap and water INGESTION: call physician, induce evacuation of intestinal tract by inducing vomiting, giving gastric lavage and a saline cathartic. Do NOT use BAL, an antidote 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: Grade 2, oral LD ₅₀ = 2,600 mg/kg (rat) 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Arsenic-containing fumes are emitted 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Not pertinent 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not pertinent		8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Watershed Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: Data not available	
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: Corrodes common metals, but reaction is not hazardous 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS The Ansul Company One Stanton Street Marquette Wis 54143	
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS		10. SHIPPING INFORMATION 101 Grades or Purities: 22 28% sodium cacodylate 3 5% cacodylic acid, balance inert solid (or water). 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open	
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Poisonous Class B 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 160.0 133 Boiling Point at 1 atm: Not pertinent (decompose.) 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: (est) ≥ 1 at 20°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent	
NOTES 			

6 FIRE HAZARDS 6.1 Flash Point: Not flammable, but supports combustion 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Fire blankets 6.5 Special Hazards of Combustion Products: In fire situations oxygen may be liberated and increase the intensity of the fire 6.6 Behavior in Fire: Melts then decomposes to give oxygen gas that increases the intensity of fire. Reacts explosively either as a solid or a liquid with all organic matter and some metals 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 11 (80) ppm: perch threshold toxicity fresh water 13 ppm: scenedesmoses threshold toxicity fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None										
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: Chlorates are powerful oxidizing agents. Violent explosive reactions when heated or rubbed with wood, organic matter, sulfur, and many metals. Even water solutions react in this way if stronger than 30%, especially when warm 7.3 Stability During Transport: Starts at 572°F with evolution of oxygen gas. Decomposition may be self-sustaining. Oxygen in, raises intensity of fires 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Kerr-McGee Chemical Corp. Kerr-McGee Bldg. Oklahoma City, Okla. 73102 2. Occidental Petroleum Corp. Hooker Chemical Co. Industrial Chemicals Division Niagara Falls, N. Y. 14302 3. Penn-Olin Chemical Co. Calvert City, Ky. 42029										
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 44C.3) SS	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical (99.5% minimum) treated (99.0% minimum) 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open										
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification*</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>0</td> </tr> <tr> <td>Flammability (Red)</td> <td>0-0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2-2</td> </tr> <tr> <td></td> <td style="text-align: center;">0000-0000</td> </tr> </tbody> </table> *First column refers to non fire situation	Category	Classification*	Health Hazard (Blue)	0	Flammability (Red)	0-0	Reactivity (Yellow)	2-2		0000-0000	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 106.45 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: 478°K = 245°C = 521°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.49 at 15°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification*										
Health Hazard (Blue)	0										
Flammability (Red)	0-0										
Reactivity (Yellow)	2-2										
	0000-0000										

(Continued on pages 5 and 6)

NOTES

SCH

SODIUM CHROMATE

Common Synonyms: Sodium chromate (VI) Neutral sodium chromate anhydrous		Solid	Yellow	Odorless
		Sinks and mixes with water		
Fire		Not flammable Will increase the intensity of a fire May cause fire on contact with combustibles		
		DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes If swallowed will cause nausea or loss of consciousness		
Exposure				
Water Pollution		Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 31 Synonyms: Neutral sodium chromate anhydrous; Sodium chromate (VI) 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: Na ₂ CrO ₄ 34 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: Yellow 43 Odor: None		
5. HEALTH HAZARDS				
51 Personal Protective Equipment: U.S. Bu. Mines approved respirator; rubber gloves; hemispherical safety goggles; rubber apron and sleeves; face shield; rubber shoes; protective clothing				
52 Symptoms Following Exposure: Inhalation causes irritation and may ulcerate mucous membranes; continued irritation of the nose may lead to perforation of the septum. Ingestion causes severe circulatory collapse and toxic nephritis; may be fatal. Contact with eyes causes severe irritation and possible conjunctivitis. Irritates skin and can cause ulcer if skin is broken; prolonged contact may cause "chrome sores" (slow healing, hard rimmed ulcers) which leave the area vulnerable to infection as a secondary effect				
53 Treatment for Exposure: INHALATION: remove victim to fresh air; get medical attention. INGESTION: get immediate medical help; if vomiting is not spontaneous, give an emetic, such as soapy water followed by copious water intake. EYES: immediately flush with plenty of water for at least 15 min.; consult physician promptly. SKIN: immediately flush with plenty of water for at least 15 min.; persistent dermatitis should be referred to physician; wash contaminated skin or clothing until chromate color disappears				
54 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ (as chromic acid)				
55 Short-Term Inhalation Limits: Data not available				
56 Toxicity by Ingestion: Grade III Dose 50-500 mg/kg				
57 Late Toxicity: Possible lung cancer				
58 Vapor (Gas) Irritant Characteristics: Data not available				
59 Liquid or Solid Irritant Characteristics: Data not available				
60 Odor Threshold: Data not available				

6 FIRE HAZARDS Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Toxic chromium oxide fumes may form in fire 66 Behavior in Fire: May increase intensity of fire when in contact with combustible material 67 Ignition Temperature: Not pertinent 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not pertinent	8 WATER POLLUTION 81 Aquatic Toxicity: 400 mg/l 24 hr bluegill 11 mm fresh water 40-60 ppm 288 hr. short crab toxic salt water 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): None 84 Food Chain Concentration Potential: Bioconcentrative to 2,000 fold but not likely to be a problem in a spill situation
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: In contact with combustible materials may cause fire 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Allied Chemical Corp. Industrial Chemicals Div. P. O. Box 1139R Morristown, N. J. 07960 2 PPG Industries, Inc. One Gateway Center Pittsburgh, Pa. 15222 3 J. I. Baker Chemical Co. Phillipsburg, N. J. 08865
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	10 SHIPPING INFORMATION 101 Grades or Purities: Reagent Commercial; Tetrahydrate grade 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venbing: Open
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 162 133 Boiling Point at 1 atm: Not pertinent (decomposes) 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 2.723 at 25°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: -24.5 Btu/lb = -11.6 cal/g = -7.57 x 10³ J/kg 1316 Heat of Polymerization: Not pertinent <i>(Continued on pages 5 and 6)</i>
NOTES	

SCN

SODIUM CYANIDE

Common Synonyms	Solid granules, flakes or lumps White Almond odor Sinks and mixes with water
Fire	Not flammable
Exposure	 DUST POISONOUS IF INHALED OR IF SKIN IS EXPOSED  SOLID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Will burn eyes  HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE See Response Methods Handbook CG 446-61 Toxic warning - poison Restrictions Evacuation Chemical and physical treatment	2. LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: Hydrocyanic acid, sodium salt 32 Coast Guard Compatibility Classification: Not applicable 33 Chemical Formula: NaCN 34 IMCO United Nations Numerical Designation: 2.1 169	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: White 43 Odor: Odorless when dry. When moist it has a slight odor of hydrogen cyanide.
5. HEALTH HAZARDS 51 Personal Protective Equipment: Protective gloves when handling solid sodium cyanide; rubber gloves when handling cyanide solutions (wash hands and rubber gloves thoroughly with running water after handling cyanide); U.S. Bureau of Mines approved dust respirator; approved chemical safety goggles. 52 Symptoms Following Exposure: As little as 180 milligrams is a rapidly fatal poison if ingested. Non-lethal doses may cause toxic symptoms. Strong water solutions or the solid itself can be absorbed by the skin and cause deep ulcers which heal slowly. 53 Treatment for Exposure: INGESTION: As treatment immediately call a physician, carry victim to fresh air, have him lie down, keep him quiet and warm until physician arrives. • If victim is conscious and breathing, induce vomiting by giving emetic or warm salt water (1 tablespoon salt/cup water), repeat until vomit fluid is clear. Then have victim drink one pint of 1% solution of sodium (tin) sulfate to be repeated in 1 hour. • If victim has stopped breathing, give artificial respiration until breathing starts. • If victim is unconscious but breathing, give oxygen from an inhaler. For all other conditions: have victim breathe an antidote. Break nitrite pearls in a cloth and hold tightly over victim's nose for 15 sec., repeating 5 times at about 15 sec. intervals. If necessary repeat this procedure every 3 min. with the pearls until he or she has been given 16 pearls (Pearls must not be over 2 years old). Avoid oral intake and nitrite which is interfering to victims. 54 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 55 Short-Term Inhalation Limits: Not pertinent 56 Toxicity by Ingestion: Grade 4 below 50 mg/kg	

6. FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Not flammable 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not flammable	8. WATER POLLUTION 81 Aquatic Toxicity: 0.15 ppm/96 hr. bluegill; 11 mg. fresh water 0.25 ppm/48 hr. prawn; 1.0 mg. salt water 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): (theoretical) 7 days 84 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 71 Reactivity with Water: When sodium cyanide dissolves in water, a mild reaction occurs and some poisonous hydrogen cyanide gas is released. This gas is not hazardous except in an enclosed space. If the water is acidic, however, toxic amounts of the gas will form at once. 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. F. I. duPont de Nemours & Co., Inc. Electrochemical Dept. Wilmington, Del. 19880 2. Mallinckrodt Chemical Works Industrial Chemical Division 2nd and Mallinckrodt Sts. St. Louis, Mo. 63109								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook CG 446-2 NS	10. SHIPPING INFORMATION 101 Grades or Purity: 99+ 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Sealed containers must be stored in well ventilated area								
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Poisonous liquid or solid, Class B 122 HAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: <table> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 49.01 133 Boiling Point at 1 atm: Very high 134 Freezing Point: 1047 °F = 564°C = 537°K 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 1.60 at 25°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	3								
Flammability (Red)	0								
Reactivity (Yellow)	0								
5. HEALTH HAZARDS (Cont'd) 57 Late Toxicity: None 58 Vapor (Gas) Irritant Characteristics: Non-volatile, but moisture in air can liberate some lethal hydrogen cyanide gas. 59 Liquid or Solid Irritant Characteristics: Entry severe skin irritant - may cause pain and second degree burns after a few minutes contact. 510 Odor Threshold: Not pertinent									

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SDT

SODIUM DICHORO-S-TRIAZINETRIONE

Common Synonyms Sodium dichlorosuccinate	Solid White Bleach like odor Mixes with water
Fire	Not flammable May cause fire on contact with combustibles. POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes. Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-4) Issue warning - oxidizing material - I water contaminant Restrict access Disperse and flush	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Sodium dichlorosuccinate 3.2 Coast Guard Competibility Classification: Not applicable 3.3 Chemical Formula: $\text{NaCl}_2(\text{NCO})_2$ 3.4 IMCO/United Nations Numerical Designation: 5.1	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Bleach/Chlorine
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask or chlorine canister mask, goggles, rubber gloves, and other protective clothing to prevent contact with skin 5.2 Symptoms Following Exposure: Dust cause sneezing and coughing, moderate irritation of the eyes, and itches and redness of the skin. Ingestion causes burns of mouth and stomach 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air. EYES: flush with water for 15 min., call a physician. SKIN: flush with water. INGESTION: induce vomiting, call physician 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 1.679 mg/kg (rat) 5.7 Late Toxicity: Effects unknown in experimental animals 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable but contact with ordinary combustibles may cause fire 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: May form toxic chlorine and other gases in fire 6.6 Behavior in Fire: Decomposition can be initiated with a heat source and can propagate throughout the mass with the evolution of dense fumes. Containers may explode when heated 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None										
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Forms a bleach solution, the reaction is not violent 7.2 Reactivity with Common Materials: Contact with most foreign materials, organic matter, or easily chlorinated or oxidized materials may result in fire. Avoid contact with oil, grease, sand, dust, floor sweepings, easily oxidized organics 7.3 Stability During Transport: Stable if dry 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS FMC Corporation Industrial Chemical Division 633 Third Avenue New York, N.Y. 10017										
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) SS	10. SHIPPING INFORMATION 10.1 Grade or Purity: Technical 99-90% available chlorine 10.2 Storage Temperature: Cool ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure vacuum										
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Oxidizing material 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table data-bbox="906 1472 1151 1559"> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> <tr> <td></td><td>OX</td></tr> </table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	0	Reactivity (Yellow)	2		OX	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 220.0 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.96 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Data not available 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification										
Health Hazard (Blue)	3										
Flammability (Red)	0										
Reactivity (Yellow)	2										
	OX										
NOTES											

(Continued on pages 4 and 5)

SCR

SODIUM DICHROMATE

Common Synonyms Sodium Dichromate		Solid crystals	Red to orange	Odorless
		Sinks and mixes with water		
Fire		Not flammable May cause fire on contact with combustibles		
Exposure		DUST Irritating to eyes, nose, and throat If inhaled, will cause difficult breathing SOLID Will burn skin and eyes If swallowed, will cause nausea and vomiting		
Water Pollution		Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Methods in Methods Handbook CG 446.4) Issue warning - water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification Not applicable 3.3 Chemical Formula: $\text{Na}_2\text{Cr}_2\text{O}_7$ 3.4 'MCO' United Nations Numerical Designation: 900 129		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Bright orange-red 4.3 Odor: Odorless		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment		Approved dust mask, protective gloves, goggles, face shield		
5.2 Symptoms Following Exposure:		Inhalation of dust or mist causes respiratory irritation, sometimes resembling asthma; nasal septal perforation may occur. Ingestion causes vomiting, diarrhea and travels to stomach and kidney complications. Contact with eyes or skin produces local irritation; repeated skin exposure causes dermatitis.		
5.3 Treatment for Exposure:		INGESTION: have victim drink water or milk, do NOT induce vomiting, call a doctor. SKIN OR EYE CONTACT: treat like acid burns, flush eyes with water for at least 15 min. external lesion can be scrubbed with a 2% solution of sodium thiosulfate.		
5.4 Toxicity by Inhalation (Threshold Limit Value)		Not pertinent		
5.5 Short-Term Inhalation Limits		Data not available		
5.6 Toxicity by Ingestion:		Grade III Dose 150 to 800 mg/kg		
5.7 Late Toxicity:		Some suggestion of lung cancer		
5.8 Vapor (Gas) Irritant Characteristics:		Dust or mist may cause severe irritation of eye and throat and can cause eye and lung injury. This cannot be tolerated at very low concentrations.		
5.9 Liquid or Solid Irritant Characteristics:		Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes.		
5.10 Odor Threshold:		0.1 mg/m ³		

6. FIRE HAZARDS

- 6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Flood with water
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Decomposes to produce oxygen when heated. May ignite other combustibles upon contact.
6.7 Ignition Temperature: Not flammable
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not flammable

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: In contact with finely divided combustibles, such as sawdust, ignites on may or less.
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: 145 ppm, 24 hr. bluegill, 11 mg/l fresh water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

1. Diamond Shamrock Corp.
Soda Products Division
Belleville, Pa.
Kearny, N.J. 07032
2. Hercules Inc.
Coatings and Specialty Products Dept.
910 Market St.
Wilmington, Del. 19809
3. PPG Industries, Inc.
Industrial Chemical Division
1400 Civic Center
Pittsburgh, Pa. 15222

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Technical grades 99.5% to 99.9%, high purity grades 99.9% to 99.99%
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook CG 446.3
NS

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: ORM-A
12.2 NAS Hazard Rating for Bulk Water Transportation: No listed
12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 1 |
| Flammability (Red) | 0 |
| Reactivity (Yellow) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 262.01
13.3 Boiling Point at 1 atm: Decomposes
13.4 Freezing Point: 675°F = 357°C = 630°K
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 2.35 at 25°C (solid)
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Not pertinent
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

NOTES

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SFC

SODIUM FERROCYANIDE

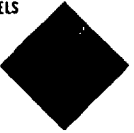
Common Synonyms		Solid	Yellow	Odorless
		Sinks and mixes with water		
Fire	Not flammable			
Exposure	SOLID Harmful if swallowed			
Water Pollution	Effects of low concentrations on aquatic life unknown May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4 Inert and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: Na ₄ Fe(CN) ₆ 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow 4.3 Odor: Odorless		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Not required except for eye irritation, which should be treated by flushing with water				
5.2 Symptoms Following Exposure: Not specified				
5.3 Treatment for Exposure: None required except for eye irritation, which should be treated by flushing with water				
5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent				
5.5 Short-Term Inhalation Limits: Not pertinent				
5.6 Toxicity by Ingestion: Grade III Dermal Irritant				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Not applicable				
5.9 Liquid or Solid Irritant Characteristics: Not applicable				
5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable		8. WATER POLLUTION 8.1 Aquatic Toxicity: 540mg/L * daphnia magna toxic conc. fresh water * Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD) 0 lb/lb 8.4 Food Chain Concentration Potential None	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. American Cyanamid Co. Industrial Chemicals & Plastics Division Wayne, N. J. 07470 2. E.I. du Pont de Nemours and Co. 147 Madison Ave. New York, N. Y. 10017	
		10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3 NN		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 424.04 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 4.88 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed			
NOTES			

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SDH

SODIUM HYDRIDE

Common Synonyms	Powder metal Grease Kerosene odor Reacts violently with water. Flammable gas is produced.
Fire	FLAMMABLE MAY EXPLODE ON CONTACT WITH WATER
Exposure	SOLID Will burn skin and eyes. Harmful if swallowed.
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 445.4 Issue warning of high flame and ... Resistances ... Should be removed. Chemical and physical treatment.	2. LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Sodium hydride 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: NaH 3.4 IMCO United Nations Numerical Designation: 4.1, 4.2	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Gray 4.3 Odor: Kerosene
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Face shield, other gloves 5.2 Symptoms Following Exposure: Metallic taste in mouth, ... 5.3 Treatment for Exposure: INGESTION: ... 5.4 Toxicity by Inhalation (Threshold Limit Value): ... 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Dermal irritant 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: ... 5.10 Odor Threshold: Not pertinent	

6. FIRE HAZARDS 6.1 Flash Point: ... 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: ... 6.4 Fire Extinguishing Agents Not to be Used: ... 6.5 Special Hazards of Combustion Products: ... 6.6 Behavior in Fire: ... 6.7 Ignition Temperature: ... 6.8 Electrical Hazard: ... 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: ... 8.2 Waterflow Toxicity: ... 8.3 Biological Oxygen Demand (BOD): ... 8.4 Food Chain Concentration Potential: ...
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: ... 7.2 Reactivity with Common Materials: ... 7.3 Stability During Transport: ... 7.4 Neutralizing Agents for Acids and Caustics: ... 7.5 Polymerization: ... 7.6 Inhibitor of Polymerization: ...	9. SELECTED MANUFACTURERS
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 445.4 RR	10. SHIPPING INFORMATION 10.1 Grades or Purities: ... 10.2 Storage Temperature: ... 10.3 Inert Atmosphere: Must be dry 10.4 Venting: Pressure-relieving
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: ... 12.2 NAS Hazard Rating for Bulk Water Transportation: ... 12.3 NFPA Hazard Classifications: ...	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: ... 13.2 Molecular Weight: Not applicable 13.3 Boiling Point at 1 atm: ... 13.4 Freezing Point: ... 13.5 Critical Temperature: ... 13.6 Critical Pressure: ... 13.7 Specific Gravity: ... 13.8 Liquid Surface Tension: ... 13.9 Liquid-Water Interfacial Tension: ... 13.10 Vapor (Gas) Specific Gravity: ... 13.11 Ratio of Specific Heats of Vapor (Gas): ... 13.12 Latent Heat of Vaporization: ... 13.13 Heat of Combustion: ... 13.14 Heat of Decomposition: ... 13.15 Heat of Solution: ... 13.16 Heat of Polymerization: ...
NOTES ...	

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SHS

SODIUM HYDROSULFIDE SOLUTION

Common Synonyms Sodium hydrosulfide Sodium hydrosulfate Sodium hydrogen sulfide		Liquid	Light yellow to red	Rotten egg odor
		Mixes with water		
Fire		Not flammable		
Exposure		LIQID Irritating to skin and eyes. If swallowed will cause nausea, vomiting, or loss of consciousness.		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if all waters water intakes.		
1. RESPONSE TO DISCHARGE See Response to Discharge Manualbook, CG 446-1. Issue warning - water contamination contaminant Restrict access Dispose and flush		2. LABELS No label required by Code of Federal Regulation		
3. CHEMICAL DESIGNATIONS 3.1 Synonym: Sodium hydrosulfide Sodium hydrogen sulfide NaHS sulfhydrate 3.2 Coast Guard Compatibility Classification: To be developed 3.3 Chemical Formula: $\text{NaSH} \cdot \text{H}_2\text{O}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid Aqueous solution 4.2 Color: Light green to pale yellow amber to dark red 4.3 Odor: Rotten eggs		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber protective equipment such as apron, gloves, splash proof goggles, gloves, canister type respirator in case of unaided breathing apparatus. 5.2 Symptoms Following Exposure: Inhalation of mist causes irritation to respiratory tract and possible asphyxiation; breathing high concentration gas which may be asphyxiant. If inhaled and present causes headache, dizziness, nausea, vomiting, continued exposure can lead to loss of consciousness, respiratory failure, and death. Liquid causes marked eye irritation, itching, inflammation, swelling, and conjunctivitis causing burning of vision; the most common effect is conjunctivitis. Light may increase the potential effects. Contact of liquid with skin causes irritation and corrosion. Prolonged exposure may cause dermatitis. Ingestion causes severe burning and corrosion. Irritation of the gastrointestinal tract, pain in the throat and abdomen, nausea, and vomiting, followed by diarrhea. In severe cases collapse, unconsciousness, and paralysis. Respiration may be expected. 5.3 Treatment for Exposure: INHALATION: move victim from contaminated atmosphere. All physician if breathing has ceased, start mouth to mouth resuscitation. EYES: immediately flush with large quantities of running water for 15 minutes. If severe, obtain medical attention as soon as possible while awaiting instructions from physician, patient may be kept in a dark room and ice compresses applied to the eyes and forehead. SKIN: immediately flush affected areas with water, obtain medical attention. Irritation on persons. INGESTION: obtain medical attention as soon as possible. If patient is conscious, induce vomiting by giving large amounts of water or warm salty water (2 tablespoons of table salt to a pint of water). If this measure is unsuccessful, vomiting may be induced by sticking the back of patient's tongue with a finger. Vomiting should be encouraged until the vomitus is clear.				

6 FIRE HAZARDS

- 6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Not pertinent
6.6 Behavior in Fire: Not pertinent
6.7 Ignition Temperature: Not pertinent
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: 20 mg/l 96 hr LC50 for fish (11 p.p.m. fresh water)
8.2 Waterway Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): Data not available
8.4 Food Chain Concentration Potential: None

9 SELECTED MANUFACTURERS

1. Stauffer Chemical Company
Industrial Chemical Division
Westport, Conn. 06880
2. Pitts Industries, Incorporated
Industrial Chemical Division
One Gateway Center
Pittsburgh, Pa. 15222
3. Chemical Products Corporation
King Philip Rd.
East Providence, R.I. 02943

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials: Corrosive to metals but reaction is not hazardous
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Flush with water
7.5 Polymerization: No pertinent
7.6 Inhibitor of Polymerization: No pertinent

10 SHIPPING INFORMATION

- 10.1 Grades or Purities: 40% solution in water
10.2 Storage Temperature: 20-60 F
10.3 Inert Atmosphere: Not pertinent
10.4 Venting: A pressure valve

1 HAZARD ASSESSMENT CODE

See Hazard Assessment Manualbook, CG 446-3
A.P.

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
12.2 NAS Hazard Rating for Bulk Water Transportation:
- | Category | Rating |
|--------------------------|--------|
| Fire | 1 |
| Health | 1 |
| Vapor Irritant | 1 |
| Liquid or Solid Irritant | 4 |
| Pressure | 4 |
| Water Pollution | 1 |
| Human Toxicity | 1 |
| Aquatic Toxicity | 1 |
| Yes/No Effect | 1 |
| Reactivity | 1 |
| Other Chemicals | 1 |
| Water | 1 |
| Self-Reactivity | 1 |
- 12.3 NFPA Hazard Classifications: Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 25°C and 1 atm: Liquid
13.2 Molecular Weight: Not pertinent
13.3 Boiling Point at 1 atm: 100°C (212°F)
13.4 Freezing Point: 100°C (212°F)
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 1.04 at 20°C (68°F)
13.8 Liquid Surface Tension: Data not available
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Not pertinent
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

5 HEALTH HAZARDS (Cont.)

- If patient is unconscious, do not give anything but ensure there is no obstruction to breathing. The tongue should be kept forward and false teeth removed. If will be less likely to aspirate vomitus if he is placed in a face down position.
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available
5.5 Short-Term Inhalation Limits: Data not available
5.6 Toxicity by Ingestion: Grade 2.1 D.O.S. to 5 g/kg
5.7 Late Toxicity: Data not available
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary.
5.9 Liquid or Solid Irritant Characteristics: Early severe irritation. May cause pain and severe degree burn after a few minutes contact.
5.10 Odor Threshold: 0.0047 ppm

(continued on page 2)

SHD

SODIUM HYDROXIDE

Common Synonyms Caustic soda Lye		Solid flakes or pellets	White	Odorless
		Sinks and mixes with water		
Fire		Not flammable May cause fire on contact with combustibles Flammable gas (H ₂) is produced on contact with metals		
Exposure		DUST Irritating to eyes, nose and throat SOLID Will burn skin and eyes Harmful if swallowed		
Water Pollution		Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes		
1 RESPONSE TO DISCHARGE See Response Methods Manual, Vol. 6, 600-4 Toxic with H ₂ gas May be used Toxic to land life		2. LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Caustic soda 3.2 Coast Guard Compatibility Classification: N 3.3 Chemical Formula: NaOH 3.4 IMCO United Nations Numerical Designation: 1512		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: (X)		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: (X) Safety glasses, gloves, and a respirator should be worn when handling this material. 5.2 Symptoms Following Exposure: (X) Irritation of the eyes, nose, and throat. (X) INHALATION: May cause severe irritation of the respiratory tract. (X) INGESTION: May cause severe irritation of the mouth and throat. (X) SKIN CONTACT: May cause severe irritation of the skin. 5.3 Treatment for Exposure: (X) INHALATION: Remove the person to fresh air. (X) INGESTION: Do not induce vomiting. (X) SKIN CONTACT: Wash the affected area with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 mg/m ³ 5.5 Short-Term Inhalation Limits: 150 mg/m ³ 5.6 Toxicity by Ingestion: (10% solution) oral rabbit LD ₅₀ = 500 mg/kg 5.7 Late Toxicity: (X) 5.8 Vapor (Gas) Irritant Characteristics: (X) 5.9 Liquid Solid Irritant Characteristics: (X) Severe irritation of the skin. (X) Severe irritation of the eyes. 5.10 O ₄ : (X) Irritant				

6 FIRE HAZARDS

- 6.1 Flash Point: (X)
6.2 Flammable Limits in Air: (X)
6.3 Fire Extinguishing Agents: (X)
6.4 Fire Extinguishing Agents Not to be Used: (X)
6.5 Special Hazards of Combustion Products: (X)
6.6 Behavior in Fire: (X)
6.7 Ignition Temperature: (X)
6.8 Electrical Hazard: (X)
6.9 Burning Rate: (X)

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: (X)
8.2 Waterway Toxicity: (X)
8.3 Biological Oxygen Demand (BOD): (X)
8.4 Food Chain Concentration Potential: (X)

9 SELECTED MANUFACTURERS

D. M. S. Co.
F. M. S. Co.
D. M. S. Co.
D. M. S. Co.
M. M. S. Co.
P. M. S. Co.
F. M. S. Co.
M. M. S. Co.

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: (X)
7.2 Reactivity with Common Materials: (X)
7.3 Stability During Transport: (X)
7.4 Neutralizing Agents for Acids and Cautics: (X)
7.5 Polymerization: (X)
7.6 Inhibitor of Polymerization: (X)

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: (X)
10.2 Storage Temperature: (X)
10.3 Inert Atmosphere: (X)
10.4 Venting: (X)

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Manual, Vol. 6, 600-4
(X)

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: (X)
12.2 NAS Hazard Rating for Bulk Water Transportation: (X)
12.3 NFPA Hazard Classifications:
Category: (X)
Classification: (X)

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: (X)
13.2 Molecular Weight: (X)
13.3 Boiling Point at 1 atm: (X)
13.4 Freezing Point: (X)
13.5 Critical Temperature: (X)
13.6 Critical Pressure: (X)
13.7 Specific Gravity: (X)
13.8 Liquid Surface Tension: (X)
13.9 Liquid-Water Interfacial Tension: (X)
13.10 Vapor (Gas) Specific Gravity: (X)
13.11 Ratio of Specific Heats of Vapor (Gas): (X)
13.12 Latent Heat of Vaporization: (X)
13.13 Heat of Combustion: (X)
13.14 Heat of Decomposition: (X)
13.15 Heat of Solution: (X)
13.16 Heat of Polymerization: (X)

NOTES

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SHC

SODIUM HYPOCHLORITE

Common Synonyms: (Chemical Abstracts)		Waters: liquid Green to yellow Bleaching liquid odor Sinks and mixes with water	
Fire		Not flammable	
Exposure		LIQUID Irritating to skin and eye. Harmful if swallowed	
Water Pollution		Harmful to aquatic life at very low concentrations. May be dangerous if it enters water bodies	
1 RESPONSE TO DISCHARGE See Response Methods Manual, 1-2-66-4 Evacuate area. Do not touch.		2 LABELS No label (Hazardous by Federal Regulations)	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Liquid bleach 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: NaOCl 3.4 IMCO United Nations Numerical Designation: 1519		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Greenish-yellow 4.3 Odor: Bleach-like odor	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves 5.2 Symptoms Following Exposure: Irritation to skin and eyes 5.3 Treatment for Exposure: INGESTION: Induce vomiting and give milk or water. EYE: Flush with water. SKIN: Wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not known 5.5 Short-Term Inhalation Limits: Not known 5.6 Toxicity by Ingestion: Grade I, oral rat LD50 = 8.91 g/kg 5.7 Late Toxicity: Not known 5.8 Vapor (Gas) Irritant Characteristics: Not known 5.9 Liquid or Solid Irritant Characteristics: Not known 5.10 Odor Threshold: Not known			
6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not applicable 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: May decompose, generating irritating fumes 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable			
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: Not reactive 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Destroy with acid and neutralize with water and water then neutralize with alkali 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent			
8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None			
9 SELECTED MANUFACTURERS 1. The Chlorine Co. One East 14th St. New York, N.Y. 2. The Chlorine Co. One East 14th St. New York, N.Y. 3. The Chlorine Co. One East 14th St. New York, N.Y.			
10 SHIPPING INFORMATION 10.1 Grades or Purity: Not applicable 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure vacuum			
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, 1-2-66-4 A P			
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed			
13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not applicable 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: Not applicable 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not applicable 13.16 Heat of Polymerization: Not pertinent			
NOTES			

REVISED 1978

SML	SODIUM METHYLATE
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Common Synonyms Sodium methoxide		Solid	White	Colorless
		Mixes with water		
		FLAMMABLE		
Exposure		DUST Irritating to eyes, nose and throat		
		SOLID Irritating to skin and eyes. Harmful if swallowed.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE See Response Methods Manual C6-684-4 Issue washing - High flammability. Self-healing. Reactive action. Disperse and flush.		2 LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonym: Sodium methoxide 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: CH ₃ ONa 3.4 IMCO/United Nations Chemical Designation: 1 + 1A		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Self-contained breathing apparatus, self-contained eye protection, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation - Mild irritation; severe effects with nose and throat contact with eyes which causes severe irritation and pain. Ingestion - Irritation of mouth and stomach. 5.3 Treatment for Exposure: Get medical attention immediately as exposure to this compound INHALATION requires immediate administration of first aid and may require hospitalization. The treatment other than giving as much liquid as patient is able to swallow. If time has apparently elapsed give a first aid report. If any further danger should be identified or experienced persons MUST wash with water then with 1% sodium bicarbonate solution and add small water washes. SKIN - Wash well with water then with dilute vinegar. INGESTION - Systemic symptoms indicate continuing administration of gastric lavage until no further response followed by repeat water washes. Seek medical attention if symptoms of poisoning develop. Keep victim calm and covered until all visible signs have disappeared and no possibility of further absorption remaining. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.				

6 FIRE HAZARDS	6.1 Flash Point: Not pertinent (Not flammable liquids) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry chemical agent powder is used as a method of extinguishing a fire disaster. 6.4 Fire Extinguishing Agents Not to be Used: Water 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Combustion is violent and produces a large volume of smoke and a large amount of heat. 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazards: Not pertinent 6.9 Burning Rate: Not pertinent	7 CHEMICAL REACTIVITY	7.1 Reactivity with Water: Produces a violent reaction and a large amount of heat. 7.2 Reactivity with Common Materials: A violent reaction occurs with acids and bases. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Water, sodium hydroxide, and ammonia. 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	8 WATER POLLUTION	8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None	9 SELECTED MANUFACTURERS	Hartwell Chemical Company Industrial Chemical Department 941 East 17th Street Cleveland, Ohio 44115 Chemical Corporation 201 East 17th Street Cleveland, Ohio 44115 Chemical Corporation 201 East 17th Street Cleveland, Ohio 44115	10 SHIPPING INFORMATION	10.1 Grades or Purity: N/A 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Flammable liquid 10.4 Venting: Safety relief	11 HAZARD ASSESSMENT CODE	See Hazard Assessment Handbook, Chapter 3	12 HAZARD CLASSIFICATIONS	12.1 Code of Federal Regulations: Flammable liquid 12.2 NFPA Hazard Rating for Bulk Water Transport: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES	13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 142.1 13.3 Boiling Point at 1 atm: Not pertinent 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: Not pertinent 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
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6 FIRE HAZARDS 6.1 Flash Point: Not flammable, but may intensify fire* 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Apply plenty of water to adjacent fires. Cool exposed containers with water. 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fires. 6.6 Behavior in Fire: May increase intensity of fire if in contact with combustible material. May melt and flow at elevated temperatures. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8 WATER POLLUTION 8.1 Aqueous Toxicity: 17.1 ppm, 24 hr. minnow, no effect* Fresh water. 7.5 ppm, 48 hr. mosquitofish, TL_m fresh water. 8.2 Waterflow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Allico Chemical Corp. Specialty Chemicals Div. P. O. Box 687R Morristown, N. J. 07960 2. J. T. Baker Chemical Co. Phillipsburg, N. J. 08865 3. Fisher Scientific Co. 711 Forbes Ave. Pittsburgh, Pa. 15219
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	10 SHIPPING INFORMATION 10.1 Grades or Purity: USP Reagent. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Solid oxidizing material. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 69. 13.3 Boiling Point at 1 atm: (decomposes) >608°F = >320°C = >593°K. 13.4 Freezing Point: 520°F = 271°C = 544°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.17 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.

(Continued on pages 5 and 6)

NOTES

SOX

SODIUM OXALATE

Common Synonyms Ethanedioic acid disodium salt		Solid	White	Odorless
		Sinks and mixes slowly in water		
Fire		Not flammable		
 Exposure		DUST Irritating to eyes, nose and throat. If inhaled will cause difficult breathing or loss of consciousness. SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed will cause nausea, vomiting or loss of consciousness.		
Water Pollution		Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant. Disperse and flush.		2 LABELS No hazard label required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ethanedioic acid Sodium salt 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $\text{Na}_2\text{C}_2\text{O}_4$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation or ingestion causes pain in throat, esophagus, and stomach; mucous membranes turn white; other symptoms include vomiting, severe purring, weak pulse, cardiovascular collapse, neuromuscular symptoms, and kidney damage. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: If promptly INHALED, move to fresh air; if exposure to dust is severe, get medical attention. If INGESTION, give diluted lemon juice, lime water, or milk; administer gastric lavage; consult physician with toxicology of the pharynx and delivery of construction of esophagus. EYES or SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion (Grade 3 LD ₅₀): 500 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 6.1 Flash Point Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 1-150 ppm/48 hr/mosquit fish, 11 m, fresh water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 10%, 5 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 J. T. Baker Chemical Co. Philipsburg, N. J. 08865 2 Fisher Scientific Co. 41 Forbes Ave. Pittsburgh, Pa. 15219 3 Gallard-Schlesinger Chemical Mfg. Co. 584 Mincola Ave. Carle Place, N. Y. 11514
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent Primary standard grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) H-SS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 134.0 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.27 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 U.S. Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
Continued on pages 4 and 5	
NOTES	

SPP

SODIUM PHOSPHATE

Common Synonyms	Solid (powder or granules)	White	Odorless
	Sinks and mixes with water		
Fire	Not flammable		
Exposure	DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.		
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Disperse and flush.	2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Sodium phosphate is generic term and includes the following: (1) monosodium phosphate (MSP, sodium phosphate, monobasic); (2) disodium phosphate (DSP, sodium phosphate dibasic); (3) trisodium phosphate (TSP, sodium phosphate, tribasic); (4) sodium acid pyrophosphate (ASPP, SAPP, disodium dihydrogen pyrophosphate); (5) tetrasodium pyrophosphate (TSPP). (Continued on page 4)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Granular or powdered solid; some may appear glassy. 4.2 Color: White. 4.3 Odor: None.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: U.S. Bu. Mines toxic dust mask, protective gloves, chemical eye goggles, full cover clothing. 5.2 Symptoms Following Exposure: Inhalation of heavy dust may irritate nose and throat. Ingestion may irritate mouth, throat, and gastrointestinal tract, resulting in nausea, vomiting, cramps, and diarrhea; pain and burning in mouth may occur. Contact with eyes produces local irritation, can lead to chemical damage. Contact with skin produces local irritation; repeated or prolonged contact can lead to dermatitis. 5.3 Treatment for Exposure: If the following measures do not eliminate the symptoms, see a physician. INHALATION: Give large amounts of water or warm salty water to induce vomiting; repeat until vomitus is clear. milk, eggs, or olive oil may then be given to soothe the stomach. EYES: Immediately flush with large amounts of water for at least 15 min., holding eyes apart to ensure flushing of entire surface; avoid chemical neutralizers. SKIN: Flush with water; avoid chemical neutralizers. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.			

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: May melt with loss of steam. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 120 ppm, 72 hr. daphnia magna, 11 pH, fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: All dissolve readily. MSP and ASPP form weakly acidic solutions. TSP forms strong caustic solution similar to soda lye. TSPP forms weakly alkaline solution. 7.2 Reactivity with Common Materials: When wet, mild steel or brass may be corroded by MSP, ASPP, and TSP. The others are not considered corrosive. 7.3 Stability During Transport: All forms of sodium phosphate are stable. TSP tends to pick up moisture from air and form a hard cake. 7.4 Neutralizing Agents for Acids and Caustics: For those sodium phosphates that form acidic or basic solutions, dilution with water removes hazard. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Stauffer Chemical Co. Industrial Chemical Division Westport, Conn. 06880 2. I.M.C. Corporation Inorganic Chemicals Div. 633 Third Avenue New York, N.Y. 10017 3. Monsanto Company 800 North Lindbergh Blvd. St. Louis, Mo. 63166.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) NS	10. SHIPPING INFORMATION 10.1 Grades or Purity: All are available in Technical Grade; some in Food Grade and Reagent Grade. Some are available as hydrates as well as anhydrous forms. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: Values for anhydrous salts run from 120 to high polymer values. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.8 to 2.5 at 25°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: +83 to -81 Btu/lb = +46 to -45 cal/g = +193 to -188 x 10 ³ J/kg. 13.16 Heat of Polymerization: Not pertinent. (Continued on page 5 and 6)
3. CHEMICAL DESIGNATIONS (Cont'd.) (6) sodium metaphosphate (insoluble sodium metaphosphate); (7) sodium trimetaphosphate; (8) sodium hexametaphosphate; and (9) sodium tripolyphosphate (STPP, TPP). 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formulas: (1) NaH ₂ PO ₄ ; (2) NaH ₂ HPO ₄ ; (3) NaHPO ₃ ; (4) Na ₂ H ₂ P ₂ O ₇ ; (5) Na ₂ P ₂ O ₇ ; (6) (NaPO ₃) _n ; (7) (NaPO ₃) _n ; (8) (NaPO ₃) _n NaO; (9) Na ₆ P ₆ O ₁₈ . 3.4 IMCO/United Nations Numerical Designation: Not listed.	NOTES

SSC

SODIUM SILICATE

Common Synonyms Water glass Soluble glass		Thick board	Colorless	Odorless
Sinks and mixes with water				
SEE SECTION 10 FOR Neutralizing Agent: Ammonia or sodium hydroxide Neutralizing Agent: Ammonia or sodium hydroxide				
Fire	Not flammable			
Exposure	CALIFORNIA DECADE LIQUID Harmful if swallowed IF SWALLOWED: Drink plenty of water. Do not induce vomiting. DO NOT INDUCE VOMITING.			
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes Not recommended for use in water intakes Not recommended for use in water intakes			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Water glass Soluble glass 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: Na_2SiO_3 , Na_2SiO_4 , H_2O 3.4 IMCO United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): High viscosity liquid 4.2 Color: Colorless 4.3 Odor: Odorless		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: If large doses are ingested, some irritation of mucous membranes may occur, similar to that caused by caustic soda solution. 5.3 Treatment for Exposure: INGESTION (large doses): Give water or milk. Do NOT induce vomiting. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 2 (US to Sp. ketumini) 5.7 Lete Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Non-irritating 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point Not flammable 6.2 Flammable Limits in Air Not flammable 6.3 Fire Extinguishing Agents Not pertinent 6.4 Fire Extinguishing Agents Not to be Used Not pertinent 6.5 Special Hazards of Combustion Products Not pertinent 6.6 Behavior in Fire Not pertinent 6.7 Ignition Temperature Not flammable 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate Not flammable	8 WATER POLLUTION 8.1 Aquatic Toxicity 2120 ppm 96-hr. mosquitofish 14 m. fresh water 8.2 Waterfowl Toxicity Data not available 8.3 Biological Oxygen Demand (BOD) None 8.4 Food Chain Concentration Potential None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water No reaction 7.2 Reactivity with Common Materials No reaction 7.3 Stability During Transport Stable 7.4 Neutralizing Agents for Acids and Caustics Not pertinent 7.5 Polymerization Not pertinent 7.6 Inhibitor of Polymerization Not pertinent	9 SELECTED MANUFACTURERS 1. Diamond Shamrock Chemical Co. 170 Superior Ave. Cleveland, Ohio 44114 2. E. I. duPont de Nemours & Co., Inc. Industrial and Biochemicals Dept. Wilmington, Del. 19898 3. Philadelphia Quartz Co. Public Ledger Bldg. Philadelphia, Pa. 19106
	10 SHIPPING INFORMATION 10.1 Grades or Purity A wide variety of grades, which differ in concentration of sodium silicate in water, in specific gravity, and in viscosity. 10.2 Storage Temperature Ambient 10.3 Inert Atmosphere No requirement 10.4 Venting Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm Liquid 13.2 Molecular Weight Not applicable 13.3 Boiling Point at 1 atm Decomposes 13.4 Freezing Point Not pertinent 13.5 Critical Temperature Not pertinent 13.6 Critical Pressure Not pertinent 13.7 Specific Gravity 1.1-1.7 at 20°C (liquids) 13.8 Liquid Surface Tension Not pertinent 13.9 Liquid-Water Interfacial Tension Not pertinent 13.10 Vapor (Gas) Specific Gravity Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas) Not pertinent 13.12 Latent Heat of Vaporization Not pertinent 13.13 Heat of Combustion Not pertinent 13.14 Heat of Decomposition Not pertinent 13.15 Heat of Solution (solid) = -20 Btu/lb = -10 kcal/g = -0.4 x 10³ J/kg 13.16 Heat of Polymerization Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation Not listed 12.3 NFPA Hazard Classifications Not listed	(Continued on pages 4 and 5)
NOTES	

SFR

SODIUM SILICOFLUORIDE

Common Synonyms Sodium fluoride Sodium hexafluoroarsate Salfer		Solid	White	Odorless
Sinks in water				
Fire		Not flammable		
		DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing.		
Exposure		SOLID POISONOUS IF SWALLOWED Will burn skin and eyes. If swallowed will cause nausea, vomiting, loss of consciousness. EYES: Flush with water for at least 15 min. SKIN: Flush with water, wash with soap and water.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Issue warning, water contaminant. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Salfer, Sodium fluoride, Sodium hexafluoroarsate. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: NaSiF ₆ . 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid. 4.2 Color: White. 4.3 Odor: None.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator, goggles or face shield, protective gloves. 5.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Ingestion causes symptoms similar to fluoride poisoning; compound is highly toxic. Initial symptoms include nausea, cramps, vomiting, diarrhea, and dehydration; in severe cases, convulsions, shock, and cyanosis are followed by death in 2-4 hr. Contact with eyes causes irritation. Contact with skin causes rash, redness, and burning, sometimes followed by ulcer formation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: seek medical attention; administer gastric lavage with lime water, then give lime water or milk at frequent intervals. EYES: flush with water for at least 15 min. SKIN: flush with water, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 2 mg/m ³ (as fluoride). 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade III (LD ₅₀ 500 mg/kg). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Decomposes at red heat. 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterlow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Cardiner, Inc. P.O. Box 3269 Tampa, Fla. 33601 2. Fisher Scientific Co. 711 Forbes Ave. Pittsburgh, Pa. 15219 3. Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902	
		10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 98+%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-2.) II		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 188. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 2.68 at 20°C (solid). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.		NOTES	

(continued on pages 4 and 5)

SDS

SODIUM SULFIDE

Common Synonyms	Solid flakes Yellow to red Rotten eggs odor Sinks and mixes with water
Fire	Combustible POISONOUS GAS MAY BE PRODUCED IN FIRE Flammable, poisonous gas is formed on contact with acids and oxidizing agents.
Exposure	POISON Irritating to eyes, nose and throat SOLID Harmful if swallowed
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods HAZRD004, CG 446-3) Issue warning - corrosive Protect rivers Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: Na_2S 3.4 IMCO United Nations Numerical Designation: 4.2 (3)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow to light red 4.3 Odor: Rotten eggs
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: Cautious skin and eye irritation - irritate both 5.3 Treatment for Exposure: INGESTION: give water or induce vomiting called for SKIN OR EYE CONTACT: flush with water for 15 min 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Toxic, LD ₅₀ Strongly Corrosive 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not applicable 5.9 Liquid or Solid Irritant Characteristics: Irritant skin and mucous membranes 5.10 Odor Threshold: Not pertinent	

6. FIRE HAZARDS 6.1 Flash Point: Moderately flammable solid 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards or Combustion Products: Irritating sulfur dioxide is produced in fire 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.1 ppm, 48 hr. Blue/green/silky film fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Allied Chemical Corp. Specialty Chemicals Division Maine Hook Pl. 09041 2. EMI Corp. Organic Chemicals Division 600 Third Ave. New York, N.Y. 10017 3. Mohl Oil Corp. North American Division Paulsboro, N.J. 08052								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	10. SHIPPING INFORMATION 10.1 Grades or Purity: Crystals 99.6% plus water based chips 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable solid 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 78.04 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.88 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Heat of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	2								
Reactivity (Yellow)	2								
NOTES									

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SSF

SODIUM SULFITE

Common Synonyms		Solid	Colorless	Odorless
		Sinks and moves slowly with water		
Fire	Not flammable			
Exposure	SO ₂ IDS Irritation may cause loss of consciousness (See Response Methods Handbook, CG 444-3)			
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-3 Is a water-polluting water contamination Disperse and flush		2. LABELS No hazard labels required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification Not applicable 3.3 Chemical Formula: Na ₂ SO ₃ 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Odorless		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Dust mask, goggles or face shield				
5.2 Symptoms Following Exposure: When ingested solid may cause a strong irritant in the mouth, throat, stomach and bowels. Reactions might include nausea, vomiting, diarrhea, and other large doses may result in pulmonary edema, pulmonary hemorrhage, central nervous system depression, and death.				
5.3 Treatment for Exposure: INGESTION: Flush mouth with water. Do not apply first aid.				
5.4 Toxicity by Inhalation (Threshold Limit Value): No pertinent				
5.5 Short-Term Inhalation Limits: No pertinent				
5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ (See Note)				
5.7 Late Toxicity: None				
5.8 Vapor (Gas) Irritant Characteristics: No pertinent				
5.9 Liquid or Solid Irritant Characteristics: No pertinent				
5.10 Odor Threshold: No pertinent				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point: Not flammable		8.1 Aquatic Toxicity: Irritation 24 hrs & 48 hrs in aquatic life Heavy fresh water	
6.2 Flammable Limits in Air: No pertinent		8.2 Waterflow Toxicity: No pertinent	
6.3 Fire Extinguishing Agents: No pertinent		8.3 Biological Oxygen Demand (BOD): 0.12 to 0.13 at various times	
6.4 Fire Extinguishing Agents Not to be Used: No pertinent		8.4 Food Chain Concentration Potential: No pertinent	
6.5 Special Hazards of Combustion Products: No pertinent			
6.6 Behavior in Fire: No pertinent			
6.7 Ignition Temperature: No pertinent			
6.8 Electrical Hazard: No pertinent			
6.9 Burning Rate: No pertinent			
7 CHEMICAL REACTIVITY		9 SELECTED MANUFACTURERS	
7.1 Reactivity with Water: No pertinent		Koppers Co. Inc. Olin Chemical Division Phillips Petroleum Co.	
7.2 Reactivity with Common Materials: No pertinent		2 Morton Co. Morton Chemical Co. 300 North 10th Street, Bldg. 1 St. Louis, Mo. 63102	
7.3 Stability During Transport: Stable		4 Ruppel Chemical Co. 201 E. 8th St. White Plains, N.Y. 10602	
7.4 Neutralizing Agents for Acids and Caustics: No pertinent			
7.5 Polymerization: No pertinent			
7.6 Inhibitor of Polymerization: No pertinent			

(continued on pages 1 and 4)

SCY

SODIUM THIOCYANATE

Common Synonyms Sodium sulfocyanate Sodium rhodanide Rhodanate	Solid Sinks and mixes with water	White	Odorless
Fire	Not flammable POISONOUS GASES MAY BE PRODUCED WHEN HEATED		
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea, vomiting or loss of consciousness		
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4.) Issue warning, water cont. instant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Rhodanate, Sodium rhodanide, Sodium sulfocyanate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: NaSCN 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None	
5. HEALTH HAZARDS			
5.1 Personal Protective Equipment: Rubber or plastic gloves, standard goggles, rubber or plastic apron			
5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion of large doses causes vomiting, extreme cerebral excitement, convulsions, and death in 10-48 hrs. Chronic poisoning can cause flu like symptoms, skin rashes, weakness, fatigue, vertigo, nausea, vomiting, diarrhea, confusion. Contact with eyes causes irritation. Prolonged contact with skin may produce various skin eruptions, dizziness, cramps, nausea, and mild to severe disturbance of the nervous system.			
5.3 Treatment for Exposure: INHALATION: move to fresh air; if exposure has been great, get medical attention. INGESTION: consult physician; hemodialysis is recommended as the treatment of choice. EYE: Flush with water for 15 min. SKIN: Flush with water for 15 min.			
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available			
5.5 Short-Term Inhalation Limits: Data not available			
5.6 Toxicity by Ingestion: Grade 2, LD ₅₀ 5.4 g/kg			
5.7 Late Toxicity: Causes birth defects in fish embryos			
5.8 Vapor (Gas) Irritant Characteristics: Data not available			
5.9 Liquid or Solid Irritant Characteristics: Data not available			
5.10 Odor Threshold: Data not available			

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Irritating, fumes of sulfur and nitrogen may form in fire. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 1240 ppm: 2 hr. fish killed, fresh water. > 400 ppm: 48 hr. green crab 11% mortality, salt water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Argus Chemical Corp. Haltersville, PA 900 Terminal Ave. New Castle, DE 19720 2. J. T. Baker Chemical Co. Phillipsburg, N.J. 08865 3. Fisher Scientific Co. 711 Forbes Ave. Pittsburgh, Pa. 15219.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.2.) N	10. SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 99% Reagent 99% 50% aqueous solutions in water. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid. 13.2 Molecular Weight: 76.06. 13.3 Boiling Point at 1 atm: Not pertinent (decomposes). 13.4 Freezing Point: -20°C = 30°F = -4°F. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: > 1 at 20°C (solids). 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: 14.9 Btu/lb = 19.4 cal/g = 0.812 x 10 ⁴ J/kg. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

SBT

SORBITOL

Common Synonyms Sorbitol Sorbit 1,2,3,4,5,6-Hexanediol D-Glucitol	Liquid Colorless Odorless Sinks and mixes with water
Fire	Not flammable
Exposure	LIQUID Will burn skin and eyes
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes
1 RESPONSE TO DISCHARGE See Response Methods Manual, CG 446.4 D 000 and 008	2. LABELS No hazard labels required (Other Labels as Required)
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: D-Glucose, Hexahydroxy-1,2,3,4,5,6-heptanose, 1,2,3,4,5,6-Hexanediol, N, N, N, N, N, N 3.2 Coast Guard Compatibility Classification: (000) 3.3 Chemical Formula: C ₆ H ₁₄ O ₆ 3.4 IMCO United Nations Numerical Designation: N/A	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: (0)
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: (000) 5.2 Symptoms Following Exposure: (000) 5.3 Treatment for Exposure: (000) 5.4 Toxicity by Inhalation (Threshold Limit Value): N/A 5.5 Short-Term Inhalation Limits: N/A 5.6 Toxicity by Ingestion: N/A 5.7 Late Toxicity: N/A 5.8 Vapor (Gas) Irritant Characteristics: N/A 5.9 Liquid or Solid Irritant Characteristics: N/A 5.10 Odor Threshold: N/A	

6 FIRE HAZARDS 6.1 Flash Point: 542°F O.C. 6.2 Flammable Limits in Air: No per cent 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Data not available 6.5 Special Hazards of Combustion Products: No per cent 6.6 Behavior in Fire: No per cent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: No per cent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 43,000 mg/l/day 8.4 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: No per cent 7.5 Polymerization: No per cent 7.6 Inhibitor of Polymerization: No per cent	9 SELECTED MANUFACTURERS B. F. Goodrich New Orleans, Louisiana New Mexico, B. F. Goodrich Wilmington, Delaware
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 446.1 A P 0	10 SHIPPING INFORMATION 10.1 Grades or Purity: USP, FCC, etc. 10.2 Storage Temperature: (000) 10.3 Inert Atmosphere: No reaction 10.4 Venting: Open flame protectors
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classification: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 182.17 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: 290°F (149°C) w/ 0.5% K 13.5 Critical Temperature: No per cent 13.6 Critical Pressure: No per cent 13.7 Specific Gravity: (000) (000) (000) 13.8 Liquid Surface Tension: No per cent 13.9 Liquid-Water Interfacial Tension: No per cent 13.10 Vapor (Gas) Specific Gravity: No per cent 13.11 Ratio of Specific Heats of Vapor (Gas): No per cent 13.12 Latent Heat of Vaporization: No per cent 13.13 Heat of Combustion: (000) (000) (000) 13.14 Heat of Decomposition: No per cent 13.15 Heat of Solution: (000) (000) (000) 13.16 Heat of Polymerization: No per cent
NOTES	

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SRA

STEARIC ACID

Common Synonyms Octadecanoic acid n-Octadecylic acid Stearophanic acid 1-Heptadecanecarboxylic acid		Solids	White	Mild odor
		Floats on water		
Fire		Combustible		
Exposure		DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. Harmful if swallowed.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE See Response Manuals Handbook, CG 446.4. Mechanical management Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Heptadecanecarboxylic acid; Octadecanoic acid; n-Octadecylic acid; Stearophanic acid. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: $\text{C}_{18}\text{H}_{36}\text{O}_2$ 3.4 IMCO/United Nations Numerical Designation: Not listed.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Fatty.		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: For prolonged exposure, respiratory and skin supplied mask or chemical cartridge respirator; impervious gloves; goggles; impervious boots. 5.2 Symptoms Following Exposure: Irritation; generally considered non-toxic. Inhalation irritates respiratory tract and bronchi. Dust causes mild irritation to eyes. 5.3 Treatment for Exposure: INGESTION: drink plenty of water; induce vomiting; if unconscious, do not induce vomiting. If swallowed, induce vomiting. If in contact with skin, wash with plenty of water. For irritation, seek medical attention. - SKIN: wash with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade II D - Slight risk. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: 20 ppm.				

6 FIRE HAZARDS 6.1 Flash Point: (in open solid) 410-435 F (210-280 C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: 740 F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD) 144% 5 days 8.4 Food Chain Concentration Potential None	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1 Union Camp Corp. 2041 N. Lane Avenue Jacksonville, Fla 32209 2 Ashland Chemical Co. P.O. Box 2219 Columbus, Ohio 43216 3 Evers Industries, Inc. 2400 Erie Avenue Cincinnati, Ohio 45232	
		10 SHIPPING INFORMATION 10.1 Grades or Purities: USP Commercial Triple pressed Double pressed 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Open	
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.3 II		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm. Solid 13.2 Molecular Weight: 284.48 13.3 Boiling Point at 1 atm.: Not pertinent (decomposes) 13.4 Freezing Point: 57.1 to 70.0 C (135 to 158 F) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.86 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension Not pertinent 13.10 Vapor (Gas) Specific Gravity Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas) Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 11,740 Btu/lb (44,400 kJ/kg) (calculated) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Category Classification Health Hazard (Blue) Flammability (Red) Reactivity (Yellow)			
NOTES			

SRS

SUCROSE

Common Synonyms Beet sugar Cane sugar Saccharose Saccharum Sugar		Solid	White	Odorless
Sinks in water				
Fire	Combustible			
Exposure	DUST Not harmful SOLID Not harmful			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444.4 Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Beet sugar, Cane sugar, Saccharose, Saccharum, Sugar 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_{12}H_{22}O_{11}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask and goggles or face shield 5.2 Symptoms Following Exposure: None 5.3 Treatment for Exposure: EYES: flush with water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1 oral LD ₅₀ (30 days) = 28,500 mg/kg/day (rat) 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS

- 6.1 Flash Point: Not pertinent (combustible solid).
 6.2 Flammable Limits in Air: Not pertinent.
 6.3 Fire Extinguishing Agents: Water.
 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent.
 6.5 Special Hazards of Combustion Products: Irritating fumes may form on fires.
 6.6 Behavior in Fire: Melts and chars.
 6.7 Ignition Temperature: Not pertinent.
 6.8 Electrical Hazards: Not pertinent.
 6.9 Burning Rate: Not pertinent.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: irritant effects from 1 g/l to 100 g/l.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): 60% in days.
 8.4 Food Chain Concentration Potential: None.

9 SELECTED MANUFACTURERS

1. Amstar Corporation
1251 Avenue of the Americas
New York, N.Y.
 2. Great Western Sugar Corp.
2530 16th Street
Denver, Colo.
 3. Revere Sugar Refining Co.
Prudential Center
Boston, Mass.

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Food grade Technical.
 10.2 Storage Temperature: Ambient.
 10.3 Inert Atmosphere: No requirements.
 10.4 Venting: Open.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 444.3)
 NS

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed.
 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed.
 12.3 NFPA Hazard Classifications: Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid.
 13.2 Molecular Weight: 342.3.
 13.3 Boiling Point at 1 atm: Not pertinent (decomposes).
 13.4 Freezing Point: (decomposes) -20 to -36°C = -160 to -186°C = -233 to -299°K .
 13.5 Critical Temperature: Not pertinent.
 13.6 Critical Pressure: Not pertinent.
 13.7 Specific Gravity: 1.59 at 20°C (solid).
 13.8 Liquid Surface Tension: Not pertinent.
 13.9 Liquid-Water Interfacial Tension: Not pertinent.
 13.10 Vapor (Gas) Specific Gravity: Not pertinent.
 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent.
 13.12 Latent Heat of Vaporization: Not pertinent.
 13.13 Heat of Combustion: 6,400 Btu/lb = 150 kcal/g = $150 \times 10^3 \text{ J/kg}$.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: Not pertinent.

(Continued on pages 5 and 6)

NOTES

SFL

SULFOLANE

Common Synonyms: Tetrahydrothiophene 1,1-dioxide Tetramethylene sulfone	Oily liquid Colorless Weak odor Solidifies and sticks and mixes with water. Freezing point 19.9°C
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE
Exposure	LIQUID Not irritating to skin Irritating to eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE See Response Methods Handbook, 11-444.4 DANGER	2. LABELS No hazard label required OSHA 1910.1200
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Sulfolane, W Tetrahydrothiophene 1,1-dioxide Tetramethylene sulfone 3.2 Coast Guard Compatibility Classification Sulfolane 3.3 Chemical Formula: <chem>C2H4CS2O</chem> 3.4 IMCO United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weak
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, gloves, and protective clothing 5.2 Symptoms Following Exposure: Irritation of eyes and skin 5.3 Treatment for Exposure: INGESTION: Induce vomiting. SKIN/ EYE CONTACT: Wash with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not known 5.5 Short-Term Inhalation Limits: Not known 5.6 Toxicity by Ingestion: Toxic if swallowed 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not known 5.9 Liquid or Solid Irritant Characteristics: Not known 5.10 Odor Threshold: Not known	

6. FIRE HAZARDS 6.1 Flash Point: Not known 6.2 Flammable Limits in Air: Not known 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not known 6.5 Special Hazards of Combustion Products: Not known 6.6 Behavior in Fire: Not known 6.7 Ignition Temperature: Not known 6.8 Electrical Hazard: Not known 6.9 Burning Rate: Not known	8. WATER POLLUTION 8.1 Aquatic Toxicity: Not known 8.2 Waterfowl Toxicity: Not known 8.3 Biological Oxygen Demand (BOD): Not known 8.4 Food Chain Concentration Potential: Not known																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not known 7.2 Reactivity with Common Materials: Not known 7.3 Stability During Transport: Not known 7.4 Neutralizing Agents for Acids and Caustics: Not known 7.5 Polymerization: Not known 7.6 Inhibitor of Polymerization: Not known	9. SELECTED MANUFACTURERS P. H. G. & Co. R. H. G. & Co. S. H. G. & Co. T. H. G. & Co. U. H. G. & Co. V. H. G. & Co. W. H. G. & Co. X. H. G. & Co. Y. H. G. & Co. Z. H. G. & Co.																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, 11-444.4 APO	10. SHIPPING INFORMATION 10.1 Grades or Purity: Not known 10.2 Storage Temperature: Not known 10.3 Inert Atmosphere: Not required 10.4 Venting: Open flame protectors																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not known 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Flammable</td> <td>Not known</td> </tr> <tr> <td>Health</td> <td>Not known</td> </tr> <tr> <td>Vapor Toxicity</td> <td>Not known</td> </tr> <tr> <td>Ingested Toxicity</td> <td>Not known</td> </tr> <tr> <td>Water Pollution</td> <td>Not known</td> </tr> <tr> <td>Reactivity</td> <td>Not known</td> </tr> <tr> <td>Stability</td> <td>Not known</td> </tr> <tr> <td>Waste</td> <td>Not known</td> </tr> <tr> <td>Other</td> <td>Not known</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not known	Category	Rating	Flammable	Not known	Health	Not known	Vapor Toxicity	Not known	Ingested Toxicity	Not known	Water Pollution	Not known	Reactivity	Not known	Stability	Not known	Waste	Not known	Other	Not known	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Not known 13.2 Molecular Weight: Not known 13.3 Boiling Point at 1 atm: Not known 13.4 Freezing Point: Not known 13.5 Critical Temperature: Not known 13.6 Critical Pressure: Not known 13.7 Specific Gravity: Not known 13.8 Liquid Surface Tension: Not known 13.9 Liquid-Water Interfacial Tension: Not known 13.10 Vapor (Gas) Specific Gravity: Not known 13.11 Ratio of Specific Heats of Vapor (Gas): Not known 13.12 Latent Heat of Vaporization: Not known 13.13 Heat of Combustion: Not known 13.14 Heat of Decomposition: Not known 13.15 Heat of Solution: Not known 13.16 Heat of Polymerization: Not known
Category	Rating																				
Flammable	Not known																				
Health	Not known																				
Vapor Toxicity	Not known																				
Ingested Toxicity	Not known																				
Water Pollution	Not known																				
Reactivity	Not known																				
Stability	Not known																				
Waste	Not known																				
Other	Not known																				
NOTES																					

REVISED 1978

SFD	SULFUR DIOXIDE
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SFD	SULFUR DIOXIDE
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Common Synonyms		Evaporated compressed gas Colorless Sharp irritating odor Liquid white and boils in water. Poisonous stable vapor cloud is produced	
Fire		Not flammable	
 Exposure		VAPOR "POISONOUS IF INHALED" LIQUID May cause frostbite	
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes	
1. RESPONSE TO DISCHARGE See response to discharge instructions on page 4 1.1 1.2 1.3 1.4		2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 3.2 Coast Guard Compatibility Classification 3.3 Chemical Formula: 4.2 Color: 4.3 Odor: 3.4 IMCO United Nations Numerical Designation:		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): 4.2 Color: 4.3 Odor:	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment 5.2 Symptoms Following Exposure 5.3 Treatment for Exposure: INHALATION 5.4 Toxicity by Inhalation (Threshold Limit Value): 5.5 Short-Term Inhalation Limits 5.6 Toxicity by Ingestion: 5.7 Late Toxicity: 5.8 Vapor (Gas) Irritant Characteristics: 5.9 Liquid or Solid Irritant Characteristics: 5.10 Odor Threshold:			

6 FIRE HAZARDS

- 6.1 Flash Point
- 6.2 Flammable Limits in Air
- 6.3 Fire Extinguishing Agents
- 6.4 Fire Extinguishing Agents Not to be Used
- 6.5 Special Hazards of Combustion Products
- 6.6 Behavior in Fire
- 6.7 Ignition Temperature
- 6.8 Electrical Hazard
- 6.9 Burning Rate

- ## 6 FIRE HAZARDS
- 6.1 Flash Point: N
 - 6.2 Flammable Limits in Air
 - 6.3 Fire Extinguishing Agents
 - 6.4 Fire Extinguishing Agents Not to be Used
 - 6.5 Special Hazards of Combustion Products
 - 6.6 Behavior in Fire
 - 6.7 Ignition Temperature
 - 6.8 Electrical Hazard
 - 6.9 Burning Rate

8 WATER POLLUTION

- 8.1 Aquatic Toxicity
- 8.2 Waterfowl Toxicity
- 8.3 Biological Oxygen Demand (BOD)
- 8.4 Food Chain Concentration Potential

- ### 8 WATER POLLUTION
- 8.1 Aquatic Toxicity
 - 8.2 Waterfowl Toxicity
 - 8.3 Biological Oxygen Demand (BOD)
 - 8.4 Food Chain Concentration Potential

9 SELECTED MANUFACTURERS

- ## 9 SELECTED MANUFACTURERS

7 CHEMICAL REACTIVITY

- 1 Reactivity with Water
- 2 Reactivity with Common Materials.
- 3 Stability During Transport.
- 4 Neutralizing Agents for Acids and Caustics.
- 5 Polymerization.
- 6 Inhibitor of Polymerization

- ## 7 CHEMICAL REACTIVITY
- 1 Reactivity with Water
 - 2 Reactivity with Common Materials.
 - 3 Stability During Transport.
 - 4 Neutralizing Agents for Acids and Caustics.
 - 5 Polymerization.
 - 6 Inhibitor of Polymerization

10 SHIPPING INFORMATION

*01 Grades or Purity: 99.9999%
99.9999%
99.9999%
99.9999%

*02 Storage Temperature: 100°C

*03 Inert Atmosphere: N₂

*04 Venting: Safety cap

- 10 SHIPPING INFORMATION**
- *01 Grades or Purity: *99.9999%*
- *02 Storage Temperature: *1 hour at 1*
- *03 Inert Atmosphere: *Nitrogen*
- *04 Venting: *Safety cap*

11 HAZARD ASSESSMENT CODE

11 HAZARD ASSESSMENT CODE

12. HAZARD CLASSIFICATIONS

12.1 Code of Federal Regulations.

12.2 KAS Hazard Rating for Bulk Waste Transportation:

12. HAZARD CLASSIFICATIONS
- 12.1 Code of Federal Regulations.
- 12.2 KAS Hazard Rating for Bulk Waste Transportation:

Category	Rating
1. <i>Chickadee</i>	
2. <i>Blue Jay</i>	4
3. <i>Downy Woodpecker</i>	
4. <i>Parula</i>	2
5. <i>Robin</i>	
6. <i>Red-bellied</i>	
7. <i>Starling</i>	
8. <i>Titmouse</i>	
9. <i>Tree Toad</i>	
10. <i>Worm-eating Warbler</i>	
11. <i>Yellow-rumped</i>	
12. <i>Mockingbird</i>	
13. <i>Kingbird</i>	

12.3 NEPA Hazard Classifications	
Category	Classification
1.1	Extremely Hazardous
1.2	Hazardous
2.1	Highly Hazardous
2.2	Hazardous
3.1	Extremely Hazardous
3.2	Hazardous
4.1	Extremely Hazardous
4.2	Hazardous
5.1	Extremely Hazardous
5.2	Hazardous
6.1	Extremely Hazardous
6.2	Hazardous
7.1	Extremely Hazardous
7.2	Hazardous
8.1	Extremely Hazardous
8.2	Hazardous
9.1	Extremely Hazardous
9.2	Hazardous
10.1	Extremely Hazardous
10.2	Hazardous
11.1	Extremely Hazardous
11.2	Hazardous
12.1	Extremely Hazardous
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14.1	Extremely Hazardous
14.2	Hazardous
15.1	Extremely Hazardous
15.2	Hazardous
16.1	Extremely Hazardous
16.2	Hazardous
17.1	Extremely Hazardous
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78.1	Extremely Hazardous
78.2	Hazardous

12.3 NEPA Hazard Classifications	
Category	Classification
1.1	Extremely Hazardous
1.2	Hazardous
2.1	Highly Hazardous
2.2	Hazardous
3.1	Extremely Hazardous
3.2	Hazardous
4.1	Extremely Hazardous
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78.1	Extremely Hazardous
78.2	Hazardous

- 13.1 Physical State at 15°C and 1 atm: $\dots$
- 13.2 Molecular Weight: $\dots$
- 13.3 Boiling Point at 1 atm: $\dots$
- 13.4 Freezing Point: $\dots$
- 13.5 Critical Temperature: $\dots$
- 13.6 Critical Pressure: $\dots$
- 13.7 Specific Gravity: $\dots$
- 13.8 Liquid Surface Tension: $\dots$
- 13.9 Liquid-Water Interfacial Tension: $\dots$
- 13.10 Vapor (Gas) Specific Gravity: $\dots$
- 13.11 Ratio of Specific Heats of Vapor (Gas): $\dots$
- 13.12 Latent Heat of Vaporization: $\dots$
- 13.13 Heat of Combustion: $\dots$
- 13.14 Heat of Decomposition: $\dots$
- 13.15 Heat of Solution: $\dots$
- 13.16 Heat of Polymerization: $\dots$

- 13.1 Physical State at 15°C and 1 atm: $\dots$
- 13.2 Molecular Weight: $\dots$
- 13.3 Boiling Point at 1 atm: $\dots$
- 13.4 Freezing Point: $\dots$
- 13.5 Critical Temperature: $\dots$
- 13.6 Critical Pressure: $\dots$
- 13.7 Specific Gravity: $\dots$
- 13.8 Liquid Surface Tension: $\dots$
- 13.9 Liquid-Water Interfacial Tension: $\dots$
- 13.10 Vapor (Gas) Specific Gravity: $\dots$
- 13.11 Ratio of Specific Heats of Vapor (Gas): $\dots$
- 13.12 Latent Heat of Vaporization: $\dots$
- 13.13 Heat of Combustion: $\dots$
- 13.14 Heat of Decomposition: $\dots$
- 13.15 Heat of Solution: $\dots$
- 13.16 Heat of Polymerization: $\dots$

1 meter, on page 1 and 2

NOTES

SFA

SULFURIC ACID

Common Synonyms Oil of vitriol Battery acid Fertilizer acid	Only liquid Colorless Odorless Sinks and mixes violently with water. Irritating if it is produced.
Fire	Not flammable. May cause fire on contact with combustibles. Flammable gas may be produced on contact with metals. POISONOUS GAS MAY BE PRODUCED IN FIRE.
Exposure	MIST Irritating to eyes, nose and throat. If inhaled, will cause coughing, difficult breathing, or loss of consciousness. LIQUID Will burn skin and eyes. Harmful if swallowed.
Water Pollution	HARMFUL TO AQUA LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response No. 1024 Handbook CG 446-3) Issue warning - corrosive. Restrict access. Disperse and flush with care.	2 LABEL 
3 CHEMICAL DESIGNATIONS 31 Synonyms Battery acid Chamber acid Fertilizer acid Oil of vitriol 32 Coast Guard Compatibility Classification Sulfuric acid 33 Chemical Formula H_2SO_4 34 IMCO/United Nations Numerical Designation 8.0/TS30	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped) Liquid 4.2 Color: Colorless (pure) to dark brown 4.3 Odor: Odorless unless hot, then choking
5. HEALTH HAZARDS 5.1 Personal Protective Equipment Safety shower, eyewash fountain, safety goggles, face shield, approved respirator or self-contained air line, rubber safety shoes, rubber apron. 5.2 Symptoms Following Exposure Inhalation of vapor from hot concentrated acid may injure lungs. Swallowing may cause severe internal damage. Contact with skin or eyes causes severe burns. 5.3 Treatment for Exposure Call a doctor for INFORMATION on severe victim for delayed pulmonary reaction. INGESTION: have victim drink water if possible, do NOT induce vomiting. EYES: AND SKIN: wash with large amounts of water for at least 15 min., do not use ointments or lotions on eyes, treat skin burns. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m. 5.5 Short-Term Inhalation Limits: 10 mg/m ³ for 5 min.; 2 mg/m ³ for 10 min.; 1 mg/m ³ for 30 min. 5.6 Toxicity by Ingestion No effects except for one second try to tissue damage. 5.7 Late Toxicity None. 5.8 Vapor (Gas) Irritant Characteristics Vapors from hot acid (177.9°) cause moderate irritation of eyes and respiratory system. Effect is temporary. 5.9 Liquid or Solid Irritant Characteristics 77.9° acid causes severe second and third degree burns if skin on short contact and is very numerous to the eyes. 5.10 Odor Threshold Greater than 1 mg/m.	

6 FIRE HAZARDS 6.1 Flash Point Not flammable. 6.2 Flammable Limits in Air Not flammable. 6.3 Fire Extinguishing Agents Not pertinent. 6.4 Fire Extinguishing Agents Not to be Used Water used on adjacent fires should be carefully handled. 6.5 Special Hazards of Combustion Products Not pertinent. 6.6 Behavior in Fire Not flammable. 6.7 Ignition Temperature Not flammable. 6.8 Electrical Hazard None. 6.9 Burning Rate Not flammable.	8 WATER POLLUTION 8.1 Aquatic Toxicity 24 hr. pp10/24 hr. bioassay lethal, fresh water 47 ppm/48 hr. prawn, 1% w salt water. 8.2 Waterfowl Toxicity Data not available. 8.3 Biological Oxygen Demand (BOD) None. 8.4 Food Chain Concentration Potential None.																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water Reacts violently with evolution of heat. Spattering occurs when water is added to the compound. 7.2 Reactivity with Common Materials Extremely hazardous in contact with many materials, particularly metals and combustibles. Dilute acid reacts with most metals, releasing hydrogen which can form explosive mixtures with air in confined spaces. 7.3 Stability During Transport Stable. 7.4 Neutralizing Agents for Acids and Caustics Dilute with water, then neutralize with lime, limestone, or soda ash. 7.5 Polymerization Not pertinent. 7.6 Inhibitor of Polymerization Not pertinent.	9. SELECTED MANUFACTURERS 1 Allied Chemical Corp. Industrial Chemical Division P.O. Box 1119R Morristown, N.J. 07960 2 Cities Service Co., Inc. North American Chemicals and Metals Group 60 Wall St. New York, N.Y. 10039 3 E. I. duPont de Nemours & Co., Inc. Exposives Dept. Wilmington, DE 19858																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) A P O 12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive Material. 12.2 AS Hazard Rating for Bulk Water Transportation. <table data-bbox="982 1440 1218 1703"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>0</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>2</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>4</td> </tr> <tr> <td>Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>2</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>esthetic Effect</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td>4</td> </tr> <tr> <td>Water</td> <td>4</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 12.3 HFPA Hazard Classifications <table data-bbox="982 1724 1218 1821"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>0</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>2</td> </tr> </tbody> </table>	Category	Rating	Fire	0	Health		Vapor Irritant	2	Liquid or Solid Irritant	4	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	esthetic Effect	2	Reactivity		Other Chemicals	4	Water	4	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	0	Reactivity (Yellow)	2	10 SHIPPING INFORMATION 10.1 Grades or Purity CP USP Technical at 33.7-39.8% (32° Be to 66° Be) 10.2 Storage Temperature Ambient. 10.3 Inert Atmosphere No requirement. 10.4 Venting Open. 13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight 98.08. 13.3 Boiling Point at 1 atm (44°) = 340°C = 644°F. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature Not pertinent. 13.6 Critical Pressure Not pertinent. 13.7 Specific Gravity 1.84 at 20°C (liquid). 13.8 Liquid Surface Tension Not pertinent. 13.9 Liquid-Water Interfacial Tension Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas) Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution = 418.4 Btu/lb = 242.2 cal/g = 9.715 x 10 ³ J/kg. 13.16 Heat of Polymerization Not pertinent. *Physical properties apply to concentrated (98%) acid only; other as stated. More dilute acid is more water like.
Category	Rating																																				
Fire	0																																				
Health																																					
Vapor Irritant	2																																				
Liquid or Solid Irritant	4																																				
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Flammability (Red)	0																																				
Reactivity (Yellow)	2																																				
NOTES Continued on page																																					

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SAC

SULFURIC ACID, SPENT

Common Synonyms Dilute sulfuric acid	Only liquid Colorless to dark brown Odorless Sinks and mixes with water
CAUTION: EMERGENCY TREATMENT If inhaled: Get fresh air. If in eyes: Flush with water for 15 minutes. If on skin: Flush with water for 15 minutes. If swallowed: Do not induce vomiting.	
Fire	Not flammable Poisonous gas may be produced in fire Flammable gas may be produced on contact with metals Weakly acidic; reacts with alkalis and carbonates Extinguish with water
Exposure	CAUTION: MEDICAL USE LIQUID Will burn skin and eyes Harmful if swallowed Respiratory irritation may occur if inhaled Flush affected area with water for 15 minutes IF IN EYES: Flush with water for 15 minutes IF SWALLOWED: Do not induce vomiting Do not expectorate
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes Neutralize with alkali before disposal Do not pour down drain
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-6) Issue warning: Corrosive Restrict access Dispose and flush	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Competibility Classification: Sulfuric acid 3.3 Chemical Formula: H_2SO_4 , H_2O 3.4 IMCO/United Nations Numerical Designation: 80 1832	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to dark brown 4.3 Odor: Odorless
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety goggles and face shield; rubber gloves; boots and apron 5.2 Symptoms Following Exposure: Contact with eyes or skin causes severe burn; the severity depending on the strength of the acid. Ingestion: Irritates, severe irritation of mouth and stomach 5.3 Treatment for Exposure: Call a doctor. INGESTION: Do NOT induce vomiting. SKIN OR EYES: Flush affected parts with large amounts of water for at least 15 min. do NOT use oils or ointments in eyes. Treat burns 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: No effects except those stemming from local damage 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Non-volatile 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes severe first and third degree burns on short contact and is very injurious to the eye 5.10 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: 24 Spmt 24 hr. bioassay lethal fresh water 42 Spmt/48 hr. p.a.w. 10% salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: None, unless strength is above 80-90% in which case heat is liberated 7.2 Reactivity with Common Materials: Attacks many metals, releasing flammable hydrogen gas 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Limestone, lime or soda ash 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Not manufactured. Dilute or spent sulfuric acid is formed as a result of various uses of the concentrated acid								
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P	10 SHIPPING INFORMATION 10.1 Grades or Purity: Purity depends on the process in which the original acid is used. The strength (in water) is probably below 80% and the solution may contain a wide variety of metals and organic compounds in solution 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive material 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table data-bbox="951 1466 1185 1543"> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td></td></tr> <tr> <td>Flammability (Red)</td><td>0</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </table>	Category	Classification	Health Hazard (Blue)		Flammability (Red)	0	Reactivity (Yellow)	2	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: 337.9°C = 640.2°F 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.84 at 20°C liquids 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Rate of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: $< -45 \text{ Btu/lb}$ $= < -232 \text{ cal/g} = < -9.7 \times 10^3 \text{ J/kg}$ 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)									
Flammability (Red)	0								
Reactivity (Yellow)	2								
NOTES									

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SFM

SULFUR MONOCHLORIDE

Common Synonyms	Only liquid Yellow to red Irritating sharp odor Mixes and reacts with water. Poisonous vapor is produced.
Fire	Combustible
 Exposure VAPOR Irritating to eyes. Poisonous if inhaled. LIQUID Will burn skin and eyes. Poisonous if swallowed.	
Water Pollution	Dangerous to aquatic life in high concentrations. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: corrosive air contaminant: water contaminant Protect access Chemical and physical treatment	2. LABEL  CORROSIVE
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: SCl_2 3.4 IMCO United Nations Numerical Designation: 80 1525	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellowish red 4.3 Odor: Suffocating pungent nauseating irritating
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety goggles and or face shield canister type gas mask (light concentrations) or self contained breathing apparatus (heavy concentrations) chemically resistant shoes or boots apron and long sleeve gloves 5.2 Symptoms Following Exposure: Vapors irritate eye and respiratory system; pulmonary edema may result. Liquid burns and damages eyes. Unless removed at once it burns the skin. Ingestion causes severe irritation to mouth and stomach. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, use artificial respiration and oxygen if required call doctor. INGESTION: give water, do NOT induce vomiting call a doctor. EYES: flush with water for at least 15 min. obtain medical attention at once. SKIN: flush with water, remove contaminated clothing and shower. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eye and throat in eyes cause eye and lung injury. This cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very irritant to the eyes. 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS

- 6.1 **Flash Point:** 245 F (120 C) 260 F (100 C)
 6.2 **Flammable Limits in Air:** Data not available
 6.3 **Fire Extinguishing Agents:** Dry chemical carbon dioxide water spray
 6.4 **Fire Extinguishing Agents Not to be Used:** Water reacts violently with compound
 6.5 **Special Hazards of Combustion Products:** Toxic and corrosive fumes are evolved when heated
 6.6 **Behavior in Fire:** Not pertinent
 6.7 **Ignition Temperature:** 483 F
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Data not available

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterfowl Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. Hooker Chemical Corp.
 Industrial Chemicals Division
 Niagara Falls, N.Y. 14302
 2. Stauffer Chemical Co.
 Industrial Chemical Division
 Niagara Falls, N.Y. 14302

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Reacts violently with water to produce heat and hydrogen chloride fumes. The solution is strongly acid.
 7.2 **Reactivity with Common Materials:** The liquid dissolves rubber and plastics. After reaction with water, the strong acid formed attacks metals generating flammable hydrogen gas.
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** After reaction with water the acid formed can be neutralized with lime or soda ash.
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

10 SHIPPING INFORMATION

- 10.1 **Grades or Purity:** Commercial material may contain 0-5% free sulfur
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Pressure vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 NO

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Corrosive material
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 1 |
| Health | |
| Vapor Irritant | 4 |
| Liquid or Solid Irritant | 4 |
| Poisons | 4 |
| Water Pollution | |
| Human Toxicity | 5 |
| Aquatic Toxicity | 4 |
| Aesthetic Effect | 4 |
| Reactivity | |
| Other Chemicals | 3 |
| Water | 4 |
| Self Reaction | 0 |
- 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 1 |
| Reactivity (Yellow) | 1 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid
 13.2 **Molecular Weight:** 135 (g)
 13.3 **Boiling Point at 1 atm:** 299.1 F (148.4 C = 411 K)
 13.4 **Freezing Point:** -112 F = -80 C = 193 K
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 1.68 at 20°C (liquid)
 13.8 **Liquid Surface Tension:** Not pertinent
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.129
 13.12 **Latent Heat of Vaporization:** 13.8 Btu/lb = 63.5 cal/g = 2.67 X 10⁵ J/kg
 13.13 **Heat of Combustion:** Not pertinent
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** 502.2 Btu/lb = 2790 cal/g = 11.67 X 10⁵ J/kg
 13.16 **Heat of Polymerization:** Not pertinent

(Continued on pages 5 and 6)

NOTES

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SCL

SULFURYL CHLORIDE

Common Synonyms		Waters liquid	Cubane to apple yellow	Faint odor
		Mixes and reacts violently with water. Poisonous gas is produced.		
Fire	Not flammable. Flammable gas may be produced on contact with metals.			
Exposure	VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause coughing, difficult breathing, or loss of consciousness. LIQUID Will burn skin and eyes. Harmful if swallowed.			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS* May be dangerous if it enters water intakes.			
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41. Evacuate area. Remove all personnel from area. Restrict access. Evacuate area. Disperse and flush with water.		2 LABEL 		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: See common synonyms. 3.2 Corrosive Compatibility Classification: Not applicable. 3.3 Chemical Formula: SOCl ₂ 3.4 IMCO United Nations Numerical Designation: 801854		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to light yellow 4.3 Odor: Acid, choking.		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Chemical goggles and face shield; work with acid vapors; wear rubber gloves and boots.				
5.2 Symptoms Following Exposure: Vapors cause severe irritation to eyes and respiratory system. Liquid burns eyes and skin. If ingested, can cause severe chemical burns to mouth and stomach.				
5.3 Treatment for Exposure: Call doctor for INHALATION; remove from exposure; administer artificial respiration if required. INGESTION: Give water or milk if NOT induced vomit. EYES: Flush with water or other eye wash. SKIN: Wash with large amounts of water.				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available.				
5.5 Short-Term Inhalation Limits: Data not available.				
5.6 Toxicity by Ingestion: Data not available.				
5.7 Late Toxicity: None.				
5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation to eyes and throat and can cause eye and lung injury. Eyes may be irritated even at low concentrations.				
5.9 Liquid or Solid Irritant Characteristics: Early severe skin irritation may cause pain and second degree burns after a few minutes exposure.				
5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point:	Not flammable.	8.1 Aquatic Toxicity:	Data not available.
6.2 Flammable Limits in Air:	Not flammable.	8.2 Waterfowl Toxicity:	Data not available.
6.3 Fire Extinguishing Agents:	Not pertinent.	8.3 Biological Oxygen Demand (BOD):	None.
6.4 Fire Extinguishing Agents Not to be Used:	Water applied to adjacent fire should be handled carefully.	8.4 Food Chain Concentration Potential:	None.
6.5 Special Hazards of Combustion Products:	Not pertinent.	9 SELECTED MANUFACTURERS	
6.6 Behavior in Fire:	Toxic and irritating gases are generated.	1. Hook Chemical Corp. Industrial Chemical Division Nassau Mills, N.Y. 14902	
6.7 Ignition Temperature:	Not flammable.	2. Union Carbide Corp. Lima Division 270 Park Ave. New York, N.Y. 10017	
6.8 Electrical Hazard:	Not pertinent.	10 SHIPPING INFORMATION	
6.9 Burning Rate:	Not flammable.	10.1 Grades or Purities:	None.
7 CHEMICAL REACTIVITY		10.2 Storage Temperature:	Ambient.
7.1 Reactivity with Water:	Reacts vigorously with water releasing hydrogen chloride fumes and forming sulfurous acid.	10.3 Inert Atmosphere:	Not required.
7.2 Reactivity with Common Materials:	Acids formed by reaction with moisture attack metals and liberate flammable hydrogen gas.	10.4 Venting:	Pressure/vacuum.
7.3 Stability During Transport:	Stable.	11 HAZARD ASSESSMENT CODE	
7.4 Neutralizing Agents for Acids and Caustics:	Not formed by reaction with water can be neutralized by a custom lime or soda ash.	See Hazard Assessment Handbook, CG 446-3.	
7.5 Polymerization:	Not pertinent.	VO	
7.6 Inhibitor of Polymerization:	Not pertinent.	12 HAZARD CLASSIFICATIONS	
12.1 Code of Federal Regulations:		13 PHYSICAL AND CHEMICAL PROPERTIES	
Corrosive material.		13.1 Physical State at 15°C and 1 atm:	Liquid.
12.2 NAS Hazard Rating for Bulk Water Transportation:		13.2 Molecular Weight:	134.97.
Category	Rating	13.3 Boiling Point at 1 atm:	107.4°C = 225.3°F = 380.5 K.
1. Health	0	13.4 Freezing Point:	Not pertinent.
2. Health	0	13.5 Critical Temperature:	Not pertinent.
3. Health	0	13.6 Critical Pressure:	Not pertinent.
4. Health	0	13.7 Specific Gravity:	1.67 at 20°C (liquids).
5. Health	0	13.8 Liquid Surface Tension:	Not pertinent.
6. Health	0	13.9 Liquid-Water Interfacial Tension:	Not pertinent.
7. Health	0	13.10 Vapor (Gas) Specific Gravity:	4.6.
8. Health	0	13.11 Ratio of Specific Heats of Vapor (Gas):	1.22.
9. Health	0	13.12 Latent Heat of Vaporization:	89.1 Btu/lb = 49 kcal/g = 207 x 10 ³ J/kg.
10. Health	0	13.13 Heat of Combustion:	Not pertinent.
11. Health	0	13.14 Heat of Decomposition:	Not pertinent.
12. Health	0	13.15 Heat of Solution:	88.5 Btu/lb = 49 kcal/g = 207 x 10 ³ J/kg.
13. Health	0	13.16 Heat of Polymerization:	Not pertinent.
14. Health	0	12.3 NFPA Hazard Classifications: Not listed.	
15. Health	0		
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100. Health	0		

Continued on page 3, 4 and 5

NOTES

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TLO

TALLOW

Common Synonyms Edible tallow Inedible tallow		Only liquid	Dark yellow	Waxy odor
		Floats on water. Freezing point is 35° F - 45° F.		
Fire	Combustible F + 1 May be dangerous if it enters water intakes.			
Exposure	Not harmful			
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. N - Not tested.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 448-4) Mechanical cleaning Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Edible tallow Inedible tallow Tallow oil 3.2 Coast Guard Compatibility Classification: F + 1 3.3 Chemical Formula: Not pertinent 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Dark yellow 4.3 Odor: Waxy		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, protective clothing, if exposure to hot liquid is possible. 5.2 Symptoms Following Exposure: Hot liquid can burn eyes and skin. 5.3 Treatment for Exposure: Treat burns caused by hot liquid. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade II. D above 15 g/kg. 5.7 Late Toxicity: None. 5.8 Vapor (Gas) Irritant Characteristics: Not volatile. 5.9 Liquid or Solid Irritant Characteristics: None. 5.10 Odor Threshold: Not pertinent.				

6. FIRE HAZARDS

- 61 Flash Point: 109°F (40°C)
62 Flammable Limits in Air: Not pertinent.
63 Fire Extinguishing Agents: Foam, water, carbon dioxide, or dry chemical.
64 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing.
65 Special Hazards of Combustion Products: Not pertinent.
66 Behavior in Fire: Not pertinent.
67 Ignition Temperature: Data not available.
68 Electrical Hazard: Not pertinent.
69 Burning Rate: Data not available.

7. CHEMICAL REACTIVITY

- 71 Reactivity with Water: No reaction.
72 Reactivity with Common Materials: No reaction.
73 Stability During Transport: Stable.
74 Neutralizing Agents for Acids and Caustics: Not pertinent.
75 Polymerization: Not pertinent.
76 Inhibitor of Polymerization: Not pertinent.

8. WATER POLLUTION

- 81 Aquatic Toxicity: Data not available.
82 Waterway Toxicity: Data not available.
83 Biological Oxygen Demand (BOD): 182 x 5 days.
84 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

- 1 Atlas Refinery, Inc.
142 Lockwood St.
Newark, N.J. 07102
2 Kull's Whitemar, Inc.
Conshohocken, Pa. 19380
3 Swift and Co.
115 W. Jackson Blvd.
Chicago, Ill. 60664

10. SHIPPING INFORMATION

- 101 Grades or Purity: Acidless buffing, industrial fancy, edible, inedible.
102 Storage Temperature: Ambient.
103 Inert Atmosphere: Not requirement.
104 Venting: Open (flame arresters).

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Manual, CG 448-3)
A T U

12. HAZARD CLASSIFICATIONS

- 121 Code of Federal Regulations: Not listed.
122 NAS Hazard Rating for Bulk Water Transportation: Not listed.
123 NFPA Hazard Classifications
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 0 |
| Flammability (Red) | 1 |
| Reactivity (Yellow) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 131 Physical State at 15°C and 1 atm: Solid.
132 Molecular Weight: Not pertinent.
133 Boiling Point at 1 atm: Very high.
134 Freezing Point: 35 - 45°F
= 2 - 7°C = 273 - 280°K.
135 Critical Temperature: Not pertinent.
136 Critical Pressure: Not pertinent.
137 Specific Gravity: (est.) 0.87 at 80°C (liquid).
138 Liquid Surface Tension: Data not available.
139 Liquid-Water Interfacial Tension: Data not available.
1310 Vapor (Gas) Specific Gravity: Not pertinent.
1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent.
1312 Latent Heat of Vaporization: Not pertinent.
1313 Heat of Combustion: (est.) -15,000 Btu/lb
= -10,000 cal/g = -420 x 10³ J/kg.
1314 Heat of Decomposition: Not pertinent.
1315 Heat of Solution: Not pertinent.
1316 Heat of Polymerization: Not pertinent.

(continued on pages 5 and 6)

NOTES

TFA

TALLOW FATTY ALCOHOL

Common Synonyms Higher fatty alcohol Stearyl alcohol crude		Waxy solid Floats on water	White	Mild soapy odor
Fire		Combustible		
Exposure		SOLID Not harmful		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Higher fatty alcohol Stearyl alcohol crude 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula C ₁₈ H ₃₇ OH (approx.) 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Waxy white 4.3 Odor: Mild soapy		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Material is practically non-toxic. Contact with eyes or prolonged contact with skin can cause mild irritation. 5.3 Treatment for Exposure: EYES: flush with water if irritation persists, see a doctor. SKIN: wipe off, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion, Grade 2 oral LD ₅₀ : 1,900 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: $>270^{\circ}\text{F}$ ($^{\circ}\text{C}$) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Dry chemical foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Procter & Gamble Distributing Co. Industrial Chemicals Division P. O. Box 599 Cincinnati, Ohio 45201 2 Ashland Chemical Co. Industrial Chemicals and Solvents Div. P. O. Box 2219 Columbus, Ohio 43216 3 M. Michel and Co., Inc. 40 Broad Street New York, N. Y. 10004
	10. SHIPPING INFORMATION 10.1 Grades or Purities: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) II	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 282 (avg.) 13.3 Boiling Point at 1 atm: $>480^{\circ}\text{F}$ = $>249^{\circ}\text{C}$ = $>522^{\circ}\text{K}$ 13.4 Freezing Point: 127°F = 53°C = 326°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.810 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vaporization: Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion (cal/g): -18,500 Btu/lb = -10,200 cal/g = $-430 \times 10^3 \text{ J/kg}$ 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
is continued on pages 4 and 5	
NOTES	

(Continued on pages 2 and 3)

TNA

TANNIC ACID

Common Synonyms Tannin Chronic tannin Gallotannic acid Gallotannin Glucic		Solid	Light yellow to tan	Faint odor
		Sinks and mixes with water		
Fire	Combustible			
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting None			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes			
1 RESPONSE TO DISCHARGE (See Response Manual with Hazchem CG 444-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Chinese tannin Gallotannic acid, Gallicotannin Glucic Tannin 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $C_{12}H_{10}O_{14}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Light tan to yellow 4.3 Odor: faint characteristics		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation causes irritation of nose and throat, coughing, and sneezing. Ingestion may cause gastric disturbance. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting. EYES or SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, oral LD ₅₀ = 2,300 mg/kg rats 5.7 Late Toxicity: Causes cancer of liver in rats 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS

- 6.1 Flash Point: Not pertinent (combustible solid)
6.2 Flammable Limits in Air: Not pertinent
6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide
6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing
6.5 Special Hazards of Combustion Products: Decomposes at 210° to carbon dioxide and pyrogallol, which can form irritating vapors
6.6 Behavior in Fire:
6.7 Ignition Temperature: 480 °F
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials:

7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity:
97 ppm 96 hr LC50 to fish: 11 ppm, fresh water
4.7 mg/L 2 hr LC50 to young chinook salmon: creek level salt water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): 18% 5 days
8.4 Food Chain Concentration Potential: None

9. SELECTED MANUFACTURERS

- 1 The Harshaw Chemical Co.
1945 East 97th Street
Cleveland, Ohio 44106
2 J. T. Baker Chemical Co.
Phillipsburg, N. J. 08865
3 Fisher Scientific Co.
741 Forbes Ave.
Pittsburgh, Pa. 15219

10 SHIPPING INFORMATION

- 10.1 Grades or Purities: Commercial 84%
Reagent
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: No requirement
10.4 Venting: Open

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 444-3)
SS

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 0 |
| Flammability (Red) | 1 |
| Reactivity (Yellow) | 0 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 1701
13.3 Boiling Point at 1 atm: Not pertinent (decomposes)
13.4 Freezing Point: Not pertinent
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: >1 at 20°C (solid)
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: $(-H_c) = 9,810 \text{ Btu/lb}$
 $= -5,440 \text{ cal/g} = -228 \times 10^3 \text{ J/kg}$
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

(Continued on pages 5 and 6)

NOTES

TES

2,4,5-T (ESTERS)

Common Synonyms: Butyl 2,4,5-trichlorophenoxyacetate Butyl 2,4,5-trichlorophenoxyacetate Butyl 2,4,5-trichlorophenoxyacetate Butyl 2,4,5-trichlorophenoxyacetate		Liquid	Yellowish brown	Mild odor
		Sinks in water		
Fire	Combustible Irritating gases may be produced when heated			
Exposure	LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant Should be removed Chemical and physical treatment		2. LABELS No hazard - but required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Butyl 2,4,5-trichlorophenoxyacetate; Butoxypropyl trichlorophenoxyacetate; Isobutyl trichlorophenoxyacetate; 2-Ethylhexyl trichlorophenoxyacetate 3.2 Coast Guard Compatibility Classification: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Amber-dark amber 4.3 Odor: Very weak - mixtures with kerosene or diesel fuel have odor of the solvent		
continued on page 4				
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Goggles or face shield and rubber gloves				
5.2 Symptoms Following Exposure: Ingestion causes intestinal disturbances. Contact with eyes or skin causes mild irritation; transient chemical injury may occur				
5.3 Treatment for Exposure: INGESTION: promptly induce vomiting and get medical attention. EYES: flush with flowing water and get medical attention. SKIN: wash with soap and water				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade 3; LD ₅₀ 50-900 mg/kg				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: 265-420°F (C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing. 6.5 Special Hazards of Combustion Products: Hydrogen chloride gas and other irritating fumes may form in fires. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Data not available.		8. WATER POLLUTION 8.1 Aquatic Toxicity: Toxicity ester: 26 ppm (48 hr bluegill/11 m fresh water) Butyl 2,4,5-trichlorophenoxyacetate: 17 ppm (48 hr bluegill/11 m fresh water) 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: Data not available.																	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: May attack some forms of plastics. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.		9. SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. Frankwal Inc. P.O. Box 69 Jacksonville, Ark. 72074 3. Phodan Inc. Chapman Division 25 Belmont Drive Sonoma, Calif. 94967																	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A X Y		10. SHIPPING INFORMATION 10.1 Grades or Purities: Technical 95-99% 95-99% with only a trace of diesel oil, which is combustible. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirements. 10.4 Venting: Open.																	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NIPI Hazard Classifications: Not listed.		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: Mixtures all greater than 300. 13.3 Boiling Point at 1 atm: <table border="1"> <thead> <tr> <th>Butyl</th> <th>Butylpropyl</th> <th>Isobutyl</th> <th>2-Ethylhexyl</th> </tr> </thead> <tbody> <tr> <td>610</td> <td>651</td> <td>740</td> <td>770</td> </tr> <tr> <td>337</td> <td>344</td> <td>410</td> <td>410</td> </tr> <tr> <td>610</td> <td>617</td> <td>683</td> <td>683</td> </tr> </tbody> </table> 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.2 at 20°C (liquid). 13.8 Liquid Surface Tension: Data not available. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Data not available. 13.13 Heat of Combustion: Data not available. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.		Butyl	Butylpropyl	Isobutyl	2-Ethylhexyl	610	651	740	770	337	344	410	410	610	617	683	683
Butyl	Butylpropyl	Isobutyl	2-Ethylhexyl																
610	651	740	770																
337	344	410	410																
610	617	683	683																
3. CHEMICAL DESIGNATIONS (Cont'd) 3.3 Chemical Formula: 2,4,5-Cl ₃ C ₆ H ₂ OCH ₂ COOR where R = C ₄ H ₉ , C ₆ H ₅ , etc. 3.4 IMCO/United Nations Numerical Designation: Not listed.		(Continued on pages 5 and 6)																	

TBT

TETRABUTYL TITANATE

Common Synonyms: Titanium tetrabutoxide Butyl titanate Titanium tetrabutoxide Butyl titanate monomer		Liquid	Colorless to light yellow	Weak alcohol-like odor
		May float on water. Reacts with water.		
Fire		Combustible Containers may explode in fire		
Exposure		LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting		
Water Pollution		Effect of low concentrations on aquatic life is unknown routing to shoreline May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant Restrict access Mechanical containment Disperse and flush		2. LABELS No label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Butyl titanate, Butyl titanate monomer, Orthotitanic acid, tetrabutyl ester, Titanium butoxide, Titanium tetrabutoxide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $Ti(OBu)_4$ 3.4 HMCC/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Weak alcohol		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Self-contained breathing apparatus or organic canister mask, goggles or face shield, rubber gloves				
5.2 Symptoms Following Exposure: Inhalation causes nonspecific irritation of the upper respiratory tract. Contact with liquid may cause corneal damage in eyes and local irritation of skin. Ingestion causes nonspecific irritation of gastrointestinal tract, nausea, vomiting, cramps, and diarrhea. In severe cases, central nervous system depression may result.				
5.3 Treatment for Exposure: INHALE: At 15°C, move from contaminated atmosphere. If symptoms of respiratory discomfort persist, see a physician. EYES: Immediately flush with large quantities of running water for a minimum of 15 min. obtain medical attention if irritation persists. SKIN: Immediately flush affected areas with water. obtain medical attention if irritation persists. INGESTION: Give large amounts of water or warm salty water to induce vomiting. If this measure is unsuccessful, vomiting may be induced by tickling the back of the patient's throat with a finger; vomiting should be encouraged until vomitus is clear. obtain medical attention if abdominal discomfort persists.				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Data not available				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: 170°F (6°C) 6.2 Flammable Limits in Air: 2-12% 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: water 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: May give off dense white smoke. Containers may explode. 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 1.4 mm/min	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts to form butanol and titanium dioxide; the reaction is not hazardous. 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Stauffer Chemical Company, Specialty Chemical Division, Westport, Conn. 06880 2 Ventron Corporation, Chemical Division, 8 Congress Street, Beverly, Mass. 01915 3 Dynamit Nobel, America, Inc., 105 Stonehurst Court, Northvale, N. J. 07647
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame arresters
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NO HAZARD	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 340 13.3 Boiling Point at 1 atm: 342°F = 312°C = 335°K 13.4 Freezing Point: -60°F = -55°C = 218°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.995 at 25°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 142 Btu/lb = 79 cal/g = 3.3×10^4 J/kg 13.13 Heat of Combustion: (cal/g) = 14,600 Btu/lb = -8.105×10^4 cal/g = -340×10^3 J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES	

TEC

TETRACHLOROETHANE

Common Synonyms: 1,1,2,2-Tetrachloroethane Acetylene tetrachloride		Liquid	Colorless to pale yellow	Sweet odor
		Sinks in water		
Fire		Not flammable Poisonous gases may be produced when heated		
 Exposure		VAPOR Irritating to eyes, nose and throat Harmful if inhaled LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes If swallowed will cause nausea and vomiting		
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison air contaminant Restrict access Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetylene tetrachloride 1,1,2,2-Tetrachloroethane 3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon 3.3 Chemical Formula: C ₂ Cl ₄ (C ₂ HCl ₃) 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless slightly yellow light yellowish green 4.3 Odor: Chloroform like, pleasant like carbon tetrachloride, mild, sweetish similar to several other chlorinated hydrocarbons		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical safety goggles, plastic face shield, air or oxygen supplied mask, safety hat with brim, solvent proof apron, synthetic rubber gloves 5.2 Symptoms Following Exposure: Compound is a powerful narcotic and liver poison. May also cause changes in blood composition and neurologic disturbances. Repeated exposure by inhalation can be fatal. Ingestion causes vomiting, diarrhea, severe mucosal injury. In severe cases, cyanosis, unconsciousness, loss of reflexes, and death. Contact with eyes causes irritation and inflammation. Can be absorbed through the skin and may produce severe skin lesions. 5.3 Treatment for Exposure: INHALATION: remove victim from exposure, begin artificial respiration if breathing has ceased. INGESTION: induce vomiting, call a physician. EYES: irrigate with water for 15 min. SKIN: remove clothing, wash skin thoroughly with warm water and soap. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 ppm 5.5 Short-Term Inhalation Limits: 10 ppm, 30 min 5.6 Toxicity by Ingestion: Grade 3, oral LD ₅₀ = 200 mg/kg rats 5.7 Late Toxicity: Liver poisoning, nervous disorders 5.8 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smothering and reddening of the skin. 5.10 Odor Threshold: 0.5 ppm				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating to eyes, nose and throat, may form soot 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Hoover Chemical Corp. Industrial Chemicals Div. Niagara Falls, N.Y. 14302 2. Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233 3. Eastman Organic Chemicals Rochester, N.Y. 14650
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 98% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A A	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 167.85 13.3 Boiling Point at 1 atm: 204.1°F = 126.1°C = 419.3°K 13.4 Freezing Point: -24.8°F = -43.3°C = 229.8°K 13.5 Critical Temperature: Data not available 13.6 Critical Pressure: Data not available 13.7 Specific Gravity: 1.895 at 20°C (liquid) 13.8 Liquid Surface Tension: 37.85 dynes/cm = 0.03785 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: 5.70 13.11 Ratio of Specific Heats of Vapor (Gas): 1.090 at 25°C 13.12 Latent Heat of Vaporization: 99.2 Btu/lb = 55.1 cal/g = 230 x 10³ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: ORM-A 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
(continued on pages 1 and 2)	
NOTES	

ITN

TETRADECANOL

Common Synonyms: 1 Tetradecanol Myristyl alcohol n-Tetradecyl alcohol	Thick liquid (solid); colorless. Faint alcohol odor. Solidifies and floats on water.
Fire	Combustible
Exposure	LIQUID: Irritating to skin and eyes.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Tendency to bioaccumulate. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Regional Emergency Manual: 15-444-4 Methylated spirits Non-flammable Non-toxic	2. LABELS N/A
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Myristyl alcohol Myristyl alcohol n-Tetradecyl alcohol n-Tetradecanol 3.2 Coast Guard Compatibility Classification: N/A 3.3 Chemical Formula: C₁₄H₃₀O 3.4 IMO United Nations Numerical Designation: N/A	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: N/A 4.3 Odor: Faint alcohol
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: N/A 5.2 Symptoms Following Exposure: N/A 5.3 Treatment for Exposure: INGESTION: Give water. Do not induce vomiting. EYES: Flush with water. SKIN: Wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): N/A 5.5 Short-Term Inhalation Limits: N/A 5.6 Toxicity by Ingestion: N/A 5.7 Late Toxicity: N/A 5.8 Vapor (Gas) Irritant Characteristics: N/A 5.9 Liquid or Solid Irritant Characteristics: N/A 5.10 Odor Threshold: N/A	

6. FIRE HAZARDS 6.1 Flash Point: 250°F (121°C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Liquid 6.4 Fire Extinguishing Agents Not to be Used: Water (may cause frothing) 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterford Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: Not reactive 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Chemical Co. Chemical Co. Parsippany, NJ Solutia Inc., N. J. Solutia Inc., N. J. Solutia Inc., N. J. Solutia Inc., N. J.
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual: 15-444-4 N/A	10. SHIPPING INFORMATION 10.1 Grades or Purities: N/A 10.2 Storage Temperature: N/A 10.3 Inert Atmosphere: Not pertinent 10.4 Venting: Data not available
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not pertinent 12.2 NFPA Hazard Rating for Bulk Water Transportation: Not pertinent 12.3 NFPA Hazard Classifications: Not pertinent	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: N/A 13.2 Molecular Weight: 226.4 13.3 Boiling Point at 1 atm: 250°C 13.4 Freezing Point: -25°C 13.5 Critical Temperature: 420°C 13.6 Critical Pressure: 30 atm 13.7 Specific Gravity: 0.82 at 20°C 13.8 Liquid Surface Tension: 21.5 dyn/cm at 20°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: N/A 13.11 Ratio of Specific Heats of Vapor (Gas): N/A 13.12 Latent Heat of Vaporization: N/A 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: N/A 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

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TTD

1-TETRADECENE

Common Synonyms		Waters liquid	Colorless	Mild pleasant odor
		Floats on water		
Fire	Combustible			
Exposure	LIQUID Irritating to eyes			
Water Pollution	Effect of low concentrations on aquatic life unknown Feeding to shorebirds May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, TSD 661-4 May cause water pollution Polluting potential Cleaning and physical control		2. LABELS See National Fire Protection Association, NFPA 704		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Undecylene 3.2 Coast Guard Compatibility Classification: (None) 3.3 Chemical Formula: $C_{14}H_{28}$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, gloves 5.2 Symptoms Following Exposure: Irritation 5.3 Treatment for Exposure: Treat as irritant 5.4 Toxicity by Inhalation (Threshold Limit Value): Not listed 5.5 Short-Term Inhalation Limits: Not permitted 5.6 Toxicity by Ingestion: Not permitted 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not listed 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not permitted				

6 FIRE HAZARDS 6.1 Flash Point: Not listed 6.2 Flammable Limits in Air: Not listed 6.3 Fire Extinguishing Agents: Not listed 6.4 Fire Extinguishing Agents Not to be Used: Not listed 6.5 Special Hazards of Combustion Products: Not listed 6.6 Behavior in Fire: Not listed 6.7 Ignition Temperature: Not listed 6.8 Electrical Hazard: Not listed 6.9 Burning Rate: Not listed		8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Not listed	
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not listed 7.2 Reactivity with Common Materials: Not listed 7.3 Stability During Transport: Not listed 7.4 Neutralizing Agents for Acids and Caustics: Not permitted 7.5 Polymerization: Not permitted 7.6 Inhibitor of Polymerization: Not listed		9 SELECTED MANUFACTURERS See this report for a listing of manufacturers and their addresses in the United States and foreign countries.	
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, TSD 661-4 A 2 1		10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open flame arrestor	
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 196.35 13.3 Boiling Point at 1 atm: 254.1°C (489.4°F) 13.4 Freezing Point: -9.5°C (15.1°F) 13.5 Critical Temperature: Not permitted 13.6 Critical Pressure: Not permitted 13.7 Specific Gravity: 0.764 (at 20°C) 13.8 Liquid Surface Tension: 27.5 dyne/cm at 20°C 13.9 Liquid-Water Interfacial Tension: 12.5 dyne/cm at 20°C 13.10 Vapor (Gas) Specific Gravity: Not permitted 13.11 Ratio of Specific Heats of Vapor (Gas): Not permitted 13.12 Latent Heat of Vaporization: 38.5 kJ/mol 13.13 Heat of Combustion: 10,400 kJ/mol 13.14 Heat of Decomposition: Not permitted 13.15 Heat of Solution: Not permitted 13.16 Heat of Polymerization: Not permitted	
NOTES			

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TDB

TETRADECYLBENZENE

Common Synonyms 1 Phenyltetradecane		Liquid	Colorless	Mild odor
		Floats on water		
Fire		Combustible Flash point: 110°F (43°C) Ignition temperature: 442°C (828°F) Burning rate: 4.42 mm/min		
Exposure		ALL INFORMATION IS FOR INFORMATIONAL PURPOSES ONLY. LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. CONCENTRATIONS LOW TOXICITY NO ADVERSE EFFECTS		
Water Pollution		Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1 Phenyltetradecane 3.2 Coast Guard Compatibility Classification: Aromatic hydrocarbon 3.3 Chemical Formula: $C_{15}H_{32}$ 3.4 I/MCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves				
5.2 Symptoms Following Exposure: Ingestion may cause intestinal disturbances. Contact with eyes causes mild irritation.				
5.3 Treatment for Exposure: INGESTION: Induce vomiting if large amount has been swallowed. EYES: flush with water. SKIN: wipe off, wash with soap and water.				
5.4 Toxicity by Inhalation (TLV threshold Limit Value): Data not available				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Data not available				
5.7 Late toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 61 Flash Point: Data not available 62 Flammable Limits in Air: Data not available 63 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective 65 Special Hazards of Combustion Products: 66 Behavior in Fire: 67 Ignition Temperature: Data not available 68 Electrical Hazard: Not pertinent 69 Burning Rate: 4.42 mm/min	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterfowl Toxicity: Data not available 83 Biologic Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: May attack some forms of plastics 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Conoco Chemicals Park Heights Plaza West One Saddle Brook, N.J. 07662 2. The Humphrey Chemical Co. Devine Street North Haven, Conn. 06473 3. Fisher Scientific Co. 711 Forbes Ave. Pittsburgh, Pa. 15219
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) X 1-1	10 SHIPPING INFORMATION 101 Grades or Purity: Commercial 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open (flame arrester)
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid or liquid 13.2 Molecular Weight: 214.47 13.3 Boiling Point at 1 atm: 676°F = 359°C = 632°F 13.4 Freezing Point: 61°F = 16°C = 289°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.85 at 20°C (liquid) 13.8 Liquid Surface Tension: 30.27 dynes/cm = 0.03027 N/m at 20°C 13.9 Liquid Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 95.18 Btu/lb = 52.88 cal/g = 2.22×10^4 J/kg 13.13 Heat of Combustion: -18,430 Btu/lb = -10,240 cal/g = -1.843×10^7 J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
(Continued on pages 5 and 6)	
NOTES	

TED

TETRAETHYL DITHIOPYROPHOSPHATE

Common Synonyms Tetraethyl dithiopyrophosphate	Liquid Sinks in water	Colorless
HAZARD STATEMENT: H228: Flammable liquid. H302: Harmful if swallowed. H332: Irritant to eyes. H336: Irritant to skin.		
Fire	Fire data not available	
Exposure	LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison water contaminant. Restrict access. Should be removed. Chemical and physical treatment. Disperse and flush (small discharges).		2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Dithiopyrophoric acid, O O O O tetraethyl ester, Tetraethyl dithiopyrophosphate, O O O O Tetraethyl pyrophosphorodithionate. 3.2 Coast Guard Competibility Classification: Not applicable. 3.3 Chemical Formula: (C ₂ H ₅ O) ₂ P ₂ (S) ₂ (OC ₂ H ₅) ₂ . 3.4 IMCO/United Nations Numerical Designation: 6.1-1704.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Data not available.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Mask with canister, goggles, and other protective clothing to prevent contact with skin. 5.2 Symptoms Following Exposure: Contact with liquid causes irritation of eyes and skin. Compound can be absorbed through skin. Ingestion of liquid or inhalation of mist causes nausea, vomiting, mental confusion, abdominal pain, sweating, giddiness, apprehension, and restlessness. Later muscular twitching of the eyelids and tongue begins, then other muscles of face and neck become involved, generalized twitching and muscle weakness may occur, pulmonary edema, ataxia, tremor, and convulsions may advance to coma. 5.3 Treatment for Exposure: Call physician for all exposures to this compound. INHALATION: support respiration, keep airway clear, use artificial respiration if breathing is difficult or has stopped. EYES: flush with water immediately after contact for at least 15 min. SKIN: remove victim's clothing and shoes immediately using rubber gloves, quickly wipe off affected areas with clean cloths, immediately follow with a shower using plenty of soap; if complete shower is impossible, wash affected skin, hair, and fingernails repeatedly with soap and water using clean cloths each time to prevent spreading the contamination. INGESTION: induce vomiting repeatedly until vomit fluid is clear (save fluid for physician's examination); if vomiting cannot be induced within 5 min., have victim drink plenty of milk or water, have him lie down and keep him warm; if increased secretions make breathing difficult, prop patient up to help his breathing; apply artificial or mouth-to-mouth respiration, preferably through an airway; wash victim's mouth of contamination; mechanical resuscitator should be used if available; oxygen may be necessary; keep patient under observation for 24 hrs. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available.		

6. FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable.
 6.2 **Flammable Limits in Air:** Not flammable.
 6.3 **Fire Extinguishing Agents:** Water, dry chemical, foam, carbon dioxide.
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
 6.5 **Special Hazards of Combustion Products:** Toxic phosphorus and sulfur oxides are produced.
 6.6 **Behavior in Fire:** Not pertinent.
 6.7 **Ignition Temperature:** Not pertinent.
 6.8 **Electrical Hazard:** Not pertinent.
 6.9 **Burning Rate:** Not pertinent.

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Reacts slowly to form non-hazardous products.
 7.2 **Reactivity with Common Materials:** Corrosive to most metals in the presence of moisture.
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
 7.5 **Polymerization:** Not pertinent.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available.
 8.2 **Waterfowl Toxicity:** Data not available.
 8.3 **Biological Oxygen Demand (BOD):** Data not available.
 8.4 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

Plan. Products Corp.
 Kennedy Avenue
 Blue Point, N.Y. 11715

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** Technical, multifusable concentrate.
 Dry mixtures with inert solid > 2.
 10.2 **Storage Temperature:** Ambient.
 10.3 **Inert Atmosphere:** No requirement.
 10.4 **Venting:** Pressure vacuum.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 1-1-1

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Poisonous, Class B.
 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.
 12.3 **NFPA Hazard Classifications:** Not listed.

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid.
 13.2 **Molecular Weight:** 322.4.
 13.3 **Boiling Point at 1 atm:** Not pertinent (very high).
 13.4 **Freezing Point:** Not pertinent.
 13.5 **Critical Temperature:** Not pertinent.
 13.6 **Critical Pressure:** Not pertinent.
 13.7 **Specific Gravity:** 1.1 at 25°C (liquid).
 13.8 **Liquid Surface Tension:** Data not available.
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
 13.12 **Latent Heat of Vaporization:** Not pertinent.
 13.13 **Heat of Combustion:** Not pertinent.
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** Not pertinent.
 13.16 **Heat of Polymerization:** Not pertinent.

(Continued on page 2 and 3)

5. HEALTH HAZARDS (Cont'd)

- 5.5 **Short-Term Inhalation Limits:** Data not available.
 5.6 **Toxicity by Ingestion:** Oral LD₅₀ = 5 mg/kg rats.
 5.7 **Late Toxicity:** Causes chronic nasal damage in mice.
 5.8 **Vapor (Gas) Irritant Characteristics:** Data not available.
 5.9 **Liquid or Solid Irritant Characteristics:** Data not available.
 5.10 **Odor Threshold:** Data not available.

TTG

TETRAETHYLENE GLYCOL

Common Synonyms 18 Dry Bis[2-(2-hydroxyethoxy)ethyl] ether 3,6,9-Trioxadecan-1,11-diol		Liquid Colorless to straw color Mild odor Sinks and mixes with water
Fire Combustible		
Exposure LIQUID Not harmful		
Water Pollution Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 44-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Bis[2-(2-hydroxyethoxy)ethyl] ether; 18 Dry 3,6,9-Trioxadecan-1,11-diol 3.2 Coast Guard Compatibility Classification: Glycol ether 3.3 Chemical Formula: HOCH ₂ CH ₂ OCH ₂ CH ₂ OH 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light straw, colorless 4.3 Odor: Mild
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield and rubber glove 5.2 Symptoms Following Exposure: Compensatory irritation. No symptoms observed by any exposure route 5.3 Treatment for Exposure: INGESTION: If large amounts are swallowed, induce vomiting, treat symptomatically. EYES: flush with water; get medical attention if effect develops. SKIN: wash with soap and water 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 0; oral rat LD ₅₀ = 25.5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS		8 WATER POLLUTION		
61	Flash Point: 360°F (190°C)	81	Aquatic Toxicity: Data not available	
62	Flammable Limits in Air Data not available	82	Waterflow Toxicity: Data not available	
63	Fire Extinguishing Agents: Alcohol foam, dry chemical, or carbon dioxide	83	Biological Oxygen Demand (BOD) 50% 5 days	
64	Fire Extinguishing Agents Not to be Used Water or foam may cause frothing	84	Food Chain Concentration Potential: None	
65	Special Hazards of Combustion Products			
66	Behavior in Fire			
67	Ignition Temperature: Data not available			
68	Electrical Hazard: Data not available			
69	Burning Rate: Data not available			
7 CHEMICAL REACTIVITY		9 SELECTED MANUFACTURERS		
71	Reactivity with Water: No reaction	1	Olin Corp. 120 Long Ridge Rd. Stamford, Conn. 06904	
72	Reactivity with Common Materials: May attack some forms of plastics	2	Union Carbide Corp. Chemicals & Plastics Div. 270 Park Avenue New York, N.Y. 10017	
73	Stability During Transport: Stable	3	The Dow Chemical Co. 2309 Dow Center Midland, Mich. 48640	
74	Neutralizing Agents for Acids and Caustics: Not pertinent			
75	Polymerization: Not pertinent			
76	Inhibitor of Polymerization: Not pertinent			
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 44-3) A P Q		10 SHIPPING INFORMATION		
12 HAZARD CLASSIFICATIONS		101	Grade or Purity: Commercial 99+%	
121	Code of Federal Regulations Not listed	102	Storage Temperature: Ambient	
122	NAS Hazard Rating for Bulk Water Transportation	103	Inert Atmosphere: No requirement	
	Category	Rating	104	Venting: Open (flame arrester)
	Fire	1		
	Health			
	Vapor Irritant	0		
	Liquid or Solid Irritant	0		
	Poisons	1		
	Water Pollution			
	Human Toxicity	0		
	Aquatic Toxicity	1		
	Aesthetic Effect	1		
	Reactivity			
	Other chemicals	2		
	Water	0		
	Self Reaction	0		
123	NFPA Hazard Classifications			
	Category	Classification		
	Health Hazard (Blue)	1		
	Flammability (Red)	1		
	Reactivity (Yellow)	0		
		13 PHYSICAL AND CHEMICAL PROPERTIES		
		131	Physical State at 15°C and 1 atm: Liquid	
		132	Molecular Weight: 94.23	
		133	Boiling Point at 1 atm: 621°F = 327°C = 600 K	
		134	Freezing Point: 25.5°F = -4.0°C = 269.0 K	
		135	Critical Temperature: Not pertinent	
		136	Critical Pressure: Not pertinent	
		137	Specific Gravity: 1.12 at 20°C (liquids)	
		138	Liquid Surface Tension: 18.51 dynes/cm = 0.01851 N/m at 32°C	
		139	Liquid-Water Interfacial Tension: Not pertinent	
		1310	Vapor (Gas) Specific Gravity: Not pertinent	
		1311	Ratio of Specific Heats of Vapor (Gas): Not pertinent	
		1312	Latent Heat of Vaporization: Data not available	
		1313	Heat of Combustion: -10,540 Btu/lb = -5,540 cal/g = -245 x 10 ³ J/kg	
		1314	Heat of Decomposition: Not pertinent	
		1315	Heat of Solution: Not pertinent	
		1316	Heat of Polymerization: Not pertinent	
		(Continued on pages 4 and 5)		
NOTES				

TTP

TETRAETHYLENEPENTAMINE

Common Synonyms 1,11-Diamino-3,6,9-triazadecane	Liquid Yellow Ammonia odor May float or sink in water
Fire Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE	
Exposure LIQUID Will burn skin and eyes If swallowed will cause nausea	
Water Pollution Effect of low concentrations on aquatic life is unknown May be fouling to shoreline May be dangerous if it enters water intakes	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446.4) Issue warning - water contaminant Restrict access Disperse and flush	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,11-Diamino-3,6,9-triazadecane 3.2 Coast Guard Compatibility Classification: Amphiphilic, organic 3.3 Chemical Formula: $\text{H}_2\text{N(CH}_2\text{)}_9\text{NHNH}_2$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow 4.3 Odor: Ammoniacal disagreeable penetrating
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supplied respirator, rubber gloves, complete eye protection, impervious apron 5.2 Symptoms Following Exposure: Inhalation may cause nausea and slight irritation, compound is a sensitizer and prolonged contact may cause asthma. Ingestion can cause burns of mouth, esophagus, and possibly stomach. Contact with eyes or skin may cause burns. Repeated skin contact may cause dermatitis. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, give oxygen if breathing is difficult, treat allergic manifestations by usual methods. INGESTION: do NOT induce vomiting, give large quantities of water, give at least one ounce of vinegar in an equal amount of water, get medical attention. EYES: immediately flush with plenty of water, get medical care. SKIN: flush with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2, oral LD_{50} = 3,990 mg/kg (rat) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of one eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smarting of the skin and first degree burns on short exposure, may cause second degree burns on long exposure. 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 140°F (60°C) 6.2 Flammable Limits in Air: (test 10.8%) 4.6- 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Ammonia and toxic oxides of nitrogen may form in fires. 6.6 Behavior in Fire: 6.7 Ignition Temperature: 672°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Union Carbide Corp. Chemicals & Plastics Div. 270 Park Avenue New York, N.Y. 10017 2. Jefferson Chemical Co., Inc. 3336 Richmond Avenue P.O. Box 53300 Houston, Texas 77052 3. D.W. Chemical Co. Midland, Mich. 48640																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446.3) A P Q	10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="865 1425 1110 1683"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>1</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>1</td></tr> <tr><td>Liquid or Solid Irritant</td><td>2</td></tr> <tr><td>Poisons</td><td>2</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>2</td></tr> <tr><td>Aquatic Toxicity</td><td>2</td></tr> <tr><td>Aesthetic Effect</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>1</td></tr> <tr><td>Water</td><td>0</td></tr> <tr><td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="865 1705 1110 1791"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>2</td></tr> <tr><td>Flammability (Red)</td><td>1</td></tr> <tr><td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	2	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 180 13.3 Boiling Point at 1 atm: 644°F = 340°C = 613°K 13.4 Freezing Point: -22°F = -30°C = 243°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.998 at 20°C (liquids) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Sp. Gr. - Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
Category	Rating																																				
Fire	1																																				
Health																																					
Vapor Irritant	1																																				
Liquid or Solid Irritant	2																																				
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NOTES (continued on page 2 of 6)																																					

TEL

TETRAETHYL LEAD

Common Synonyms TEL Lead tetraethyl	Only liquid. Colorless, but generally dyed red. Fruity odor. Sinks in water. Poisonous. Flammable vapor is produced.
Fire	Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Vapor may explode if ignited in an enclosed area.
 Exposure	ALL FORMS MEDICALLY TOXIC. VAPOR POISONOUS IF INHALED OR IF SKIN IS EXPOSED. Irritating to eyes. LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED. Irritating to skin. RESTRICTED ACCESS. SWALLOWED: DO NOT INDUCE VOMITING. RINSE MOUTH WITH WATER. DRINK WATER. CALL A PHYSICIAN.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-3.) Issue warning: poison. water containment. Restrict access. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Lead tetraethyl 3.2 Coast Guard Compatibility Classification: Special class 3.3 Chemical Formula: PbC ₂ H ₆ 3.4 IMCO United Nations Numerical Designation: 2.1 (1649)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Dyed red or other distinctive color 4.3 Odor: Sweet
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Oxygen vapor-type canister face mask for short periods; air for longer periods; neoprene coated liquid proof gloves; protective goggles; face shield; white or light colored clothing; rubber shoes or boots. 5.2 Symptoms Following Exposure: Increased urinary output of lead. If a large degree of absorption, coma, convulsions, skin contact may cause insomnia, excitability, tremor, coma and death. Do not confuse with inorganic lead. 5.3 Treatment for Exposure: Remove victim from contaminated area and consult physician immediately. INGESTION: induce vomiting. SKIN: wash immediately with kerosene or similar petroleum distillate followed by soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ 5.5 Short-Term Inhalation Limit: 0.15 mg Pb/m ³ for 30 min 5.6 Toxicity by Ingestion: Oral rat LD ₅₀ = 17 mg/kg 5.7 Late Toxicity: Lead poisoning. 5.8 Vapor (Gas) Irritant Characteristics: A person can feel a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes stinging of the skin and first degree burns on short exposure; may cause secondary burns on long exposure. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS

- 6.1 Flash Point: 200°F (C = 188.1°C)
- 6.2 Flammable Limits in Air: Data not available
- 6.3 Fire Extinguishing Agents: Water, foam, dry chemical or carbon dioxide
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
- 6.5 Special Hazards of Combustion Products: Toxic gases are generated in fires.
- 6.6 Behavior in Fire: May explode in fires.
- 6.7 Ignition Temperature: Decomposes above 230°F
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Data not available

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials: Reacts with some metals cause decomposition
- 7.3 Stability During Transport: Stable below 230°F. At higher temperatures may detonate or explode when confined
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: 0.20 mg/l 96-hr bluegill TL₅₀ in fresh water
- 8.2 Waterway Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: Data not available

9 SELECTED MANUFACTURERS

1. E. I. duPont de Nemours & Co., Inc. Petroleum Chemicals Division, Artich, Calif. 94509
2. Ethyl Corp. Industrial Chemicals Division, 451 Florja St., Baton Rouge, La. 70801
3. PPG Industries, Inc. Houston Chemical Co. Division, Beaumont, Tex. 77704

10 SHIPPING INFORMATION

- 10.1 Grades or Purity: Technical
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Pressure/vacuum

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3.)
 X-X-X

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Poisonous liquid or solid, Class B
- 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classifications:

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	2
Reactivity (Yellow)	3

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
- 13.2 Molecular Weight: 323.44
- 13.3 Boiling Point at 1 atm: Decomposes
- 13.4 Freezing Point: -218°F = -133°C = 136°K
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.633 at 20°C (liquid)
- 13.8 Liquid Surface Tension: 28.5 dynes/cm = 0.0285 N/m at (est.) 25°C
- 13.9 Liquid-Water Interfacial Tension: (est.) 40 dynes/cm = 0.04 N/m at 20°C
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: (est.) -7570 Btu/lb = -430 kcal/g = -183 x 10³ J/kg
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

(Continued on page 2 and 3)

NOTES

REVISED 1978

TEP

TETRAETHYL PYROPHOSPHATE

Common Synonyms Ethylpyrophosphate Nitep TEP TEPP		Liquid Mixes with water	Colorless to yellow	Faint fruity odor
Fire		Not flammable POISONOUS GASES ARE PRODUCED WHEN HEATED		
 Exposure		LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison water contaminant Restrict access Should be removed Chemical and physical treatment Disperse and flush (small discharge)		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Bladan, Ethyl pyrophosphate, Killax, Mortopal, Nitep, TEP, TEPP, Tetron, Vaportone 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula C ₂ H ₅ O ₂ POOP(OOC ₂ H ₅) ₂ or (C ₂ H ₅ P ₂ O ₆) ₂ 3.4 IMCO/United Nations Numerical Designation: 6.1, 1705		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Water white to amber 4.3 Odor: Aromatic, faint fruits		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Mask with canister approved for organic phosphate pesticides; goggles or face shield; rubber gloves and other protective clothing to prevent contact with skin. 5.2 Symptoms Following Exposure: Contact with liquid causes irritation of eyes and skin. Compound can be absorbed through skin. Ingestion of liquid or inhalation of mist causes nausea, vomiting, mental confusion, abdominal pain, sweating, giddiness, apprehension, and restlessness. Later muscular twitching of eyelids and tongue begin, then other muscles of face and neck become involved; pulmonary edema, ataxia, tremor, and convulsions may advance to coma. 5.3 Treatment for Exposure: <i>(Call physician for all exposures to this compound.)</i> INHALATION: support respiration; keep airway clear; use artificial respiration if breathing is difficult or has stopped. EYES: flush with water immediately after contact for at least 15 min. SKIN: remove victim's clothing and shoes immediately; using rubber gloves, quickly wipe off affected area with clean cloths; immediately follow with a shower; using plenty of soap, if complete shower is impossible, wash affected skin, hair, and fingernails repeatedly with soap and water using clean cloths each time to prevent spreading the contamination. INGESTION: induce vomiting by putting a finger down the throat or by giving warm salt water (one tablespoon salt per glass). Repeat until vomit fluid is clear (save fluid for physician's examination); if vomiting cannot be induced within five minutes, have victim drink plenty of milk or water; have him lie down and keep him warm; if there is difficulty in breathing due to increased secretions, chest may be cleared by propping patient up; if he stops breathing, use artificial or mouth-to-mouth respiration; preferably through an airway; wash victim's mouth of contamination; mechanical resuscitator should be used if available; oxygen may be necessary; keep patient under observation for 24 hrs. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.05 mg/m				

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable
 6.2 **Flammable Limits in Air:** Not flammable
 6.3 **Fire Extinguishing Agents:** Not pertinent
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
 6.5 **Special Hazards of Combustion Products:** Highly toxic gases and vapors of unburned material and phosphoric acid are formed in fires.
 6.6 **Behavior in Fire:** Water streams applied to adjacent fires will spread contamination of pesticide over wide area.
 6.7 **Ignition Temperature:** Not pertinent.
 6.8 **Electrical Hazard:** Not pertinent.
 6.9 **Burning Rate:** Not pertinent.

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Reacts slowly to form phosphoric acid.
 7.2 **Reactivity with Common Materials:** Corrosive to aluminum; slowly corrosive to copper, brass, zinc, and tin.
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Caustics:** Flush with water; rinse with sodium bicarbonate or lime solution.
 7.5 **Polymerization:** Not pertinent.
 7.6 **Inhibitor of Polymerization:** Not pertinent.

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** 10 ppm 96 hr fathead; 11 mg/l fresh water; 500 ppm 48 hr marine plankton; no growth of lethal salt water; *Time period not specified.
 8.2 **Waterlow Toxicity:** LD₅₀ = 3.56 mg/kg.
 8.3 **Biological Oxygen Demand (BOD):** Data not available.
 8.4 **Food Chain Concentration Potential:** None.

9 SELECTED MANUFACTURERS

1. Muller Chemical & Fertilizer Corp.
P.O. Box 333
Hanover, Pa. 17331
2. Chevron Chemical Co.
Orto Division
200 Bush Street
San Francisco, Calif. 94129

10 SHIPPING INFORMATION

- 10.1 **Grades or Purity:** Technical 40% plus 60% related ethyl phosphates.
Acetoxides (5-10%) (Class A poison); Dusts (0.66-1.2%) Sprays (0.1-0.4%).
10.2 **Storage Temperature:** Ambient.
10.3 **Inert Atmosphere:** No requirement.
10.4 **Ventilating:** Open.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446)
A P

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Poisonous, Class B.
12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed.
12.3 **MFPA Hazard Classifications:** Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid.
13.2 **Molecular Weight:** 297.2.
13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes).
13.4 **Freezing Point:** Not pertinent.
13.5 **Critical Temperature:** Not pertinent.
13.6 **Critical Pressure:** Not pertinent.
13.7 **Specific Gravity:** 1.18 at 25°C (liquids).
13.8 **Liquid Surface Tension:** Data not available.
13.9 **Liquid-Water Interfacial Tension:** Not pertinent.
13.10 **Vapor (Gas) Specific Gravity:** Not pertinent.
13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
13.12 **Latent Heat of Vaporization:** Not pertinent.
13.13 **Heat of Combustion:** Not pertinent.
13.14 **Heat of Decomposition:** Not pertinent.
13.15 **Heat of Solution:** Not pertinent.
13.16 **Heat of Polymerization:** Not pertinent.

(continued on page 2 and 3)

5 HEALTH HAZARDS (Cont'd)

- 5.5 **Short-Term Inhalation Limits:** 0.25 mg/m³ for 40 min.
5.6 **Toxicity by Ingestion:** Grade 4 LD₅₀ < 50 mg/kg.
5.7 **Loie Toxicity:** Data not available.
5.8 **Vapor (Gas) Irritant Characteristics:** Data not available.
5.9 **Liquid or Solid Irritant Characteristics:** Data not available.
5.10 **Odor Threshold:** Data not available.

(continued on page 3)

TFE

TETRAFLUOROETHYLENE, INHIBITED

Common Synonyms Teflon monomer	Compressed Gas Colorless Odorless or faint odor Visible vapor cloud is produced
Fire	FLAMMABLE POISONOUS GASES ARE PRODUCED IN FIRE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area
Exposure	VAPOR Irritating to eyes, nose and throat
Water Pollution	Not harmful to aquatic life
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability Restrict access	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Teflon monomer 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $\text{F}_2\text{C}=\text{CF}_2$ 3.4 IMCO/United Nations Numerical Designation: 2104	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Compressed gas 4.2 Color: Colorless 4.3 Odor: None or faint
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus for high gas concentrations 5.2 Symptoms Following Exposure: Inhalation causes irritation of respiratory system. Contact with eyes causes slight irritation 5.3 Treatment for Exposure: INHALATION: remove victim from exposure; if breathing is difficult give artificial respiration and call physician 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Causes possible impairment of immunologic defense system in rats 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent (gas) 6.2 Flammable Limits in Air: 10% - 18% 6.3 Fire Extinguishing Agents: Let fire burn. Stop flow of gas; cool containers with water. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: When burned in air, gas forms toxic carbonyl fluoride and hydrogen fluoride 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode 6.7 Ignition Temperature: 370 °F 6.8 Electrical Hazard: C_2F_4 air mixtures produced explosions which propagated through the smallest clearance in standard test conducted by Underwriters Laboratories. It does not meet any group classification. (Continued on page 4)	8 WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Can polymerize in the absence of inhibitor, especially when heated in a presence of oxygen 7.6 Inhibitor or Polymerization: dinitrobenzene, tetrahydrothiophene, or the methyl methacrylate	9 SELECTED MANUFACTURERS 1. I. I. duPont de Nemours & Co. Plastics Department, Wilmington, Del. 19899 2. ICI America, Wilmington, Del. 19899 3. Matheson Gas Products Co. East Rutherford, N. J. 07073								
10 SHIPPING INFORMATION 10.1 Grades or Purity: 98% 10.2 Storage Temperature: Cool ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief	11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-B-C-Z								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification*</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>2-3</td></tr><tr><td>Flammability (Red)</td><td>4-4</td></tr><tr><td>Reactivity (Yellow)</td><td>3-3</td></tr></tbody></table> *First column refers to nonfire situation	Category	Classification*	Health Hazard (Blue)	2-3	Flammability (Red)	4-4	Reactivity (Yellow)	3-3	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas 13.2 Molecular Weight: 100.0 13.3 Boiling Point at 1 atm: -105°F = -76°C = 197°K 13.4 Freezing Point: -224°F = -142°C = 13°K 13.5 Critical Temperature: (est.) 92°F = 33°C = 306°K 13.6 Critical Pressure: (est.) 473 psia = 32.6 atm = 3.95 MPa (m) 13.7 Specific Gravity: Not pertinent 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 3.45 13.11 Ratio of Specific Heats of Vapor (Gas): (eq. 1) 1.261 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (est.) -4,000 Btu/lb = -2,000 cal/g = -90 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: -40 Btu/lb = -250 cal/g = -10 x 10 ³ J/kg (Continued on pages 5 and 6)
Category	Classification*								
Health Hazard (Blue)	2-3								
Flammability (Red)	4-4								
Reactivity (Yellow)	3-3								
6 FIRE HAZARDS (Cont'd.) 6.9 Burning Rate: Not pertinent									

THF

TETRAHYDROFURAN

Common Synonyms Oxethylene oxide Tetramethylene oxide THF	Liquid Colorless Faint fruity odor Floats and mixes with water. Flammable; irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Vapor may be ineffective.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, headache or loss of consciousness. LIQUID Irritating to skin and eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445-4) Toxic warning: High flammability. Dispersal and flush.	2. LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Tetramethylene oxide THF 3.2 Coast Guard Compatibility Classification: Other 3.3 Chemical Formula: C_4H_8O 3.4 IMCO United Nations Numerical Designation: 31206	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Ether-like, similar to acetone
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles, flame hood, rubber or plastic gloves. 5.2 Symptoms Following Exposure: Vapor causes nausea, dizziness, headache, and irritation to eyes. 5.3 Treatment for Exposure: INHALATION: Remove victim from exposure area and administer artificial respiration and oxygen if needed. INGESTION: Give large amounts of water. Seek medical attention. SKIN OR EYE CONTACT: Wash thoroughly with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not given. 5.5 Short-Term Inhalation Limits: 100 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade I LD ₅₀ = 1000 mg/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes a slight irritation to the eyes and respiratory system at low concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard: Irritation to the skin and eyes if contact is maintained and rubbing of the skin. 5.10 Odor Threshold: Not given.	

6 FIRE HAZARDS 6.1 Flash Point: -11.1°C ($+10^{\circ}\text{F}$) 6.2 Flammable Limits in Air: 3.8 - 11.8% 6.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: If flame vapor is generated when heated. 6.6 Behavior in Fire: May explode. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 210°C 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 4.7 mm/min.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterlow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																												
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable unless heated. It will polymerize in the presence of peroxides. When concentrated by evaporation, it will explode. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: 0.01% butadiene hydroxybenzene (BHDH) present to prevent peroxide formation.	9 SELECTED MANUFACTURERS 1. E. I. du Pont de Nemours & Co., Inc. Electrochemical Dept. Wilmington, Del. 19880 2. The Quaker Oats Co. Chemical Division 3324 Chelsea Ave. Memphis, Tenn. 38102																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 445-2) VAPORS	10 SHIPPING INFORMATION 10.1 Grades or Purity: Data not available. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Padded. 10.4 Venting: Pressure-equalizing.																												
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>4</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td> Vapor Irritant</td> <td>1</td> </tr> <tr> <td> Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td> Poisons</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td> Human Toxicity</td> <td>2</td> </tr> <tr> <td> Aquatic Toxicity</td> <td>2</td> </tr> <tr> <td> Aesthetic Effect</td> <td>0</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td> Other Chemicals</td> <td>1</td> </tr> <tr> <td> Water</td> <td>0</td> </tr> <tr> <td> Self Reaction</td> <td>3</td> </tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	2	Aesthetic Effect	0	Reactivity		Other Chemicals	1	Water	0	Self Reaction	3	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 72.10. 13.3 Boiling Point at 1 atm: 34.3°C ($= 93.7^{\circ}\text{F}$). 13.4 Freezing Point: -108.3°C ($= 163.1^{\circ}\text{F}$). 13.5 Critical Temperature: 312.6°C ($= 590.7^{\circ}\text{F}$). 13.6 Critical Pressure: 53.3 psia ($= 3.69 \text{ MN/m}^2$). 13.7 Specific Gravity: 0.889 at 20°C (liquid). 13.8 Liquid Surface Tension: 28 dynes/cm ($= 0.028 \text{ N/m}$) at 20°C . 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not given. 13.12 Latent Heat of Vaporization: 180 Btu/lb ($= 95 \text{ cal/g}$) at 40°C (10°C). 13.13 Heat of Combustion: -14,940 Btu/lb ($= -3440 \text{ cal/g}$) at 25°C . 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	4																												
Health																													
Vapor Irritant	1																												
Liquid or Solid Irritant	1																												
Poisons	2																												
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Self Reaction	3																												
12.3 NFPA Hazard Classification <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>2</td> </tr> <tr> <td>Flammability (Red)</td> <td>4</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>1</td> </tr> </tbody> </table>		Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	4	Reactivity (Yellow)	1																				
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Health Hazard (Blue)	2																												
Flammability (Red)	4																												
Reactivity (Yellow)	1																												
NOTES																													

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THN

TETRAHYDRONAPHTHALENE

Common Synonyms: 1,2,3,4-tetrahydronaphthalene Tetralin Tetralap	Physical State: Liquids Color/Smell: Colorless. Muddy, turpentine odor. Boiling Point: 207°C (405°F) Melting Point: 80°C (176°F) Density: 1.026 g/cm³ (62.5 lb/ft³) Flash Point: 115°C (239°F) Autoignition: 253°C (487°F) Explosion Limits: 1.1% - 7.1% (vol)
	Fire Combustible
Exposure	Liquid Irritating to skin and eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE See Response Manual Handbook, CG 446-1. Mechanical containment. Should be removed. Chemical and physical treatment.	2 LABELS No hazard label required by Code of Federal Regulation.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,2,3,4-Tetrahydronaphthalene; Tetralin; Tetralap. 3.2 Coast Guard Compatibility Classification: Aromatic hydrocarbon. 3.3 Chemical Formula: C ₁₀ H ₈ . 3.4 IMCO United Nations Numerical Designation: Not listed.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Muddy character, resembling that of naphthalene and turpentine.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: A supply of clean, fresh, dry, filtered, face shield, rubber gloves. 5.2 Symptoms Following Exposure: Liquid may cause irritation to skin and eyes and may be harmful if swallowed. 5.3 Treatment for Exposure: Inhalation: If inhaled, remove to fresh air and breathe fresh air. If severe, seek medical attention. If swallowed, do not induce vomiting. If in eyes, flush with water for at least 15 minutes and seek medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not specified. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2.4 Data not available. 5.7 Late Toxicity: Liver and kidney damage from high doses. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is a weak irritant to the eyes, nose, and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. Irritated on skin and allows it to become the cause of a long period of burning pain. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 115°C (239°F). 6.2 Flammable Limits in Air: 1.1% - 7.1% (vol). 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Avoid water. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 253°C (487°F). 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8 WATER POLLUTION 8.1 Aquatic Toxicity: 78 ppm 24 hr; biodegradable. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 100 mg/l day. 8.4 Food Chain Concentration Potential: Not pertinent.																										
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive. 7.2 Reactivity with Common Materials: Not reactive. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1. Eastman Organic Chemicals: 270 Park Ave., New York, N.Y. 10017. 2. Eastman Organic Chemicals: 270 Park Ave., New York, N.Y. 10017. 3. Eastman Organic Chemicals: 270 Park Ave., New York, N.Y. 10017.																										
11 HAZARD ASSESSMENT CODE See Response Manual Handbook, CG 446-1. AFC	10 SHIPPING INFORMATION 10.1 Grades or Purity: 99+. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not required. 10.4 Venting: Open to atmosphere.																										
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: combustible liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Vapor Irritant</td> <td>1</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>1</td> </tr> <tr> <td>Poison</td> <td>2</td> </tr> <tr> <td>Water Pollution</td> <td>1</td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Acute Toxicity</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>0</td> </tr> <tr> <td>Other Chemicals</td> <td>0</td> </tr> <tr> <td>Acid</td> <td>1</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poison	2	Water Pollution	1	Human Toxicity	1	Acute Toxicity	2	Reactivity	0	Other Chemicals	0	Acid	1	Self Reaction	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: liquid. 13.2 Molecular Weight: 128.2. 13.3 Boiling Point at 1 atm: 207°C (405°F). 13.4 Freezing Point: 80°C (176°F). 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.026 at 20°C (liquid). 13.8 Liquid Surface Tension: 35.5 dynes/cm at 20°C (liquid). 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 45,000 cal/g (188,000 J/g). 13.13 Heat of Combustion: 42,000 cal/g (176,000 J/g). 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																										
Fire	1																										
Health	1																										
Vapor Irritant	1																										
Liquid or Solid Irritant	1																										
Poison	2																										
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Acute Toxicity	2																										
Reactivity	0																										
Other Chemicals	0																										
Acid	1																										
Self Reaction	0																										
NOTES 1. Information subject to change.																											

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TML	TETRAMETHYL LEAD
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TPG

THIOPHOSGENE

Common Synonyms Thiocarbonyl chloride		Liquid	Red	Sharp choking odor
Sinks in water. Reacts slowly with water and produces poisonous vapor.				

6 FIRE HAZARDS

- 6.1 Flash Point: Data not available.
 6.2 Flammable Limits in Air: Data not available.
 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide.
 6.4 Fire Extinguishing Agents Not to be Used: Water foam.
 6.5 Special Hazards of Combustion Products: Toxic phosphene, hydrogen chloride and sulfur dioxide may be generated in a fire.
 6.6 Behavior in Fire: Decomposes above 200°C. Carbon disulfide is very flammable and carbon tetrachloride.
 6.7 Ignition Temperature: Data not available.
 6.8 Electrical Hazard: Data not available.
 6.9 Burning Rate: Data not available.

8 WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): Data not available.
 8.4 Food Chain Concentration Potential: None.

9 SELECTED MANUFACTURERS

1. Aldrich Chemical Co.
 940 West St. Paul Avenue
 Milwaukee, Wis. 53233
 2. Platy and Bauer, Inc.
 1204 Northern Boulevard
 Flushing, N.Y. 11355

7 CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: It reacts with hydrogen chloride, carbon disulfide and carbon dioxide. Reaction is slow unless water is hot.
 7.2 Reactivity with Common Materials: Corrosive metals in presence of moisture.
 7.3 Stability During Transport: Stable.
 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with sodium bicarbonate or lime solution.
 7.5 Polymerization: Not pertinent.
 7.6 Inhibitor of Polymerization: Not pertinent.

10 SHIPPING INFORMATION

- 10.1 Grades or Purities: Commercial.
 10.2 Storage Temperature: Ambient.
 10.3 Inert Atmosphere: No requirement.
 10.4 Venting: Pressure vessel.

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Manual, CG 448.
 XXX

12 HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Poisonous (2105 B)
 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed.
 12.3 NFPA Hazard Classifications: Not listed.

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid.
 13.2 Molecular Weight: 76.13
 13.3 Boiling Point at 1 atm: 121°F = 50°C = 323°K.
 13.4 Freezing Point: Not pertinent.
 13.5 Critical Temperature: Not pertinent.
 13.6 Critical Pressure: Not pertinent.
 13.7 Specific Gravity: 1.262 at 20°C.
 13.8 Liquid Surface Tension: 25 dynes/cm = 0.025 N/m at 20°C.
 13.9 Liquid-Water Interfacial Tension: Not pertinent.
 13.10 Vapor (Gas) Specific Gravity: 2.
 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available.
 13.12 Latent Heat of Vaporization: 1570 Btu/lb = 716 cal/g = 3.0 x 10³ J/kg.
 13.13 Heat of Combustion: 16,000 Btu/lb = 7,000 cal/g = 30 x 10³ J/kg.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: Not pertinent.

NOTES

THR	THIRAM
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TRN

THORIUM NITRATE

Common Synonyms Thorium nitrate tetrahydrate		Solid White Odorless Mixes with water
Fire	Not flammable May cause fire on contact with combustibles POISONOUS GASES ARE PRODUCED IN FIRE	
Exposure	DUST Irritating to eyes, nose and throat Harmful if inhaled SOLID Irritating to skin and eyes Harmful if swallowed	
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intake	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: radioactive, oxidizing material, water contaminant Restrict access Should be removed chemically and physically treated		2. LABELS  
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Thorium nitrate tetrahydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: <chem>Th(NO3)4·4H2O</chem> (approx) 3.4 IMCO/United Nations Numerical Designation: Low Specific Activity		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust respirator or gloves, rubber shoes, etc. 5.2 Symptoms Following Exposure: Compound has low chemical toxicity but alpha emission is expected to constitute a hazard if a fairly large amount is inhaled or ingested. Dust may irritate eyes and cause diffuse dermatitis. Beta and gamma emission is small. 5.3 Treatment for Exposure: IF IN FLUSH with water and avoid inhaled or removed. IF INGESTED, get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Genetic effects of large exposures with level radiation are suspected to be harmful. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent		

6 FIRE HAZARDS

6.1 **Flash Point:** Not flammable, but may cause fire on contact with oxidizing materials.

6.2 **Flammable Limits in Air:** Not flammable

6.3 **Fire Extinguishing Agents:** Water

6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent

6.5 **Special Hazards of Combustion Products:** Yields toxic oxides of nitrogen when heated or fired.

6.6 **Behavior in Fire:** When heated, it may catch on fire. In fire, it may cause fire to spread and may produce water insoluble or water emulsifiable material. Water used to extinguish material will increase the spread of fire.

6.7 **Ignition Temperature:** Not pertinent

6.8 **Electrical Hazard:** Not pertinent

6.9 **Burning Rate:** Not pertinent

7 CHEMICAL REACTIVITY

7.1 **Reactivity with Water:** Forms a weak solution. In the absence of reaction is not hazardous.

7.2 **Reactivity with Common Materials:** In contact with easily oxidizable substances may react readily enough to cause ignition under confinement or exposure. Not a strong oxidizer and does not react with acids and bases.

7.3 **Stability During Transport:** Stable

7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent

7.5 **Polymerization:** Not pertinent

7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

8.1 **Aquatic Toxicity:** 100 ppm 48 hr. water bioassay with fish and daphnia

8.2 **Waterleaf Toxicity:** Data not available

8.3 **Biological Oxygen Demand (BOD):** None

8.4 **Food Chain Concentration Potential:** Data not available

9 SELECTED MANUFACTURERS

W. R. Grace & Co.
Division of Chemical Division
P.O. Box 155
Portland, Oregon 97208

American Pyrotechnics Company
288 Ann Street
West Chicago, Illinois 60591

J. T. Baker Chemical Co.
Phillipsburg, New Jersey 08865

10. SHIPPING INFORMATION

10.1 **Grade or Purity:** Reagent

10.2 **Storage Temperature:** Ambient

10.3 **Inert Atmosphere:** Not recommended

10.4 **Venting:** None

11. HAZARD ASSESSMENT CODE

See HAZARD ASSESSMENT HANDBOOK, CG 446-2
XX

12 HAZARD CLASSIFICATIONS

12.1 **Code of Federal Regulations:** Radioactive material

12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed

12.3 **NFPA Hazard Classifications:**

Category	Classification*
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	1

* See Handbook, CG 446-2, for details.

13 PHYSICAL AND CHEMICAL PROPERTIES

13.1 **Physical State at 15°C and 1 atm:** Solid

13.2 **Molecular Weight:** 388.2

13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)

13.4 **Freezing Point:** Not pertinent

13.5 **Critical Temperature:** Not pertinent

13.6 **Critical Pressure:** Not pertinent

13.7 **Specific Gravity:** 2.01 at 20°C (solid)

13.8 **Liquid Surface Tension:** Not pertinent

13.9 **Liquid-Water Interfacial Tension:** Not pertinent

13.10 **Vapor (Gas) Specific Gravity:** Not pertinent

13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent

13.12 **Latent Heat of Vaporization:** Not pertinent

13.13 **Heat of Combustion:** Not pertinent

13.14 **Heat of Decomposition:** Not pertinent

13.15 **Heat of Solution:** Not pertinent

13.16 **Heat of Polymerization:** Not pertinent

* Continued on pages 1 and 2

NOTES

III

TITANIUM TETRACHLORIDE

Common Synonyms		Water: liquid	Colorless to light yellow	Irritating odor
		Reacts violently with water. Produces dense fumes in air		
Fire	Not flammable			
Exposure	VAPOR Irritating to eyes, nose and throat If inhaled, will cause coughing or headache LIQUID Will burn skin and eyes If swallowed, will cause nausea and vomiting			
Water Pollution	Dangerous to aquatic life in high concentrations May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE		2. LABEL		
See Response to Emergency Procedures, 12.4.4.4				
3. CHEMICAL DESIGNATIONS		4. OBSERVABLE CHARACTERISTICS		
3.1 Synonyms: None		4.1 Physical State (as shipped): Liquid		
3.2 Coast Guard Compatibility Classification: N/A		4.2 Color: Colorless		
3.3 Chemical Formula: $TiCl_4$		4.3 Odor: Irritating		
3.4 IMCO United Nations Numerical Designation: N/A				
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: See Response to Emergency Procedures, 12.4.4.4				
5.2 Symptoms Following Exposure: See Response to Emergency Procedures, 12.4.4.4				
5.3 Treatment for Exposure: See Response to Emergency Procedures, 12.4.4.4				
5.4 Toxicity by Inhalation (Threshold Limit Value): 1 ppm in dust or air				
5.5 Short-Term Inhalation Limits: 10 ppm				
5.6 Toxicity by Ingestion: See Response to Emergency Procedures, 12.4.4.4				
5.7 Late Toxicity: Disturbances of upper respiratory and nervous system is due				
5.8 Vapor (Gas) Irritant Characteristics: See Response to Emergency Procedures, 12.4.4.4				
5.9 Liquid or Solid Irritant Characteristics: See Response to Emergency Procedures, 12.4.4.4				
5.10 Odor Threshold: 10 ppm				

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1 Flash Point: None		8.1 Aquatic Toxicity: See Response to Emergency Procedures, 12.4.4.4.	
6.2 Flammable Limits in Air: None		8.2 Waterland Toxicity: See Response to Emergency Procedures, 12.4.4.4.	
6.3 Fire Extinguishing Agents: Inert gases, carbon dioxide, and foam.		8.3 Biological Oxygen Demand (BOD): None.	
6.4 Fire Extinguishing Agents Not to be Used: Water.		8.4 Food Chain Concentration Potential: None.	
6.5 Special Hazards of Combustion Products: None.			
6.6 Behavior in Fire: None.			
6.7 Ignition Temperature: None.			
6.8 Electrical Hazard: None.		9 SELECTED MANUFACTURERS	
6.9 Burning Rate: None.		Cyanide Monsanto Nalco Pittsburgh Rockwell Union Carbide	

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TOL

TOLUENE

Common Synonyms Toluol Methylbenzene Methylbenzol	Watery liquid Colorless Pleasant odor Floats on water. Flammable. Irritating vapor is produced.
	
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Vapor may be ignited by static electricity. Vapor may be ignited by open flame. Vapor may be ignited by hot surfaces. Vapor may be ignited by sparks.
Exposure	CALL FOR MEDICAL AID VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, headache, dizziness, difficult breathing, or loss of consciousness. May be fatal if inhaled in high concentrations. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting or loss of consciousness. Remove clothing and shoes if contaminated. If in EYES, flush with water for at least 15 min. If IN EYES, remove contact lenses and flush with water for at least 15 min. If SWALLOWED, do NOT induce vomiting. Give water to drink. DO NOT INDUCE VOMITING.
Water Pollution	Dangerous to aquatic life at high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes. Notify local health department if it enters water. Notify local health department if it enters water.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning. High flammability. Evacuate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Methylbenzene, Methylbenzol, Toluol. 3.2 Coast Guard Compatibility Classification: Aromatic hydrocarbon. 3.3 Chemical Formula: C ₇ H ₈ . 3.4 IMCO/United Nations Numerical Designation: 3.2, 1.24.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Pungent, aromatic, benzene-like, distinct, pleasant.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supplied mask, goggles or face shield, plastic gloves. 5.2 Symptoms Following Exposure: Vapors irritate eyes and upper respiratory tract, cause dizziness, headache, anesthesia, respiratory arrest. Liquid irritates eyes and causes drying of skin. If aspirated, causes coughing, gagging, distress, and rapidly developing pulmonary edema. If ingested causes vomiting, griping, diarrhea, depressed respiration. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, give artificial respiration and oxygen if needed, call a doctor. INGESTION: do NOT induce vomiting, call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm. 5.5 Short-Term Inhalation Limits: 499 ppm for 30 min. 5.6 Toxicity by Ingestion: Grade 2 LD 50 5 to 5 g/kg. 5.7 Late Toxicity: Kidney and liver damage may follow ingestion. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 0.17 ppm.	

6. FIRE HAZARDS 6.1 Flash Point: 40°F (4°C) (55°F (13°C)). 6.2 Flammable Limits in Air: 1.2% - 7%. 6.3 Fire Extinguishing Agents: Carbon dioxide, or dry chemical for small fires; ordinary foam for large fires. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion, Products: Not pertinent. 6.6 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 99°F. 6.8 Electrical Hazard: Class I, Group D. 6.9 Burning Rate: 5.7 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 1180 mg/L, 96 hr, sunfish/11 m, fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 0% 2 days, 38% (theoretical) 5 days. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Exxon Chemical Co. Houston, Tex. 77001. 2. Shell Chemical Co. Petrochemicals Division. Houston, Tex. 77001. 3. Sun Oil Co. St. Davids, Pa. 19087.																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A-T U	10. SHIPPING INFORMATION 10.1 Grades or Purity: Research reagent, nitration, 99.98% industrial, contains 94% with 5% xylene and small amounts of benzene and nonaromatic hydrocarbons, 96-120 less pure than industrial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arrester) or pressure vacuum.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="949 1410 1194 1782"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>1</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td> Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>1</td></tr> <tr> <td> Aquatic Toxicity</td><td>3</td></tr> <tr> <td> Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>1</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="949 1694 1194 1782"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 92.14. 13.3 Boiling Point at 1 atm: 110.6°F = 110.6°C = 383.8°K. 13.4 Freezing Point: -109°F = -95.0°C = 178.2°K. 13.5 Critical Temperature: 608.4°F = 318.6°C = 591.8°K. 13.6 Critical Pressure: 596.1 psia = 40.55 atm = 4.105 MN/m ² . 13.7 Specific Gravity: 0.867 at 20°C (liquids). 13.8 Liquid Surface Tension: 29.0 dynes/cm = 0.0290 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: 36.1 dynes/cm = 0.0361 N/m at 25°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.059. 13.12 Latent Heat of Vaporization: 155 Btu/lb = 86.1 cal/g = 3.61 x 10 ⁵ J/kg. 13.13 Heat of Combustion: -17,430 Btu/lb = -9686 cal/g = -405 x 10 ⁵ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	3																																				
Health																																					
Vapor Irritant	1																																				
Liquid or Solid Irritant	1																																				
Poisons	2																																				
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Human Toxicity	1																																				
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NOTES (Continued on pages 4 and 5)																																					

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TDI

TOLUENE 2,4-DIISOCYANATE

Common Synonyms TDI Hylene T Mowdur TDS Naccosate 100	Liquid Colorless to light yellow Sharp, sweet, fruity odor Sinks and reacts with water. Freezing point is 68°F - 72°F
AVOID CONTACT WITH LIQUID AND VAPOR. Keep people away. Wear goggles, self-contained breathing apparatus and clothes for full protection. Stay downwind of leaks. Call 911 for help. If you feel dizzy, get fresh air. If you feel nauseated, do not eat or drink.	
Fire	Combustible POISONOUS GAS IS PRODUCED IN FIRE. Wear goggles, self-contained breathing apparatus and clothes for full protection. Extinguish with dry chemical or carbon dioxide. Water and foam may be ineffective.
 Exposure	CAUTION FOR MEDICAL AID LIQUID POISONOUS IF SWALLOWED Will burn skin and eyes. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES: Flush with water for at least 15 minutes. IF SWALLOWED: Do not induce vomiting. Call doctor. DO NOT INDUCE VOMITING.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not a health or wildlife threat. Not a pollutant of surface water.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-1) Issue warning - water contaminant. Restrict access. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: Hylene T, Mowdur TDS, Naccosate 100, 2,4-Tolylene diisocyanate, TDI. 32 Coast Guard Compatibility Classification: Isocyanate. 33 Chemical Formula: C ₉ H ₇ N ₂ O ₂ . 34 IMCO/United Nations Numerical Designation: Not listed.	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid. 42 Color: Colorless to light yellow. 43 Odor: Sweet, fruity, pungent.
5. HEALTH HAZARDS 51 Personal Protective Equipment: Organic vapor canister, goggles or face shield, rubber gloves, boots and apron. 52 Symptoms Following Exposure: Irritates eyes and skin. Potent sensitizer and lung irritant if inhaled. May produce bronchospasm (asthma), pneumonitis, bronchitis, and pulmonary edema. Nocturnal cough and shortness of breath are common. Repeated low level exposure may produce chronic lung disease. Oral toxicity is low. 53 Treatment for Exposure: INHALATION: remove victim to fresh air, administer artificial respiration and oxygen if needed, call a doctor at once. INGESTION: do NOT induce vomiting, call a doctor. EYES: flush with water for at least 15 min., call doctor at once. SKIN: flush with water, wipe off, wipe with rubbing alcohol, wash with soap and water. 54 Toxicity by Inhalation (Threshold Limit Value): 0.02 ppm. 55 Short-Term Inhalation Limits: 0.02 ppm for 5 min. 56 Toxicity by Ingestion: Grade 2, LD ₅₀ 5 to 5 g/kg. 57 Late Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations. 59 Liquid or Solid Irritant Characteristics: Fairly severe skin irritant, may cause pain and second degree burns after a few minutes contact. 510 Odor: Threshold: 0.4 - 2.14 ppm.	

6. FIRE HAZARDS

- 61 **Flash Point:** 270°F (100°C)
- 62 **Flammable Limits in Air:** 0.9% - 9.5%
- 63 **Fire Extinguishing Agents:** Water, foam, dry chemical or carbon dioxide.
- 64 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause frothing.
- 65 **Special Hazards of Combustion Products:** Irritating vapors are generated when heated.
- 66 **Behavior in Fire:** Not pertinent.
- 67 **Ignition Temperature:** ≥300°F
- 68 **Electrical Hazard:** Not pertinent.
- 69 **Burning Rate:** Data not available.

7. CHEMICAL REACTIVITY

- 71 **Reactivity with Water:** Forms carbon dioxide gas and an organic base. The reaction is not violent.
- 72 **Reactivity with Common Materials:** No reaction.
- 73 **Stability During Transport:** Stable.
- 74 **Neutralizing Agents for Acids and Caustics:** Not pertinent.
- 75 **Polymerization:** Slow, not hazardous above 133°F.
- 76 **Inhibitor of Polymerization:** Not pertinent.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
A-X-Y

12. HAZARD CLASSIFICATIONS

- 121 **Code of Federal Regulations:** Poison, Class B.
- 122 **NAS Hazard Rating for Bulk Water Transportation:**

Category	Rating
Fire	1
Health	3
Vapor Irritant	3
Liquid or Solid Irritant	3
Reactions	4
Water Pollution	2
Human Toxicity	2
Aquatic Toxicity	4
Neurotoxic Effect	4
Reactivity	4
Other Chemicals	3
Water	3
Self Reaction	4
- 123 **NFPA Hazard Classifications:**

Category	Classification
Health Hazard (Blue)	3
Flammability (Red)	1
Reactivity (Yellow)	1

8. WATER POLLUTION

- 81 **Aquatic Toxicity:** Data not available.
- 82 **Waterfowl Toxicity:** Data not available.
- 83 **Biological Oxygen Demand (BOD):** Data not available.
- 84 **Food Chain Concentration Potential:** None.

9. SELECTED MANUFACTURERS

- 1 BASF Wyandotte Corp.
Industrial Chemicals Group
1000 Biddle Ave.
Wyandotte, Mich. 48192
- 2 Baxchem Corp.
Mobay Chemical Co. Division
Penn. Lincoln Park West
Pittsburgh, Pa. 15205
- 3 I. I. duPont de Nemours & Co., Inc.
Eastman Chemicals Dept.
Wilmington, Del. 19895

10. SHIPPING INFORMATION

- 101 **Grades or Purity:** Commercial distilled 99% total diisocyanate. The following isomer ratios are shipped: (a) 100% 2,4; (b) 80% 2,4, 20% 2,6; most common, 65% 2,4, 35% 2,6. All mixtures have about the same hazard characteristics.
- 102 **Storage Temperature:** 75 - 100°F
- 103 **Inert Atmosphere:** Inerted.
- 104 **Venting:** Pressure-vacuum.

13. PHYSICAL AND CHEMICAL PROPERTIES

- 131 **Physical State at 15°C and 1 atm:** Solid.
- 132 **Molecular Weight:** 174.16.
- 133 **Boiling Point at 1 atm:** 452°F = 230°C = 523°K.
- 134 **Freezing Point:** 68 - 72°F = 20 - 22°C = 293 - 295°K.
- 135 **Critical Temperature:** Not pertinent.
- 136 **Critical Pressure:** Not pertinent.
- 137 **Specific Gravity:** 1.22 at 25°C (liquid).
- 138 **Liquid Surface Tension:** test 125 dynes/cm = 0.025 N/m at 25°C.
- 139 **Liquid-Water Interfacial Tension:** test 145 dynes/cm = 0.045 N/m at 25°C.
- 1310 **Vapor (Gas) Specific Gravity:** Not pertinent.
- 1311 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent.
- 1312 **Latent Heat of Vaporization:** Not pertinent.
- 1313 **Heat of Combustion:** test 1 - 10,300 Btu/lb = -5720 cal/g = -239 X 10³ J/kg.
- 1314 **Heat of Decomposition:** Not pertinent.
- 1315 **Heat of Solution:** Not pertinent.
- 1316 **Heat of Polymerization:** Not pertinent.

(Continued on pages 5 and 6)

NOTES

6 FIRE HAZARDS 6.1 Flash Point: Not pertinent (solid with low flammability) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Irritating oxides of sulfur may be formed 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 0% 5 days 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: A strong acid which can react with common metals 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Flush with water, rinse with dilute sodium bicarbonate or lime solution 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Cities Service Company Industrial Chemicals Division 3445 Peachtree Road N.E. P.O. Box 50360 Atlanta, Ga. 30302 2. Nease Chemical Co., Inc. P.O. Box 223 State College, Pa. 16801 3. Aldrich Chemical Co. 940 West St. Paul Avenue Milwaukee, Wis. 53233
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 448-3) SS	10 SHIPPING INFORMATION 10.1 Grades or Purity: 93+% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive solid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 172.2 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 219-221°F = 104-105°C = 377-378°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.45 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -40 Btu/lb = -26 cal/g = -1.2 X 10³ J/kg 13.16 Heat of Polymerization: Not pertinent

(Continued on pages 4 and 6.)

NOTES

TLI

o-TOLUIDINE

Common Synonyms 2-Amino-1-methylbenzene 2-Aminotoluene 2-Methylaniline o-Methylaniline		Liquid	Colorless to yellow-brown	Chemical odor
May float or sink in water				

6 FIRE HAZARDS 61 Flash Point: 167°F (75°C) (NTP) (C) 62 Flammable Limits in Air: Data not available 63 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective 65 Special Hazards of Combustion Products: Toxic oxides of nitrogen and flammable vapors may form in fire 66 Behavior in Fire: 67 Ignition Temperature: 900°F 68 Electrical Hazard: Data not available 69 Burning Rate: 3.62 mm/min	8 WATER POLLUTION 81 Aquatic Toxicity: Appen 18 fish lethal-fresh water *Time period not specified 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): 143% 5 days 84 Food Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 First Chemical Corp. 606 N. State St. Jackson, Miss. 39205 2 E. I. du Pont de Nemours & Co., Inc. Wilmington, Del. 19598 3 Aldrich Chemical Co. 940 W. Saint Paul Ave. Milwaukee, Wis. 53233								
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446-3. A-P-Q-T-U-X-Y	10. SHIPPING INFORMATION 101 Grades or Purity: Commercial 99.5+% 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open (flame arrester)								
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed 122 HAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>3</td></tr><tr><td>Flammability (Red)</td><td>2</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></tbody></table>	Category	Classification	Health Hazard (Blue)	3	Flammability (Red)	2	Reactivity (Yellow)	0	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: 107.2 133 Boiling Point at 1 atm: 192°F = 200°C = 473°K 134 Freezing Point: -11°F = -24°C = 249°K 135 Critical Temperature: 790°F = 421°C = 694°K 136 Critical Pressure: 544 psia = 37.9 atm = 3.75 MN/m² 137 Specific Gravity: 0.998 at 20°C (liquid) 138 Liquid Surface Tension: 41.55 dynes/cm = 0.04355 N/m at 20°C 139 Liquid-Water Interfacial Tension: Data not available 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: 179.1 Btu/lb = 99.5 cal/g = 4.16 × 10³ J/kg 1313 Heat of Combustion: -16,180 Btu/lb = -8,990 cal/g = -376 × 10³ J/kg 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	3								
Flammability (Red)	2								
Reactivity (Yellow)	0								
Continued on pages 5 and 6									
NOTES									

TXP

TOXAPHENE

Common Synonyms: Octachlorocamphene	Heavy solid or in solution Amber Solid sinks in water; solution floats on water
Notes: 1. Single charge: 100 mg/kg body weight 2. Two charges: 50 mg/kg body weight 3. Three charges: 33 mg/kg body weight 4. Four charges: 25 mg/kg body weight 5. Five charges: 20 mg/kg body weight 6. Six charges: 17 mg/kg body weight 7. Seven charges: 14 mg/kg body weight 8. Eight charges: 12 mg/kg body weight 9. Nine charges: 10 mg/kg body weight 10. Ten charges: 8 mg/kg body weight	
Fire	Solid not flammable, but usually dissolved in combustible liquid. POISONOUS GASES ARE PRODUCED IN FIRE. Fire: Single charge: 100 mg/kg body weight Fire: Two charges: 50 mg/kg body weight Fire: Three charges: 33 mg/kg body weight Fire: Four charges: 25 mg/kg body weight Fire: Five charges: 20 mg/kg body weight Fire: Six charges: 17 mg/kg body weight Fire: Seven charges: 14 mg/kg body weight Fire: Eight charges: 12 mg/kg body weight Fire: Nine charges: 10 mg/kg body weight Fire: Ten charges: 8 mg/kg body weight
 Exposure	CAUTION FOR MEDICAL USE: SOLID OR SOLUTION POISONOUS IF SWALLOWED. Irritating to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. Solution is fouling to shoreline. May be dangerous if it enters water intakes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes. Causes severe irritation to skin and eyes.
1. RESPONSE TO DISCHARGE (See Response Manual, Section 400-40) Issue warning: poison water contaminant Should be removed Chemical and physical treatment	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Octachlorocamphene 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: C ₁₁ H ₇ Cl ₈ 3.4 IMCO United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Waxy solid 4.2 Color: Amber 4.3 Odor: Mild turpentine odor
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Chemical type respirator, rubber gloves, chemical goggles or face shield 5.2 Symptoms Following Exposure: May be absorbed through skin, lungs, or intestinal tract. Symptoms include salivation, leg and back muscle spasms, nausea, vomiting, hyperreflexia, tremors, shivering, clonus, convulsions, then tetanic contractions of all skeletal muscles. Tetanic doses cause respiratory failure. Respiration affected as a result of the exertion from vomiting or convulsions. First arrested because of tetanic muscular contractions, then increased in both amplitude and rate as the muscles relax. 5.3 Treatment for Exposure: If symptoms of poisoning appear, promptly remove the unabsorbed pesticide from the stomach by inducing vomiting with warm salty or soapy water if the patient is conscious or from the skin with soap and water. Keep patient warm and quiet. Call a physician. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 4 (1 lb below 50 mg/kg dose) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: The solid is non-volatile; no solutions; see meta-xylene 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smearing and reddening of the skin. 5.10 Odor Threshold: Not pertinent	
6. FIRE HAZARDS 6.1 Flash Point: 147°F (1 solution) 6.2 Flammable Limits in Air: 1.1 - 6.4 (v/v, end vol) 6.3 Fire Extinguishing Agents: Foam, dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Toxic vapors are generated when heated 6.6 Behavior in Fire: Solution in solvent may produce corrosive products when heated 6.7 Ignition Temperature: 956°F (1 solution) 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, Chapter 11 H A T T	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Waxy solid 13.2 Molecular Weight: 414 (avg) 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: 149 °C = 65 °F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.1 (v/v, end vol) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous liquid or solid, Class II 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
NOTES (Continued on page 1, back)	

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TCE

TRICHLOROETHANE

Common Synonyms 1,1,1-Trichloroethane Methylchloroform	Wettable liquid Colorless Sweet odor Sinks in water. Irritating vapor is produced.
Fire	
Exposure	
Water Pollution	
1. RESPONSE TO DISCHARGE (See Response Methods Manual, CG 446-4) Should be removed. Chemical and physical treatment.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Aethersene Chloroethene Methylchloroform 1,1,1-Trichloroethane 3.2 Coast Guard Competency Classification: Halogenated hydrocarbon 3.3 Chemical Formula: CHCl ₃ 3.4 IMCU United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Chloroform like, sweetish
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor acid gas canister, self-contained breathing apparatus for emergencies; neoprene or polyvinyl alcohol type gloves; chemical safety goggles; and face shield; neoprene safety shoes; or leather safety shoes plus neoprene footwear; neoprene or polyvinyl alcohol apron or apron for splash protection. 5.2 Symptoms Following Exposure: INHALATION: symptoms range from loss of equilibrium and incoordination to loss of consciousness. High concentrations can be fatal due to simple asphyxiation combined with loss of consciousness. INGESTION: produces effects similar to inhalation and may cause some feeling of nausea. EYES: slightly irritating and lacrimatory. SKIN: defatting action may cause dermatitis. 5.3 Treatment for Exposure: Get medical attention for all eye exposures and any other serious over exposures. Do NOT administer adrenalin or epinephrine; otherwise, treatment is symptomatic. INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting. EYES: flush thoroughly with water. SKIN: remove contaminated clothing and wash exposed area thoroughly with soap and warm water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 150 ppm. 5.5 Short-Term Inhalation Limits: 1000 ppm for 60 min. in man. 5.6 Toxicity by Ingestion: (Grade I LD ₅₀) 15 g per rat mouse (about 2 g per kg). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary.	

6. FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: 7-11% 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating gases are generated in fires. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 912°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: (est) 1.29 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 75-150 ppm * (rainfish 11 m salt water) *Time period not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																											
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts slowly releasing corrosive hydrochloric acid. 7.2 Reactivity with Common Materials: Corrodes aluminum, but reaction is not hazardous. 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-X-Y	9. SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. PPG Industries, Inc. Industrial Chemicals Division Leawood Center Pittsburgh, Pa. 15222 3. Yukon Materials Co. Chemicals Division Wichita, Kan. 67201 10. SHIPPING INFORMATION 10.1 Grades or Purity: Uninhibited inhibited industrial inhibited white room cold cleaning 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum 13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 133.41 13.3 Boiling Point at 1 atm: 168°F = 74°C = 347°K 13.4 Freezing Point: -108°F = -78°C = 234°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.46 at 20°C (liquid) 13.8 Liquid Surface Tension: 27.4 dynes/cm = 0.0274 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (est) 14.5 dynes/cm = 0.0145 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: 4.6 13.11 Ratio of Specific Heats of Vapor (Gas): 1.04 13.12 Latent Heat of Vaporization: 100 Btu/lb = 55 cal/g = 2.4 x 10 ⁵ J/kg 13.13 Heat of Combustion: (est) 14700 Btu/lb = 2600 cal/g = 110 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																											
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="890 1412 1134 1692"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Harm to Toxicity</td><td>1</td></tr> <tr> <td>Aquatic Toxicity</td><td>3</td></tr> <tr> <td>Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed		Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Harm to Toxicity	1	Aquatic Toxicity	3	Aesthetic Effect	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction
Category	Rating																											
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Water Pollution																												
Harm to Toxicity	1																											
Aquatic Toxicity	3																											
Aesthetic Effect	2																											
Reactivity																												
Other Chemicals	1																											
Water	0																											
Self Reaction	0																											
5. HEALTH HAZARDS (Cont'd.) 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause staining and reddening of the skin. 5.10 Odor Threshold: 100 ppm																												

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TCL

TRICHLOROETHYLENE

Common Synonyms Trichloroethene Trichloroethylene	Physical State Watery liquid Colorless Sweet odor Sinks in water. Irritating vapor is produced.
Fire	Fire Combustible POISONOUS GASES ARE PRODUCED IN FIRE May cause irritation to eyes, nose, throat, and lungs.
Exposure	Exposure VAPOR Irritating to eyes, nose and throat If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness. LIQUID Irritating to skin and eyes If swallowed, will cause nausea, vomiting, difficult breathing, or loss of consciousness. If swallowed, will cause nausea, vomiting, difficult breathing, or loss of consciousness. If inhaled, will cause irritation to eyes, nose, throat, and lungs. If swallowed, will cause irritation to eyes, nose, throat, and lungs. If inhaled, will cause irritation to eyes, nose, throat, and lungs. If swallowed, will cause irritation to eyes, nose, throat, and lungs.
Water Pollution	Water Pollution Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4.) Should be removed. Chemical and physical treatment.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Mypsen, Chlorolen, Gemalgene, Threthylene, Trithylene, Tri Trichloran, Trichloroethene, Tri-Clene, Triclene, Trilene, Trilene, Trimar. 3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon. 3.3 Chemical Formula: C_2HCl_3 3.4 IMCO/United Nations Numerical Designation: 90 1210	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Chloroform like, ethereal
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor and gas canister, self-contained breathing apparatus for emergencies; neoprene vinyl gloves, chemical safety goggles, face shield, neoprene safety shoes, neoprene suit or apron for splash protection. 5.2 Symptoms Following Exposure: INHALATION: symptoms range from irritation of the nose and throat to nausea, an attitude of irresponsibility, blurred vision, and finally disturbance of central nervous system resulting in cardiac failure. Chronic exposure may cause organic injury. INGESTION: symptoms similar to inhalation. SKIN: defatting action can cause dermatitis. EYES: ethyl irritant sensation and lacrimation. 5.3 Treatment for Exposure: Do NOT administer adrenaline or epinephrine; get medical attention. In all cases of overexposure, INHALATION: remove victim to fresh air; if necessary, apply artificial respiration and/or administer oxygen. INGESTION: have victim drink water and induce vomiting; repeat three times; then give 1 tablespoon epsom salt in water. EYES: flush thoroughly with water. SKIN: wash thoroughly with soap and warm water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: 200 ppm for 30 min 5.6 Toxicity by Ingestion: Grade 3, LD ₅₀ 500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. Toxic effects are temporary. 5.9 Liquid or Solid Irritant Characteristics: Medium hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: 50 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 90°F (32°C) practically nonflammable 6.2 Flammable Limits in Air: 8.0 - 10.5% 6.3 Fire Extinguishing Agents: Water fog 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating gases are produced in fire situations. 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 750°F 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 100 mg/l 48 hr daphnia kill, fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. E. I. du Pont de Nemours & Co., Inc. Electrochemical Dept. Wilmington, Del. 19898 3. PPG Industries, Inc. Industrial Chemical Division Lake Charles, La. 70601																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3.) A-N-Y	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical dry, cleaning degreasing extraction 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: ORM-A 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td>1</td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poison</td><td>2</td></tr> <tr> <td>Water Pollution</td><td>2</td></tr> <tr> <td>Human Toxicity</td><td>2</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Narcotic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td>1</td></tr> <tr> <td>Other Chemicals</td><td>1</td></tr> <tr> <td>Water</td><td>1</td></tr> <tr> <td>Self Reaction</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed	Category	Rating	Fire	1	Health	1	Vapor Irritant	1	Liquid or Solid Irritant	1	Poison	2	Water Pollution	2	Human Toxicity	2	Aquatic Toxicity	2	Narcotic Effect	2	Reactivity	1	Other Chemicals	1	Water	1	Self Reaction	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 131.4 13.3 Boiling Point at 1 atm: 109°F = 37°C = 307°K 13.4 Freezing Point: -123.5°F = -90.4°C = 182.7°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.46 at 20°C (liquid) 13.8 Liquid Surface Tension: 29.3 dynes/cm = 0.0293 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 34.5 dynes/cm = 0.0345 N/m at 24°C 13.10 Vapor (Gas) Specific Gravity: 4.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.116 13.12 Latent Heat of Vaporization: 101 Btu/lb = 57.2 cal/g = 240 X 10 ³ J/kg 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	1																												
Health	1																												
Vapor Irritant	1																												
Liquid or Solid Irritant	1																												
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Other Chemicals	1																												
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Self Reaction	1																												
NOTES																													

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TCF

TRICHLOROFLUOROMETHANE

Common Synonyms: Freon 11 Geneton 11	Liquid Colorless Odorless Sinks in water. Harmful vapor is produced. Boiling point is 73°F.
Not flammable. Toxic when inhaled. May cause dizziness or difficulty breathing. May irritate eyes, nose, throat, and skin. May cause frostbite if in contact with liquid.	
Fire	Not flammable. POISONOUS GASES MAY BE PRODUCED IN FIRE. Water may be used to extinguish fire.
Exposure	CAUTION: IRRITANT VAPOR If inhaled, will cause dizziness or difficulty breathing. May irritate eyes, nose, throat, and skin. May cause frostbite if in contact with liquid. LIQUID: Not harmful
Water Pollution	Not harmful to aquatic life. May be dangerous if it enters water in lakes. May cause frostbite if in contact with liquid.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-1. Should be removed. Chemical and physical treatment.	2. LABELS No hazard label required by U.S. Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Azeotropic mixture of Freon 11, Freon 12, Freon 113, Geneton 11, Geneton 12, Geneton 113. 3.2 Coast Guard Compatibility Classification: Halogenated hydrocarbon. 3.3 Chemical Formula: CCl ₃ F. 3.4 IMCO United Nations Numerical Designation: Not listed.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Odorless; weak chloroform-like notes.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air line respirator or other gloves, goggles, etc. 5.2 Symptoms Following Exposure: Breathing concentrations approaching 10% may cause dizziness and drowsiness. Contact with liquid may cause frostbite. 5.3 Treatment for Exposure: INHALATION: Remove victim from contaminated area and apply artificial respiration if breathing has stopped; call a physician immediately; eye irritation may be relieved by flushing with water. SKIN: If irritation has occurred, flush skin with warm water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not known. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Not irritating. 5.9 Liquid or Solid Irritant Characteristics: May cause frostbite. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable. 6.2 Flammable Limits in Air: Not flammable. 6.3 Fire Extinguishing Agents: Not pertinent. 6.4 Fire Extinguishing Agents not to be used: Not pertinent. 6.5 Special Hazards of Combustion Products: Produces irritating and toxic products which become more dangerous at high temperatures. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Not listed in table. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not flammable.	8. WATER POLLUTION 8.1 Aquatic Toxicity: None. 8.2 Waterfowl Toxicity: None. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. E. I. du Pont de Nemours & Co., Inc., Freon Products Division, Wilmington, Del. 19880. 2. Penwalt Corp., Chemical Division, 3 Penn Center, Philadelphia, Pa. 19102. 3. Union Carbide Corp., Chemical and Plastics Division, 270 Park Ave., New York, N.Y. 10017.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-C-1-1	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Vectors: Safety sheet.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classification: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 55°C and 1 atm: Liquid. 13.2 Molecular Weight: 137.4. 13.3 Boiling Point at 1 atm: -24.8°C = -11.2°F = 248.3°K. 13.4 Freezing Point: -108.5°C = -163.1°F = 162.7°K. 13.5 Critical Temperature: 134.7°C = 274.3°F = 407.9°K. 13.6 Critical Pressure: 43.94 psia = 43.94 atm = 4.415 MPa. 13.7 Specific Gravity: 1.47 at 20°C (liquids). 13.8 Liquid Surface Tension: 23.5 dyne/cm = 0.0235 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 4.7. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.1125. 13.12 Latent Heat of Vaporization: 16,100 Btu/lb = 43,500 cal/g = 182.0 kJ/kg. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

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TPH

TRICHLOROPHENOL

Common Synonyms: 2,4,6-Tris, Phenoxy Dowicide [®] Pheno-Sol [®]	Solid crystals or flakes Yellow Strong disinfectant odor Insoluble in water
Physical Description: White to yellow crystals or flakes, melting at 112°C (234°F). Insoluble in water.	
Fire	Not flammable
Exposure	Health Hazards: DUST OR SOLID Irritating to eyes, nose, and throat. May cause severe skin irritation. May be harmful if absorbed.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4. Issue warning of water contamination. Should be removed by chemical and physical treatment.	2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Dowicide [®] , Oxya, Pheno-Sol [®] , 2,4,6-Tris, Chlorophenol 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $\text{C}_6\text{H}_3\text{Cl}_3\text{O}$ 3.4 IMCO United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Colorless to gray 4.3 Odor: Strong disinfectant
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved dust respirator for eyes, face, goggles, protective clothing to prevent contact with skin. 5.2 Symptoms Following Exposure: May cause swelling of nose and eye, severe irritation to nose and throat. Solid irritates skin, may produce a rash. 5.3 Treatment for Exposure: INHALATION: Remove to fresh air, get medical attention. EYES: Flush with water for 15 min. SKIN: Get medical attention. SKIN: Wash with soap and water. Irritation may occur. Get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: 200 mg/kg body weight of Grade 2 LD ₅₀ for rats. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Irritant to nose and throat at normal temperatures. 5.9 Liquid or Solid Irritant Characteristics: May cause severe skin irritation. Prolonged contact with skin causes a slight burn. Does irritate nose and throat. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS

- 6.1 Flash Point: Not flammable
- 6.2 Flammable Limits in Air: Not flammable
- 6.3 Fire Extinguishing Agents: Not pertinent
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
- 6.5 Special Hazards of Combustion Products: Not pertinent
- 6.6 Behavior in Fire: Not pertinent
- 6.7 Ignition Temperature: Not flammable
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not flammable

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: 12 ppm (24 hr) fish, 11 ppm (96 hr) fish
- 8.2 Waterway Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Fecundity Concentration Potential: Not applicable

9. SELECTED MANUFACTURERS

- 1. Dow Chemical
Midland Mich. 48068
- 2. E.I. du Pont de Nemours & Co.
Wilmington, Del. 19880
- 3. Hoechst Celanese Corp.
Industrial Chemical Division
Norway, N.J. 07047

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials: None
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Technical 99.5%
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 446-3
 II

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Not listed
- 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classifications: Solid form not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
- 13.2 Molecular Weight: 197.03
- 13.3 Boiling Point at 1 atm: 253°C = 485°F = 525°K
- 13.4 Freezing Point: 112°C = 234°F = 386°K
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.27 at 25°C (solid)
- 13.8 Liquid Surface Tension: Not pertinent
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: Not pertinent
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

(continued on pages 2 and 3)

NOTES

TCA

2,4,5-TRICHLOROPHENOXYACETIC ACID

Common Synonyms 2,4,5-T		Solid	White	Odorless
		Sinks in water		
Fire	Combustible POISONOUS GASES MAY BE PRODUCED IN FIRE			
 <u>Exposure</u>	SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: poison, water contaminant Restrict access Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,4,5-T 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: 2,4,5-Cl ₃ C ₆ H ₂ OC(=O)CH ₃ 3.4 NRC/United Nations Numerical Designation: 1.1.1.09		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask and rubber gloves 5.2 Symptoms Following Exposure: Overexposure to dust by inhalation or ingestion may cause fatigue, nausea, vomiting, lowered blood pressure, convulsions, coma. Dust may irritate eyes and skin. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; if required, give artificial respiration. EYES: flush with water until irritating dust is removed. SKIN: wash with soap and water. INGESTION: call physician at once; induce vomiting and administer gastric lavage. 5.4 Toxicity by Inhalation (Threshold Limit Value): 10 mg/m ³ 5.5 Short-Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 1, oral LD ₅₀ = 500 mg/kg (rats) 5.7 Life Toxicity: Birth defects in rats and mice. Causes an amniotic sac rupture among human workers. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Other Threshold: Not pertinent				

6. FIRE HAZARDS

- 6.1 Flash Point: Not pertinent (solid)
- 6.2 Flammable Limits in Air: Not pertinent
- 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
- 6.5 Special Hazards of Combustion Products: Toxic hydrogen chloride and phosgene gases may be formed
- 6.6 Behavior in Fire: Not pertinent
- 6.7 Ignition Temperature: Data not available
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Oxidizing Risk: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity:
 100 ppm 24 hr. bioassay, 12 hr. fresh water
 0.12 ppm/42 hr. spud, 50% adult salt water
- 8.2 Waterway Toxicity: 11,000 ppm LD₅₀
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: Will not bioaccumulate

9. SELECTED MANUFACTURERS

- 1 Dow Chemical Co.
 Midland, Mich. 48040
- 2 Tracoval Inc.
 P.O. Box 69
 Jacksonville, Ark. 72076
- 3 Monsanto Co.
 800 N. Lindbergh Boulevard
 St. Louis, Mo. 63166

10. SHIPPING INFORMATION

- 10.1 Grades or Purities: Commercial
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open flame protectors

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 H

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Pesticides, Class B
- 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classification: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
- 13.2 Molecular Weight: 255.4
- 13.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 13.4 Freezing Point:
 116°F = 15°C = 233°K
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.403 at 20°C (solid)
- 13.8 Liquid Surface Tension: Not pertinent
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: (solid) = 8,500 Btu/lb = 1,400 cal/g = (40 × 10³) J/kg
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

Continued on pages 7 and 8

NOTES

TCS

TRICHLOROSILANE

Common Synonyms Trichlorosilane Silchloroform	Liquid Colorless Sharp choking odor Reacts violently with water. Irritating gas is produced on contact with water. Boiling point is 90°F.
Fire	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. LIQUID Will burn skin and eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE <i>See Response Methods Handbook, CG 694-4.</i> Toxic warning: high flammability, corrosive, air contaminant. Restrict access. Evacuate area. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonym: Silchloroform, Trichlorosilane. 3.2 Corrosion Compatibility Classification: Not applicable. 3.3 Chemical Formula: SiHCl_3 . 3.4 IMCO/United Nations Numerical Designation: 1 + 1294.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: colorless. 4.3 Odor: Sharp, choking, like hydrochloric acid.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Acid vapor eye respiratory protection, rubber gloves, chemical worker's goggles, other protective equipment as necessary to protect skin and eyes. 5.2 Symptoms Following Exposure: Inhalation causes severe irritation of respiratory system. Liquid causes severe burns of eyes and skin. Ingestion causes severe burns of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: remove victim from exposure; if breathing is difficult or stopped, give artificial respiration; all physicians: EYES or SKIN: flush with plenty of water immediately for at least 15 min. and get medical attention. INGESTION: do NOT induce vomiting, give large amount of water, get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral LD_{50} = 1,000 mg/kg rats. 5.7 Lethal Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very corrosive to the eyes. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: -187°F (0°C) -187°F (0°C). 6.2 Flammable Limits in Air: 2% - 80%. 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water foam. 6.5 Special Hazards of Combustion Products: Toxic hydrogen chloride and chlorine gases may form in fire. 6.6 Behavior in Fire: Difficult to extinguish; re-ignition may occur. Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 220°F. 6.8 Electrical Hazard: Data not available. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterford Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently to form hydrogen chloride fumes (hydrochloric acid). 7.2 Reactivity with Common Materials: Reacts with surface moisture to form hydrochloric acid, which corrodes common metals and forms flammable hydrogen gas. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Flush with water; rinse with sodium bicarbonate or lime solution. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Vortex Corp. Chemicals Division 80 Corporate Street Beverly, Mass. 01915. 2. Union Carbide Corporation Chemical and Plastics Division 270 Park Avenue New York, N.Y. 10017. 3. Dow Corning Corporation P. O. Box 962 Midland, Mich. 48640.																																				
11. HAZARD ASSESSMENT CODE <i>See Hazard Assessment Handbook, CG 694-3.</i> A 11	10. SHIPPING INFORMATION 10.1 Grades or Purities: 99+%. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Pressure vacuum.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 MAS Hazard Rating for Bulk Water Transportation: <table data-bbox="976 1414 1215 1673"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>4</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>4</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td> Poisons</td><td>1</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Hazardous Toxics</td><td>1</td></tr> <tr> <td> Aquatic Toxics</td><td>1</td></tr> <tr> <td> Acute Fish Toxic</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>1</td></tr> <tr> <td> Water</td><td>4</td></tr> <tr> <td> Self-Reactive</td><td>1</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="976 1705 1215 1780"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>1</td></tr> <tr> <td>Flammability (Red)</td><td>4</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	1	Water Pollution		Hazardous Toxics	1	Aquatic Toxics	1	Acute Fish Toxic	2	Reactivity		Other Chemicals	1	Water	4	Self-Reactive	1	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	4	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 135.5. 13.3 Boiling Point at 1 atm: -107°F = -77°C = -107°K . 13.4 Freezing Point: -187°F = -77°C = -187°K . 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.444 at 20°C (liquid). 13.8 Liquid Surface Tension: 16.1 dyne/cm = 0.0161 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 4. 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available. 13.12 Latent Heat of Vaporization: 51,500 Btu/lb = 47 cal/g = 2.6×10^4 J/kg. 13.13 Heat of Combustion: Data not available. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	4																																				
Health																																					
Vapor Irritant	4																																				
Liquid or Solid Irritant	4																																				
Poisons	1																																				
Water Pollution																																					
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NOTES																																					

(continued on page 2 and 3)

TCT

TRICHLORO-S-TRIAZINETRIONE

Common Synonyms Trichloro-s-triazine 2,4,6- (1H,3H,5H)-trione Trichloro-s-triazine Trichloro-s-triazine, acid Trichloro-s-triazine, anhydrous acid		Solid White Bleach-like odor Sinks and mixes slowly with water
Fire Not flammable May cause fire on contact with combustibles POISONOUS GASES ARE PRODUCED IN FIRE Containers may explode in fire		
Exposure LC50 Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes Harmful if swallowed		
Water Pollution Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Management Manual, CG 444-4) Issue warning - washing material water contaminant Restrict access Disperse and flush	2. LABEL 	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Trichloro-s-triazine, anhydrous acid, Trichloro-s-triazine, acid, Trichloro-s-triazine, anhydrous acid, Trichloro-s-triazine, acid, Trichloro-s-triazine, anhydrous acid, Trichloro-s-triazine, acid, Trichloro-s-triazine, anhydrous acid 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: (Cl ₃ N ₃ O ₃) 3.4 IMCO/United Nations Numerical Designation: 1.1	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Like chlorine	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Duct tape or chlorine canister mask, goggles, rubber gloves 5.2 Symptoms Following Exposure: Inhalation causes sneezing and coughing. Contact with dust causes moderate irritation of eyes and itching and redness of skin. Ingestion causes burns of mouth and stomach 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air. EYES: irrigate with running water for 15 min. call physician. SKIN: flush with water. INGESTION: induce vomiting and call physician 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limit: Data not available 5.6 Toxicity by Ingestion: Grade 2, oral LD ₅₀ = 750 mg/kg-rat 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable, but may cause fire on contact with ordinary combustibles.
- 6.2 **Flammable Limits in Air:** Not pertinent
- 6.3 **Fire Extinguishing Agents:** Water in large amounts
- 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
- 6.5 **Special Hazards of Combustion Products:** Toxic, chlorine or nitrogen trichloride may be formed in fire
- 6.6 **Behavior in Fire:** Containers may explode when heated
- 6.7 **Ignition Temperature:** Not pertinent
- 6.8 **Electrical Hazards:** Not pertinent
- 6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Reacts to form bleaching solution. The reaction is not exothermic
- 7.2 **Reactivity with Common Materials:** Contact with most foreign material (organic matter or easily oxidized or oxidized materials) may result in fire. Avoid oil, grease, sand, dust, floor sweepings, other easily oxidized organic compounds
- 7.3 **Stability During Transport:** Stable
- 7.4 **Neutralizing Agents for Acids and Corrosives:** Not pertinent
- 7.5 **Polymerization:** Not pertinent
- 7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
- 8.2 **Waterbody Toxicity:** Data not available
- 8.3 **Biological Oxygen Demand (BOD):** Data not available
- 8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. FMC Corporation
 Industrial Chemical Division
 623 Third Avenue
 New York, N.Y. 10017
2. Monsanto Co.
 800 N. Lindbergh Avenue and
 St. Louis, Mo. 63166
3. Eastman Kodak Co.
 Eastman Organic Chemicals
 Rochester, N.Y. 14650

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** 99-99% available chlorine
- 10.2 **Storage Temperature:** Ambient. Avoid elevated temperatures
- 10.3 **Inert Atmosphere:** No requirement if dry
- 10.4 **Venting:** Pressure vacuum

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Manual, CG 444-3)
 H-S-N

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Oxidizing material
- 12.2 **HAS Hazard Rating for Bulk Water Transportation:** not listed
- 12.3 **MFPA Hazard Classifications:**
- | Category | Classification |
|--------------------|----------------|
| Health Hazard (H): | 1 |
| Flammability (F): | 0 |
| Reactivity (R): | 2 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid
- 13.2 **Molecular Weight:** 212.5
- 13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 13.4 **Freezing Point:** Not pertinent
- 13.5 **Critical Temperature:** Not pertinent
- 13.6 **Critical Pressure:** Not pertinent
- 13.7 **Specific Gravity:** (at 15°C at 20°C) (solid)
- 13.8 **Liquid Surface Tension:** Not pertinent
- 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
- 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 13.12 **Latent Heat of Vaporization:** Not pertinent
- 13.13 **Heat of Combustion:** Not pertinent
- 13.14 **Heat of Decomposition:** Not pertinent
- 13.15 **Heat of Solution:** Not pertinent
- 13.16 **Heat of Polymerization:** Not pertinent

(continued on pages 1 and 2)

NOTES

TCP

TRICRESYL PHOSPHATE

Common Synonyms: TCP Tri-cresyl phosphate	Liquid Colorless Odorless Sinks in water
See footnotes on page 5 for additional information. Footnote 1: This chemical is not a carcinogen. Footnote 2: This chemical is not a mutagen. Footnote 3: This chemical is not a reproductive toxicant.	
Fire	Combustible Extinguish with dry chemical or carbon dioxide. Water may be used if the fire is not exposed to other fuels.
Exposure	LIQUID Harmful if swallowed. If swallowed, induce vomiting and seek medical attention.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not suitable for wildlife. Not suitable for water pollution.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 449.4) Should be removed. Chemical and physical treatment.	2. LABELS No hazard label required by U.S. Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: TCP Tri-p-tolyl phosphate Tri-p-cresyl phosphate 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $(p\text{-CH}_3\text{C}_6\text{H}_4\text{O})_3\text{P}$ 3.4 IMCO/United Nations Numerical Designation: Not listed.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Odorless
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield. 5.2 Symptoms Following Exposure: Vapors may irritate eyes, but only at high temperatures. Ingestion of liquid may cause severe damage to central nervous system and death if significant amounts of the toxic ortho isomer are present. 5.3 Treatment for Exposure: INGESTION: induce vomiting and call a doctor. EYES: flush with water for at least 15 min. SKIN: wipe off, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade 2. LD ₅₀ 0.5 to 5 g/kg (chicken LD ₅₀ >2 g/kg). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. The compound is non-volatile for all practical purposes. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Not pertinent.	

6. FIRE HAZARDS 6.1 Flash Point: 410°F (C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Foam, dry chemical or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. ICI Corp. Organic Chemicals Division 633 Third Ave. New York, N.Y. 10012 2. Monsanto Co. Monsanto Industrial Chemicals Co. 809 N. Lindbergh Blvd. St. Louis, Mo. 63166 3. Stauffer Chemical Co. Specialty Chemicals Division Gallipolis Ferry, W. Va. 26535
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) N N	10. SHIPPING INFORMATION 10.1 Grades or Purity: Consists primarily of the para isomer, but several commercial grades may contain a significant proportion of tri-ortho-cresyl phosphate. Latter is considerably more toxic than the para isomer if ingested. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arrester.
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 368. 13.3 Boiling Point at 1 atm: 770°F = 410°C = 683°K. 13.4 Freezing Point: -27°F = -33°C = 240°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.16 at 20°C (liquid). 13.8 Liquid Surface Tension: 44 dynes/cm = 0.044 N/m at 25°C. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 130.0 Btu/lb = 44.5 cal/g = 1.86 x 10 ⁵ J/kg. 13.13 Heat of Combustion: Not pertinent. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

(Continued on page 5 of 5)

TRIDECANOL

Common Synonyms 1 Tridecanol Oxodecyl alcohol		Only liquid	Colorless	Mild, pleasant odor
		Floats on water		
Fire	Combustible Flammable with dry chemical, water fog			
Exposure	Not harmful			
Water Pollution	Effect of low concentrations on aquatic life is unknown Fouling to shoreline May be dangerous if it enters water intakes Not harmful to fish life Not harmful to birds			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Isotr, Isexanol Isotriaecyl alcohol C-13 Tridecanol 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: $C_{13}H_{28}O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild alcoholic		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Synthetic rubber gloves, chemical goggles 5.2 Symptoms Following Exposure: Inhalation hazard slight. Skin contact results in moderate irritation. Liquid contact with eyes causes severe irritation and possible eye damage. 5.3 Treatment for Exposure: EYES: promptly flush with clean water for at least 15 min. and see a physician. SKIN: wash exposed area with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS		8. WATER POLLUTION	
6.1 Flash Point: 280°F (138°C)		8.1 Aquatic Toxicity: Data not available	
6.2 Flammable Limits in Air: Data not available		8.2 Waterfowl Toxicity: Data not available	
6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical, water fog		8.3 Biological Oxygen Demand (BOD): Data not available	
6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing		8.4 Food Chain Concentration Potential: None	
6.5 Special Hazards of Combustion Products: Not pertinent		9. SELECTED MANUFACTURERS 1. Exxon Chemical Co. Houston, Tex. 77001 2. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017	
6.6 Behavior in Fire: Not pertinent			
6.7 Ignition Temperature: Data not available			
6.8 Electrical Hazard: Not pertinent			
6.9 Burning Rate: Data not available			
7. CHEMICAL REACTIVITY		10. SHIPPING INFORMATION	
7.1 Reactivity with Water: No reaction		10.1 Grades or Purity: Mixed isomers 99+%	
7.2 Reactivity with Common Materials: No reaction		10.2 Storage Temperature: Ambient	
7.3 Stability During Transport: Stable		10.3 Inert Atmosphere: No requirement	
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent		10.4 Venting: Open (flame arrest)	
7.5 Polymerization: Not pertinent		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 200.37 13.3 Boiling Point at 1 atm: 525°F = 274°C = 547°K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.846 at 20°C (liquid) 13.8 Liquid Surface Tension: (test) 30 dynes/cm = 0.03 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: (test) 30 dynes/cm = 0.03 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.027 13.12 Latent Heat of Vaporization: 120 Btu/lb = 64 cal/g = 2.7×10^3 J/kg 13.13 Heat of Combustion: (test) $-12,200$ Btu/lb $= -6,790$ cal/g = -284×10^3 J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
7.6 Inhibitor of Polymerization: Not pertinent			
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A T U			
12. HAZARD CLASSIFICATIONS			
12.1 Code of Federal Regulations: Not listed			
12.2 NAS Hazard Rating for Bulk Water Transportation:			
Category	Rating		
Lix	1		
Health			
Vapor Irritant	0		
Liquid or Solid Irritant	0		
Poisons	0		
Water Pollution			
Human Toxicity	0		
Aquatic Toxicity	0		
Aesthetic Effect	3		
Reactivity			
Other Chemicals	2		
Water	0		
Self Reaction	0		
12.3 NFPA Hazard Classifications: Not listed			

NOTES

(Continued on pages 4 and 5)

TDC

1-TRIDECENE

Common Synonyms Undecyldecene	Waters liquid Colorless Mild pleasant odor Floats on water
Spontaneous combustion Data not available	
Fire	Combustible Flammable with dry, fine dusts. Not a severe hazard. Water may be ineffective. Use special extinguishers.
Exposure	LIQUID Irritating to eyes. If INGESTED, induce vomiting and dilute with water. If INHALED, remove person to fresh air and give oxygen if needed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes. No acute health and welfare hazard. No long-term health and welfare hazard.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Mechanical contaminant. Should be removed. Chemical and physical treatment.	2 LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Undecyldecene 3.2 Coast Guard Compatibility Classification: Oilfin 3.3 Chemical Formula: $C_{12}H_{24}$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild, pleasant
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: Liquid may irritate eyes. 5.3 Treatment for Exposure: EYES: flush with water for 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Not volatile. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Not pertinent.	

6 FIRE HAZARDS 6.1 Flash Point: 175°F (approx.) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Dry chemical foam, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Data not available.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterlow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Exxon Chemical Co. Houston, Tex. 77001 2. The Humphries Chemical Co. Devine Street North Haven, Conn. 06473 3. Phillips Petroleum Co. Bartlesville, Okla. 74604
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 99% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arrester.
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A-1-U	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 182.35. 13.3 Boiling Point at 1 atm: 451°F = 233°C = 506°K. 13.4 Freezing Point: -11°F = -24°C = 249°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.765 at 20°C (liquid). 13.8 Liquid Surface Tension: 24.5 dyn/cm = 0.0245 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Data not available. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.029. 13.12 Latent Heat of Vaporization: 110 Btu/lb = 59 cal/g = 2.5×10^4 J/kg. 13.13 Heat of Combustion: -19,048 Btu/lb = -10,562 cal/g = $-44,105 \times 10^3$ J/g. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

(Continued on pages 1 and 6)

TEA

TRIETHANOLAMINE

Common Synonyms Triethylolamine Trihydroxytriethylamine Trihydroxyethylamine		Only liquid Colorless Mild ammonia odor Sinks and mixes with water. Freezing point is 71°F.
Fire		Corrosible POISONOUS GASES MAY BE PRODUCED IN FIRE
Exposure		LIQUID FORM OF ALUMINUM Irritating to skin and eyes Harmful if swallowed
Water Pollution		Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2,2,2'-Nitrilotriethanol Triethylolamine Trihydroxytriethylamine Trihydroxyethylamine 3.2 Coast Guard Compatibility Classification: Alkanolamine 3.3 Chemical Formula: (HOCH ₂) ₃ N 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild ammoniacal
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves and boots 5.2 Symptoms Following Exposure: Liquid may irritate eye and skin 5.3 Treatment for Exposure: EYES: Flush with water for at least 15 min.; call a doctor. SKIN: Wipe off, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 2 (LD ₅₀ = 5.2 g/kg (guinea pig)) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not irritating 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, it may cause smarting and reddening of the skin. 5.10 Odor Threshold: Not pertinent		

6. FIRE HAZARDS 6.1 Flash Point: 355°F (C) 175°F (F) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Alcohol foam, dry chemical or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause Boiling 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available		8. WATER POLLUTION 8.1 Aquatic Toxicity: >100 ppm 48 hr shrimp 14°C salt water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 1 > days 0% > days 6.2 (thick) 20 days 8.4 Food Chain Concentration Potential: None																																					
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Cautistics: Dilute with water 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. Jefferson Chemical Co., Inc. 3336 Richmond Ave. Houston, Tex. 77052 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																																					
		10. SHIPPING INFORMATION 10.1 Grades or Purity: 95-99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open																																					
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-1) A P Q		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 149.19 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point: 70.9°F = 21.6°C = 294.8°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.134 at 20°C (liquid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.036 13.12 Latent Heat of Vaporization: 176 Btu/lb = 97.8 cal/g = 4.10 x 10 ³ J/kg 13.13 Heat of Combustion: -11,056 Btu/lb = -6140 cal/g = -257 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution (solid): 20 Btu/lb = -12 cal/g = -5 x 10 ³ J/kg 13.16 Heat of Polymerization: Not pertinent																																					
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>0</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td>1</td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td>1</td></tr><tr><td>Aquatic Toxicity</td><td>1</td></tr><tr><td>Aesthetic Effect</td><td>2</td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td>3</td></tr><tr><td>Water</td><td>0</td></tr><tr><td>Self Reaction</td><td>0</td></tr></table> 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification*</th></tr><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>1</td></tr></table> *First column refers to non-fire situations		Category	Rating	Fire	1	Health		Vapor Irritant	0	Liquid or Solid Irritant	1	Poisons	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemicals	3	Water	0	Self Reaction	0	Category	Classification*	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	1		
Category	Rating																																						
Fire	1																																						
Health																																							
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Liquid or Solid Irritant	1																																						
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Health Hazard (Blue)	1																																						
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Reactivity (Yellow)	1																																						
Continued on pages 5 and 6																																							
NOTES																																							

TAL

TRIETHYLALUMINUM

Common Synonyms TEA Aluminum triethyl ATE	Liquid Colorless IGNITES WHEN EXPOSED TO AIR. Flammable gas is produced on contact with water.
Fire	IGNITES WHEN EXPOSED TO AIR POISONOUS GASES MAY BE PRODUCED IN FIRE DO NOT USE WATER TO EXTINGUISH FIRE. USE DRY CHEMICAL OR HALOGENATED EXTINGUISHING AGENTS.
Exposure	LIQUID Will burn skin and eyes. Harmful if swallowed. DO NOT USE WATER TO EXTINGUISH FIRE. USE DRY CHEMICAL OR HALOGENATED EXTINGUISHING AGENTS. DO NOT INHALE VAPORS.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: high flammability. Restrict access. Evacuate area. Disperse and flush with care.	2. LABELS 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: ATE Aluminum triethyl TEA 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $(C_2H_5)_3Al$ 3.4 IMCO/United Nations Numerical Designation: 12.1102	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Not pertinent
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Full protective clothing, preferably of aluminized glass cloth; goggles; face shield; gloves. In case of fire, all purpose canister or self contained breathing apparatus. 5.2 Symptoms Following Exposure: Exposure to smoke from fire causes metal fume fever (flu like symptoms). Since liquid ignites spontaneously, contact with eyes or skin causes severe burns. 5.3 Treatment for Exposure: INHALATION: only fume from fire needs be considered; metal fume fever is not critical. Lasting less than 36 hrs. EYES: flush with copious quantities of water for 15 min. with lids held open. Treat burns if fire occurred; get medical attention. SKIN: wash with water; treat burns caused by fire; get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Not pertinent; ignites instantly in a 2 inch stream with water. 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second and third degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Not pertinent	

6. FIRE HAZARDS 6.1 Flash Point: Ignites spontaneously in air at all temperatures. 6.2 Flammable Limits in Air: Not pertinent. 6.3 Fire Extinguishing Agents: Inert powders (sand, limestone); dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Water; foam; halogenated extinguishing agents. 6.5 Special Hazards of Combustion Products: Intense smoke may cause metal fume fever. 6.6 Behavior in Fire: Dense smoke of aluminum oxide forms. Contact with water applied to adjacent fires causes violent reaction producing toxic and flammable gases. 6.7 Ignition Temperature: Not pertinent (self ignites at ambient temperature). 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Not pertinent. 8.2 Waterway Toxicity: Not pertinent. 8.3 Biological Oxygen Demand (BOD): Not pertinent. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently to form flammable ethane gas. 7.2 Reactivity with Common Materials: No significant reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Ethyl Corporation Industrial Chemicals Division Ethyl Tower 451 Florida Baton Rouge, La. 70801 2. Texas Alkyls, Incorporated P.O. Box 600 Deer Park, Texas 77536 3. Ventron Corporation Alfa Products P.O. Box 159 Beverly, Mass. 01915																																				
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A-O-Z	10. SHIPPING INFORMATION 10.1 Grades or Purity: 97% to 20% or less by weight in benzene, hexane or heptane. Solutions are non pyrophoric. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Inert dry nitrogen at 5 psig. 10.4 Venting: Safety relief with rupture disk.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="1007 1415 1246 1681"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>4</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td></td></tr> <tr> <td>Liquid or Solid Irritant</td><td>4</td></tr> <tr> <td>Poisons</td><td>3</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>0</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Aesthetic Effect</td><td>3</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>4</td></tr> <tr> <td>Water</td><td>4</td></tr> <tr> <td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="1007 1703 1246 1791"> <thead> <tr> <th>Category</th><th>Classification*</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>3</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>W</td></tr> </tbody> </table> *Up to 20% by wt. in hydrocarbon solution.	Category	Rating	Fire	4	Health		Vapor Irritant		Liquid or Solid Irritant	4	Poisons	3	Water Pollution		Human Toxicity	0	Aquatic Toxicity	2	Aesthetic Effect	3	Reactivity		Other Chemicals	4	Water	4	Self Reaction	0	Category	Classification*	Health Hazard (Blue)	3	Flammability (Red)	3	Reactivity (Yellow)	W	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 114.2 13.3 Boiling Point at 1 atm: 36°C = 96.8°F = 459.8°K. 13.4 Freezing Point: 51°F = -10°C = 223°K. 13.5 Critical Temperature: 781°F = 405°C = 678°K. 13.6 Critical Pressure: 1,970 psia = 134 atm = 13.6 MN/m². 13.7 Specific Gravity: 0.836 at 20°C (liquid). 13.8 Liquid Surface Tension: 26.1 dynes/cm = 0.0261 N/m at 28°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available. 13.12 Latent Heat of Vaporization: 216 Btu/lb = 120 cal/g = 5.02 x 10³ J/kg. 13.13 Heat of Combustion: -18,364 Btu/lb = -10,202 cal/g = -42.68 x 10³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: -1,295 Btu/lb = -1,109 cal/g = -46.40 x 10³ J/kg. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	4																																				
Health																																					
Vapor Irritant																																					
Liquid or Solid Irritant	4																																				
Poisons	3																																				
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Health Hazard (Blue)	3																																				
Flammability (Red)	3																																				
Reactivity (Yellow)	W																																				
NOTES (Continued on pages 4 and 5)																																					

TEN

TRIETHYLAMINE

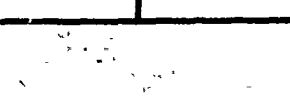
Common Synonyms TEN	Watery liquid Colorless Fishy odor Floats on water. Flammable, irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled, will cause coughing, difficult breathing, or loss of consciousness. LIQUID Will burn skin and eyes. Harmful if swallowed.
Water Pollution	HAZARDOUS TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Flow to shoreline. May be dangerous if it enters water tanks.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - high flammability. Evacuate area. Disperse and flush.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: TEN 3.2 Coast Guard Compatibility Classification: Aliphatic amine 3.3 Chemical Formula: $(C_2H_5)_3N$ 3.4 IMCO/United Nations Numerical Designation: 1.2 1206	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Fishy
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air supplied mask, goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Vapors irritate nose, throat and lungs, causing coughing, choking and difficult breathing. Contact with eyes causes severe burns. Clothing wet with chemicals causes skin burns. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air, give artificial respiration if needed, call a doctor. INGESTION: induce vomiting if patient is conscious. EYES: flush with water for at least 30 min; call a doctor. SKIN: flush with water for at least 30 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm 5.5 Short-Term Inhalation Limits: 100 ppm for 30 min 5.6 Toxicity by Ingestion: Grade 3, LD ₅₀ 50 to 900 mg/kg (rat); LD ₅₀ 460 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smothering of the skin and first degree burns on short exposure; may cause second degree burns on long exposure. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: 0°F (0°C) 6.2 Flammable Limits in Air: 1.2 - 8.0% 6.3 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires; alcohol foam for large fires. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 42°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 6.2 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: 80 ppm 24 hr fish lethal, fresh water. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Dilute with water. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Air Products and Chemicals, Inc., Allentown, Pa. 18105 2. Pennwalt Corp., Chemical Division, 4655 Biddle Ave., Wyandotte, Mich. 48193 3. Union Carbide Corp., Chemicals and Plastics Division, 275 Park Ave., New York, N.Y. 10017																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P Q R S	10. SHIPPING INFORMATION 10.1 Grades or Purity: 98.5%+ 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arrester).																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="915 1419 1159 1692"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>3</td></tr> <tr><td>Health</td><td></td></tr> <tr><td>Vapor Irritant</td><td>2</td></tr> <tr><td>Liquid or Solid Irritant</td><td>2</td></tr> <tr><td>Poisons</td><td>2</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td>Human Toxicity</td><td>3</td></tr> <tr><td>Aquatic Toxicity</td><td>3</td></tr> <tr><td>Aerobically Degradable</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td>Other Chemicals</td><td>3</td></tr> <tr><td>Waves</td><td>0</td></tr> <tr><td>Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed.	Category	Rating	Fire	3	Health		Vapor Irritant	2	Liquid or Solid Irritant	2	Poisons	2	Water Pollution		Human Toxicity	3	Aquatic Toxicity	3	Aerobically Degradable	2	Reactivity		Other Chemicals	3	Waves	0	Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 101.19 13.3 Boiling Point at 1 atm: 193.1°F = 89.5°C = 322.7°K 13.4 Freezing Point: -174.5°F = -114.7°C = 158.8°K 13.5 Critical Temperature: 549°F = 262°C = 535°K 13.6 Critical Pressure: 440 psia = 40 atm = 3.0 MPa 13.7 Specific Gravity: 0.729 at 20°C (liquid) 13.8 Liquid Surface Tension: 20.7 dynes/cm = 0.0207 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 1.5 13.11 Ratio of Specific Heats of Vapor (Gas): 1.055 13.12 Latent Heat of Vaporization: 140 Btu/lb = 80 cal/g = 3.3 x 10 ⁵ J/kg 13.13 Heat of Combustion: 17,040 Btu/lb = 9,465 cal/g = 39.6 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: -190 Btu/lb = -99 cal/g = -4.1 x 10 ⁵ J/kg 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	3																												
Health																													
Vapor Irritant	2																												
Liquid or Solid Irritant	2																												
Poisons	2																												
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Aerobically Degradable	2																												
Reactivity																													
Other Chemicals	3																												
Waves	0																												
Self Reaction	0																												
NOTES																													

REVISED 1978

TEB

TRIETHYLBENZENE

Common Synonyms: 1,3,5-Triethylbenzene meso-Triethylbenzene		Liquid Colorless Weak chemical odor Floats on water
		
Fire	Combustible Flash point: 110°F (43°C) Boiling point: 216°F (102°C) Freezing point: 4°F (-20°C)	
Exposure	LIQUID Irritating to skin and eyes May be harmful if swallowed May cause drowsiness or dizziness	
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-41 Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,3,5-Triethylbenzene meso-Triethylbenzene 3.2 Coast Guard Competibility Classification: Aromatic hydrocarbon 3.3 Chemical Formula: C ₁₂ H ₁₈ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weak aromatic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield; rubber gloves 5.2 Symptoms Following Exposure: Eye irritation by vapors or liquid; Central nervous system depression. Prolonged skin contact with liquid can cause dermatitis. 5.3 Treatment for Exposure: EYES: flush with water for at least 15 min.; call a doctor. SKIN: wipe off; wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause a slight irritation of the respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing, it may cause staining and reddening of the skin. 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: 110 F (43 C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Dry chemical, foam, or carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available																													
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agent for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS No bulk shipments																													
11. HAZARD ASSESSMENT CODE (See HAZARD ASSESSMENT HANDBOOK, CG 444-31) A-1.1		10. SHIPPING INFORMATION 10.1 Grades or Purity: Data not available 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open flame attractant																													
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table><tr><th>Category</th><th>Rating</th></tr><tr><td>Fire</td><td>1</td></tr><tr><td>Health</td><td></td></tr><tr><td>Vapor Irritant</td><td>1</td></tr><tr><td>Liquid or Solid Irritant</td><td>1</td></tr><tr><td>Poisons</td><td></td></tr><tr><td>Water Pollution</td><td></td></tr><tr><td>Human Toxicity</td><td></td></tr><tr><td>Aquatic Toxicity</td><td></td></tr><tr><td>Aesthetic Effect</td><td></td></tr><tr><td>Reactivity</td><td></td></tr><tr><td>Other Chemicals</td><td></td></tr><tr><td>Water</td><td></td></tr><tr><td>Self Reaction</td><td>0</td></tr></table>		Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons		Water Pollution		Human Toxicity		Aquatic Toxicity		Aesthetic Effect		Reactivity		Other Chemicals		Water		Self Reaction	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 162.27 13.3 Boiling Point at 1 atm: 421°F = 216°C = 439 K 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.861 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.039 13.12 Latent Heat of Vaporization: 120 Btu/lb = 65 cal/g = 2.7 X 10 ⁵ J/kg 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
Category	Rating																														
Fire	1																														
Health																															
Vapor Irritant	1																														
Liquid or Solid Irritant	1																														
Poisons																															
Water Pollution																															
Human Toxicity																															
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Reactivity																															
Other Chemicals																															
Water																															
Self Reaction	0																														
12.3 NFPA Hazard Classifications: Not listed																															
<i>(Continued on pages 5 and 6)</i>																															
NOTES																															

Continued on pages 4 and 5

TEG

TRIETHYLENE GLYCOL

Common Synonyms: Triethylol	Liquid Colorless Mild odor Sinks and mixes with water
Fire	Combustible
Exposure	Not harmful
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41 Disperse and flush.	2 LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Di beta hydroxyethoxyethane; 2,2-Ethylenebis[diethoxyethyl ether]; Triethylene glycol; triethylene glycol ether; HEG; Triglycol. 3.2 Coast Guard Compatibility Classification: Class III 3.3 Chemical Formula: HO(CH ₂ CH ₂ O) ₃ H 3.4 IMCO United Nations Numerical Designation: Not listed.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Very mild, sweet.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles, plastic gloves. 5.2 Symptoms Following Exposure: Vapor and liquid are unlikely to cause harm. 5.3 Treatment for Exposure: Flush eyes and skin with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Grade I. LD ₅₀ is 10.5 g/kg (ratine p.o.). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are non-irritating to the eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Not pertinent.	

6 FIRE HAZARDS 6.1 Flash Point: 100°F (38°C) (30°F (0°C)) 6.2 Flammable Limits in Air: 9.4% - 9.2% 6.3 Fire Extinguishing Agents: Alcohol foam; dry chemical; or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: 709°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 1.7 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterflow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 40% in 5 days. 8.4 Food Chain Concentration Potential: None.																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48040 2. Jefferson Chemical Co. 1316 Richmond Ave. Houston, Tex. 77052 3. Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																												
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P Q	10 SHIPPING INFORMATION 10.1 Grades or Purity: High purity; at treatment, commercial. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open flame arresters.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>1</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td> Vapor Irritant</td><td>0</td></tr> <tr> <td> Liquid or Solid Irritant</td><td>0</td></tr> <tr> <td> Poisons</td><td>0</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td> Human Toxicity</td><td>0</td></tr> <tr> <td> Aquatic Toxicity</td><td>1</td></tr> <tr> <td> Acute Toxicity</td><td>1</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td> Other Chemicals</td><td>2</td></tr> <tr> <td> Water</td><td>0</td></tr> <tr> <td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed.	Category	Rating	Fire	1	Health		Vapor Irritant	0	Liquid or Solid Irritant	0	Poisons	0	Water Pollution		Human Toxicity	0	Aquatic Toxicity	1	Acute Toxicity	1	Reactivity		Other Chemicals	2	Water	0	Self Reaction	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 180.17 13.3 Boiling Point at 1 atm: 301°F = 150°C = 561°K. 13.4 Freezing Point: 24°F = -4°C = 269°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.26 at 20°C (liquid). 13.8 Liquid Surface Tension: 45.2 dynes/cm = 0.0452 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.039. 13.12 Latent Heat of Vaporization: 180 Btu/lb = 99 cal/g = 4.1 × 10 ⁵ J/kg. 13.13 Heat of Combustion: -10,990 Btu/lb = -4,640 cal/g = -237.0 × 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: (est.) -13 Btu/lb = -7 cal/g = -3 × 10 ³ J/kg. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire	1																												
Health																													
Vapor Irritant	0																												
Liquid or Solid Irritant	0																												
Poisons	0																												
Water Pollution																													
Human Toxicity	0																												
Aquatic Toxicity	1																												
Acute Toxicity	1																												
Reactivity																													
Other Chemicals	2																												
Water	0																												
Self Reaction	0																												
NOTES																													

(Continued on pages 5 and 6)

TET

TRIETHYLENETETRAMINE

Common Synonyms TETA N,N'-Bis(2-aminoethyl)ethylene diamine	Only liquid Light straw to amber Ammoniac odor Floats and mixes with water
Fire	Combustible Flammable liquid Flammable solid
Exposure	LIQUID Will burn skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41 Dispense and Flush	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: N,N'-Bis(2-aminoethyl)ethylene diamine TETA Trien 3.2 Coast Guard Compatibility Classification: Aliphatic amine 3.3 Chemical Formula: N(CH ₂ CH ₂ CH ₂) ₄ NH ₂ 3.4 IMCO United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Light straw to amber 4.3 Odor: Ammoniacal
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Amine type canister, goggles or face shield, rubber gloves 5.2 Symptoms Following Exposure: Vapors from hot liquid can irritate eyes and upper respiratory system. Irritation of bare eyes and skin. May cause sensitization of skin. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air. INGESTION: do NOT induce vomiting, give large quantities of water, give at least one ounce of vinegar in equal amount of water, get medical attention. SKIN: flush with plenty of water. EYES: flush with plenty of water for at least 15 min. and get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ Strongly irritant 5.7 Late Toxicity: May cause dermatitis, asthma and other allergic reactions in man 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation to the eyes, nose and throat at high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes smearing of the skin and first degree burns on short exposure, may cause secondary burns on long exposure. 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS

- 6.1 **Flash Point:** 275°F (135°C) (260°F) (100°C)
 6.2 **Flammable Limits in Air:** Data not available
 6.3 **Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
 6.4 **Fire Extinguishing Agents Not to be Used:** Water or foam may cause fothing
 6.5 **Special Hazards of Combustion Products:** Not pertinent
 6.6 **Behavior in Fire:** Not pertinent
 6.7 **Ignition Temperature:** 640°F
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Data not available

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterfowl Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** None

9. SELECTED MANUFACTURERS

1. Dow Chemical Co.
 Midland, Mich. 48040
 2. Jefferson Chemical Co., Inc.
 1100 Richmond Ave.
 Houston, Tex. 77002
 3. Union Carbide Corp.
 Chemicals and Plastics Division
 270 Pease Ave.
 New York, N.Y. 10013

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:** No reaction
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** After dilution with water, can be neutralized with acetic acid
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

10. SHIPPING INFORMATION

- 10.1 **Grades or Purity:** 99+ %
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** None

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 A P Q

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 1 |
| Health | |
| Vapor Irritant | 2 |
| Liquid or Solid Irritant | 2 |
| Poisons | 1 |
| Water Pollution | |
| Human Toxicity | 1 |
| Aquatic Toxicity | 1 |
| Acute Toxicity | 1 |
| Reactivity | |
| Other Chemicals | 3 |
| Water | 0 |
| Self Reaction | 0 |
- 12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Liquid
 13.2 **Molecular Weight:** 146.24
 13.3 **Boiling Point at 1 atm:**
 $531.31^\circ\text{F} = 277.4^\circ\text{C} = 550.6^\circ\text{K}$
 13.4 **Freezing Point:** $-31.1^\circ\text{F} = -35^\circ\text{C} = 236^\circ\text{K}$
 13.5 **Critical Temperature:**
 $940.1^\circ\text{F} = 499.5^\circ\text{C} = 772^\circ\text{K}$
 13.6 **Critical Pressure:**
 $470\text{ psia} = 32\text{ atm} = 3.2\text{ MPa}$
 13.7 **Specific Gravity:** 0.982 at 20°C (liquids)
 13.8 **Liquid Surface Tension:** Not pertinent
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.03
 13.12 **Latent Heat of Vaporization:** Not pertinent
 13.13 **Heat of Combustion:** (cal) = 13,500 Btu/lb
 $= 57,540\text{ cal/g} = 241.5 \times 10^3\text{ J/kg}$
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** (cal) = 13 Btu/lb
 $= 54\text{ cal/g} = 0.228 \times 10^3\text{ J/kg}$
 13.16 **Heat of Polymerization:** Not pertinent

NOTES

TFC

TRIFLUOROCHLOROETHYLENE

Common Synonyms Chlorotrifluoroethylene Trifluoroethyl chloride CTFE Genetron 111B Trifluoroethene, monochloride Kel-F monomer Fluonac monomer	Liquefied compressed gas. Colorless. Odorless or faint odor. Sinks and boils in water. Flammable visible vapor cloud is produced.
Fire	FLAMMABLE-POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor train may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR If inhaled will cause dizziness, nausea, or vomiting. LIQUID Will cause frostbite.
Water Pollution	Not harmful to aquatic life.
1. RESPONSE TO DISCHARGE (See Response Procedures Handbook, CG 446.4.) Issue warning - high flammability, air contaminant. Restrict access to vacate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Chlorotrifluoroethylene, Kel-F monomer, Fluonac monomer, Trifluoromonomochloroethylene, Trifluoroethyl chloride. 3.2 Coast Guard Competibility Classification: Halogenated compounds (4). 3.3 Chemical Formula: C_2ClF_3 3.4 IMCO/United Nations Numerical Designation: 2.1H6.2	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Compressed liquefied gas. 4.2 Color: Colorless. 4.3 Odor: None (ant chloral).
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Self-contained breathing apparatus, goggles, rubber gloves. 5.2 Symptoms Following Exposure: Inhalation causes dizziness, nausea, vomiting, liver and kidney injury may develop after several hours and cause jaundice and necrosis of the kidney. Contact with liquid causes frostbite of eyes and possibly of skin. 5.3 Treatment for Exposure: Call a physician after all exposures to this compound. It is more toxic than most of the chloro related propellant gases. INHALATION: remove victim to fresh air, enforce bed rest, administer oxygen for 30 min. or over. If for 6 hours, even if no symptoms appear. SKIN: if frostbite has occurred, apply warm water and treat burn. 5.4 Toxicity by Inhalation (Threshold Limit Value): None (suggested). 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Not pertinent (CTFE is a gas at normal temperatures). 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (gas). 6.2 Flammable Limits in Air: 16% - 34%. 6.3 Fire Extinguishing Agents: Let fire burn, stop gas flow, cool containers with water. 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent. 6.5 Special Hazards of Combustion Products: Toxic hydrogen chloride and hydrogen fluoride gases are formed. 6.6 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode in a fire. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: Not pertinent.	8. WATER POLLUTION 8.1 Aquatic Toxicity: None. 8.2 Waterford Toxicity: None. 8.3 Biological Oxygen Demand (BOD): None. 8.4 Food Chain Concentration Potential: None.								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Can occur. 7.6 Inhibitor of Polymerization: Terpenes, Triisobutylene (TIB).	9. SELECTED MANUFACTURERS 1. ICI Company 131 Center Saint Paul, Minn. 55104 2. Matheson Gas Products Co. East Rutherford, N. J. 07073 3. Tubed Chemical Corporation Physics Division Morristown, N. J. 07960								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3.) A B C H I J	10. SHIPPING INFORMATION 10.1 Grade or Purity: Polymerization grade 99.9%. 10.2 Storage Temperature: Ambient, not less than 150°F. 10.3 Inert Atmosphere: Air must be excluded. 10.4 Venting: Safety relief.								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: <table data-bbox="898 1444 1142 1530"> <tr> <th>Category</th><th>Classification</th></tr> <tr> <td>Health Hazard (Blue)</td><td></td></tr> <tr> <td>Flammability (Red)</td><td>4</td></tr> <tr> <td>Reactivity (Yellow)</td><td>0</td></tr> </table>	Category	Classification	Health Hazard (Blue)		Flammability (Red)	4	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Gas. 13.2 Molecular Weight: 116.4. 13.3 Boiling Point at 1 atm: -18°F = -28°C = 245°K. 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: (est.) 223.2°F = 106.2°C = 379.4°K. 13.6 Critical Pressure: (est.) 992 psia = 40.2 atm = 4.08 MN/m. 13.7 Specific Gravity: 1.30 at 20°C (liquid). 13.8 Liquid Surface Tension: (est.) 12 dynes/cm = 0.012 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: 4.02. 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available. 13.12 Latent Heat of Vaporization: 83 Btu/lb = 46 cal/g = 192 X 10 ³ J/kg. 13.13 Heat of Combustion: Data not available. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Data not available.
Category	Classification								
Health Hazard (Blue)									
Flammability (Red)	4								
Reactivity (Yellow)	0								
NOTES (Continued on pages 1 and 2.)									

TFR

TRIFLURALIN

Common Synonyms: alpha, alpha, alpha-trifluoro-2, 6-dinitro-N, N-dipropyl-p-toluidine Triflan	Solid Yellow-orange Sinks in water
Fire	Combustible POISONOUS GASES ARE PRODUCED IN FIRE
Exposure	DUST POISONOUS IF INHALED SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445-4) Issue warning: poison, water contaminant Restrict access Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 2, 6-Dinitro-N, N-dipropyl 4-trifluoromethylphenyl ether; 2, 6-Dinitro-N, N-dipropyl-alpha, alpha, alpha-trifluorop-toluidine; N, N-Dipropyl 2, 6-dinitro-4-trifluoromethylphenyl ether; Triflan; alpha, alpha, alpha-trifluoro-2, 6-dinitro-N, N-dipropyl-p-toluidine 3.2 Coast Guard Compatibility Classification: Not applicable	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow-orange 4.3 Odor: Data not available
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective gloves, goggles, dust mask 5.2 Symptoms Following Exposure: Eyes may irritate eyes. No toxic symptoms have been observed during the manufacture and use of this compound 5.3 Treatment for Exposure: INHALATION: move to fresh air. EYES: wash with running water, call physician if irritation persists. SKIN: wash with soap and running water. INGESTION: induce vomiting, call physician 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 1, oral LD ₅₀ = 500 mg/kg rats 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

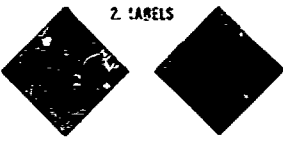
(continued on page 4)

6. FIRE HAZARDS 6.1 Flash Point: >185°F (3°C) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic and irritating hydrogen fluoride gas may be formed in fire 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 11 µg/l 48 hr LC50 blue trout; 11 µg/l fresh water; 11 µg/l 48 hr LC50 bluegill; 1 µg/l fresh water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Elanco Products Company P.O. Box 1750 Indianapolis, Ind. 46206
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 85% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure vacuum
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 445-3) II	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 335.3 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 105°F = 42°C = 315 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.244 at 25°C (reads) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: (cal/g) 9,640 (Btu/lb) -5,920 (cal/g) = -210 (X 10 ³ J/kg) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not Listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	3. CHEMICAL DESIGNATIONS (Cont'd) 3.3 Chemical Formula: C ₁₄ H ₁₃ N ₂ O ₄ F ₃ 3.4 IMCO/United Nations Numerical Designation: 6.1 (ENV)

(Continued on pages 5 and 6)

TIA

TRIIISOBUTYLALUMINUM

Common Synonyms TIBA TIBAL Aluminum triisobutyl		Liquid Colorless IGNITES WHEN EXPOSED TO AIR. Flammable gas is produced on contact with water.
Fire IGNITES WHEN EXPOSED TO AIR POISONOUS GASES MAY BE PRODUCED IN FIRE		
Exposure LIQUID Will burn skin and eyes. Harmful if swallowed.		
Water Pollution Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water makes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: high flammability. Restrict access. Evacuate area. Disperse and flush with care.		2. LABELS 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Aluminum triisobutyl TIBA TIBAL 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $(\text{CH}_3)_2\text{CHAl}$ 3.4 IMCO/United Nations Numerical Designation: 4.2 (19.5)		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Not pertinent
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Full protective clothing, preferably of aluminumized glass cloth; goggles; face shield; gloves. In case of fire, all persons must wear self-contained breathing apparatus. 5.2 Symptoms Following Exposure: Inhalation of smoke from fire causes metal fume fever (flu like symptoms). Contact with liquid can cause severe burns of eyes and skin because of spontaneous ignition. 5.3 Treatment for Exposure: INHALATION: Only fumes from fire need be considered; metal fume fever lasts less than 48 hrs. and is not critical. EYES: flush gently with copious quantities of water for 15 min. while in open; treat burns, if fire occurred; get medical attention. SKIN: wash with water; treat burns caused by fire; get medical attention. INGESTION: Not pertinent. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent. 5.5 Short-Term Inhalation Limits: Not pertinent. 5.6 Toxicity by Ingestion: Not pertinent. 5.7 Late Toxicity: Metal fume fever may develop following exposure to smoke from fire. 5.8 Vapor (Gas) Irritant Characteristics: Not pertinent. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and is very injurious to the eyes. 5.10 Odor Threshold: Not pertinent.		

6. FIRE HAZARDS 6.1 Flash Point: Not pertinent (not applicable) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Inert powder (e.g., sand, limestone) dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water, foam, halogenated extinguishing agents 6.5 Special Hazards of Combustion Products: Dense smoke may cause metal fume fever 6.6 Behavior in Fire: Dense smoke of aluminum oxide forms 6.7 Ignition Temperature: Ignites spontaneously under ambient conditions 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Not pertinent 8.2 Water-fowl Toxicity: Not pertinent 8.3 Biological Oxygen Demand (BOD): None 8.4 Feed Chain Concentration Potential: None								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts violently to form flammable hydrogen gas 7.2 Reactivity with Common Materials: Not compatible with silicone rubber, a urethane rubber 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. TIBA Corporation Industrial Chemical Division 4750 Tower 451 Florida Baton Rouge, La. 70801 2. Texas Alkyl Incorporated P. O. Box 600 Deer Park, Texas 77606 3. Alkyl Corporation Alfa Products P. O. Box 199 Beverly, Mass. 01915								
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical, 99.95% 20% or less by weight in net weight because of Septane solutions are not proprietary electronic grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Inerted drums, nitrogen at 4 psig 10.4 Labeling: Labels reflect with rupture drum								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A O /	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 198.1 13.3 Boiling Point at 1 atm: 114.7°C = 237.3°F = 455.9°K 13.4 Freezing Point: -1.4°C = 29.3°F = 271.8°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.763 at 20°C (liquid) 13.8 Liquid Surface Tension: test 1 24 dynes/cm = 0.024 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: test 1a 15,164 cal/g = 63.4 x 10³ J/kg 13.13 Heat of Combustion: test 1b -10,235 cal/g = -42,823 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><thead><tr><th>Category</th><th>Classification*</th></tr></thead><tbody><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>3</td></tr><tr><td>Reactivity (Yellow)</td><td>4</td></tr></tbody></table> *Refer to 20% or less by weight in hydrocarbon solution	Category	Classification*	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	4	
Category	Classification*								
Health Hazard (Blue)	1								
Flammability (Red)	3								
Reactivity (Yellow)	4								
NOTES (Continued on pages 1 and 2)									

TMA

TRIMETHYLAMINE

Common Synonyms: Liquefied compressed gas Colorless Fish or ammonia odor Boils and melts and boils on water. Flammable. Flammable vapor/liquid is produced.	
Fire	FLAMMABLE Flashback above vapor limit may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR POISONOUS IF INHALED Irritating to eyes, nose, and throat. LIQUID Irritates skin and eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water bodies.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446.4. 1. Use water spray. Flush thoroughly. 2. Use water spray. Flush thoroughly. 3. Use water spray. Flush thoroughly. 4. Use water spray. Flush thoroughly.	2. LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonym: Trimethylamine 32 Coast Guard Compatibility Classification: Aliphatic amine 33 Chemical Formula: $(CH_3)_3N$ 34 IMCO United Nations Hazardous Designation: 2.3 (toxic)	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquefied compressed gas 42 Color: Colorless 43 Odor: Ammoniacal
5. HEALTH HAZARDS 51 Personal Protective Equipment: Vapor protection and eye protection are required. 52 Symptoms Following Exposure: Vapor irritates eyes, nose, and throat. Liquid irritates skin and eyes. Swallowing liquid may cause severe irritation of the mouth and throat. 53 Treatment for Exposure, INHALATION: Remove victim to fresh air. If breathing is difficult, give artificial respiration. If unconscious, give artificial respiration. If swallowed, give water to drink. If skin is irritated, wash with water and soap. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available. 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Data not available. 57 Late Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Vapor is made irritant by the fact that it penetrates and irritates the respiratory tract. 59 Liquid or Solid Irritant Characteristics: Liquid irritates the skin and eyes. Swallowing liquid may cause severe irritation of the mouth and throat. 510 Odor Threshold: 1.0 ppm (approx.)	

6. FIRE HAZARDS 61 Flash Point: Not pertinent (gas). 62 Flammable Limits in Air: 2.0% - 11.6% 63 Fire Extinguishing Agents: Non-flammable gas. Use water, alcohol, foam, dry chemical, carbon dioxide, or water-soluble foam. 64 Fire Extinguishing Agents Not to be Used: Not pertinent. 65 Special Hazards of Combustion Products: Not pertinent. 66 Behavior in Fire: Vapor is heavier than air and may travel a considerable distance in a search for ignition and flash back. 67 Ignition Temperature: 124°F 68 Electrical Hazard: Not pertinent. 69 Burning Rate: Not pertinent.	8. WATER POLLUTION 81 Aquatic Toxicity: Data not available. 82 Waterfowl Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): Data not available. 84 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: No reaction. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Corrosives: Although a water solution may be neutralized with alkali, rapid evaporation will remove all of the compound. 75 Polymerization: Not pertinent. 76 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS 1. Air Products and Chemicals Inc., Allentown, Pa. 18105. 2. Commercial Solvents Corp., 245 Park Ave., New York, N.Y. 10017. 3. Robin and Haas Co., Independence, Mo. 64654. 4. Philadelphia, Pa. 19105.																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 446.4. A B C D E F M N	10. SHIPPING INFORMATION 101 Grades or Purities: Anhydrous or as shipped as 25% solution in water. 102 Storage Temperature: Ambient. 103 Inert Atmosphere: No requirements. 104 Venting: Safety relief.																																				
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Liquefied compressed gas. 122 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>4</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>3</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>2</td> </tr> <tr> <td>Persons</td> <td>3</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td>2</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>3</td> </tr> <tr> <td>Acute Toxicity</td> <td>2</td> </tr> <tr> <td>Reactions</td> <td></td> </tr> <tr> <td>Other Damage</td> <td>3</td> </tr> <tr> <td>Waves</td> <td>0</td> </tr> <tr> <td>Self Reaction</td> <td>0</td> </tr> </tbody> </table> 123 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health (H) and Effect</td> <td>3</td> </tr> <tr> <td>Flammability (F)</td> <td>4</td> </tr> <tr> <td>Reactivity (R)</td> <td>0</td> </tr> </tbody> </table>	Category	Rating	Fire	4	Health		Vapor Irritant	3	Liquid or Solid Irritant	2	Persons	3	Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	Acute Toxicity	2	Reactions		Other Damage	3	Waves	0	Self Reaction	0	Category	Classification	Health (H) and Effect	3	Flammability (F)	4	Reactivity (R)	0	13. PHYSICAL AND CHEMICAL PROPERTIES* 131 Physical State at 15°C and 1 atm: Gas. 132 Molecular Weight: 59.12 133 Boiling Point at 1 atm: 3.27°C (38°F) 134 Freezing Point: -163.5°C (-262.3°F) 135 Critical Temperature: 120.2°C (248.4°F) 136 Critical Pressure: 48.2 atm (4.82 MPa) 137 Specific Gravity: 0.633 at 20°C (liquids) 138 Liquid Surface Tension: 17 dynes/cm (0.024 N/m) at 20°C 139 Liquid-Water Interfacial Tension: Not pertinent. 140 Vapor (Gas) Specific Gravity: 2.0 141 Ratio of Specific Heats of Vapor (Gas): 1.14 142 Latent Heat of Vaporization: 17.4 kJ/mol (4.16 kcal/mol) at 20°C 143 Heat of Combustion: -17,600 J/g (4.2 kcal/g) at 20°C 144 Heat of Decomposition: Not pertinent. 145 Heat of Solution: -135 kJ/mol (32.5 kcal/mol) at 20°C 146 Heat of Polymerization: Not pertinent. *Physical properties apply to anhydrous material.
Category	Rating																																				
Fire	4																																				
Health																																					
Vapor Irritant	3																																				
Liquid or Solid Irritant	2																																				
Persons	3																																				
Water Pollution																																					
Human Toxicity	2																																				
Aquatic Toxicity	3																																				
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Category	Classification																																				
Health (H) and Effect	3																																				
Flammability (F)	4																																				
Reactivity (R)	0																																				
NOTES																																					

TMC

TRIMETHYLCHLOROSILANE

Common Synonyms Chlorotrimethylsilane Trimethylchlorosilane		Liquid	Colorless	Sharp irritating odor
Reacts violently with water. Irritating gas is produced on contact with water.				
Fire	FLAMMABLE. POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.			
Exposure	VAPOR Irritating to eyes, nose and throat. Harmful if inhaled. LIQUID Will burn skin and eyes. Harmful if swallowed.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444.4. Issue warning: High flammability. A constant flame is formed. Resist access. Evacuate area. Disperse and flush with water.		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Chlorotrimethylsilane Trimethylchlorosilane 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: CH_3SiCl_3 3.4 IMCO/United Nations Numerical Designation: 12.02XX		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Sharp hydrocarbon-like and irritating		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Acid vapor-type respiratory protection, rubber gloves, chemical-resistant goggles, other protective equipment as necessary to protect skin and eyes. 5.2 Symptoms Following Exposure: Irritation of vapor irritates mucous membranes. Contact of liquid with eyes or skin causes severe burns. Ingestion causes severe burns of mouth and stomach. 5.3 Treatment for Exposure: Get medical attention following all exposures to this compound. INHALATION: Remove victim from exposure if breathing is difficult or stopped, give artificial respiration. EYES: Flush with water for 15 min. SKIN: Flush with water. INGESTION: Do NOT induce vomiting; give large amount of water. 5.4 Toxicity by Inhalation (Threshold and Limit Values): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade III, Dose 0.1 to 5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung burns. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and severe exposure to the eyes. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS 6.1 Flash Point: 0°F (0°C) 6.2 Flammable Limits in Air: 1.1-11.1 6.3 Fire Extinguishing Agents: Dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water foam 6.5 Special Hazards of Combustion Products: Toxic and irritating hydrochloric acid and phosphine may be formed in fires. 6.6 Behavior in Fire: The liquid is extremely combustible. It reacts with water to produce a violent reaction. It reacts with water to produce a violent reaction.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously, including hydrochloric acid, hydrofluoric acid. 7.2 Reactivity with Common Materials: Reacts with surface materials such as hydrogen chloride, which will produce a violent reaction and form a flammable hydrogen gas. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Bases: Flush with water and use with caution. Neutralize with alkali. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS Dow Corning Corporation P.O. Box 100 Midland, Michigan 48686 Vapor-Sil Corporation 440 West N. Plank Avenue Milwaukee, Wisconsin 53204 Permutene, Inc. P.O. Box 100 Rockland, Maine 04866																												
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444.3. V41	10. SHIPPING INFORMATION 10.1 Grades or Purities: Not pertinent. 10.2 Storage Temperature: Not pertinent. 10.3 Inert Atmosphere: Not pertinent. 10.4 Venting: Not pertinent.																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td></td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td>Vapor Irritant</td> <td>4</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>4</td> </tr> <tr> <td>Poisons</td> <td></td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td>Human Toxicity</td> <td></td> </tr> <tr> <td>Aquatic Toxicity</td> <td></td> </tr> <tr> <td>Acute Effect</td> <td>4</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td>Other Chemicals</td> <td></td> </tr> <tr> <td>Water</td> <td>4</td> </tr> <tr> <td>Self-Reaction</td> <td></td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed	Category	Rating	Fire		Health		Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons		Water Pollution		Human Toxicity		Aquatic Toxicity		Acute Effect	4	Reactivity		Other Chemicals		Water	4	Self-Reaction		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 108.1 13.3 Boiling Point at 1 atm: $107.9 \pm 0.1^\circ\text{C}$ ($226.2 \pm 0.2^\circ\text{F}$) 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.844 at 25°C (liquid) 13.8 Liquid Surface Tension: Not pertinent. 13.9 Liquid-Water Interfacial Tension: Not pertinent. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: 124 Btu/lb $= 10.41 \text{ kcal/g} = 24 \times 10^3 \text{ J/kg}$ 13.13 Heat of Combustion: Not pertinent. $10.41 \text{ kcal/g} = 240 \times 10^3 \text{ J/kg}$ 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Data not available. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																												
Fire																													
Health																													
Vapor Irritant	4																												
Liquid or Solid Irritant	4																												
Poisons																													
Water Pollution																													
Human Toxicity																													
Aquatic Toxicity																													
Acute Effect	4																												
Reactivity																													
Other Chemicals																													
Water	4																												
Self-Reaction																													
NOTES																													

Continued on page 2 and 3

Common Synonyms		Liquid	Colorless	Characteristic odor
		May float or sink and mix with water		
Storage/Leakage if possible: • If this substance is not hazardous, it may be disposed of as waste. • No mixtures of this material and pollutants are to be released.				
Fire	Corrosible Extensive contact with liquid may cause severe skin irritation. Water may become flammable. Could expose to irritant gases if released.			
Exposure	LIQUID Not harmful			
Water Pollution	Effect of low concentrations on aquatic life is known. May be dangerous if it enters water intakes. No data available on effects on plants and animals. No data available on effects on birds and fish.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: miscible. 3.3 Chemical Formula: $\text{HC}(\text{C}_2\text{H}_5\text{O})\text{C}_2\text{H}_5\text{OH}$ 3.4 IMCO/United Nations Numerical Designation: Not listed.		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Characteristic.		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Plastic gloves, safety glasses or face shield. 5.2 Symptoms Following Exposure: Non-irritating; no symptoms observed by any exposure route. 5.3 Treatment for Exposure: INGESTION: if large amount is swallowed, induce vomiting, treat symptomatically. EYE or SKIN: flush with water; get medical attention if ill effects develop. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2, oral $\text{LD}_{50} = 3,000 \text{ mg/kg/rat}$. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapors are nonirritating to eyes and throat. 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin. 5.10 Odor Threshold: Good.				

6 FIRE HAZARD 6.1 Flash Point: 255°F (C) 6.2 Flammable Limits in Air: 0.8% - 8.0% (est.) 6.3 Fire Extinguishing Agents: Alcohols, foam, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: Acid fumes of acids and aldehydes may form in fires 6.6 Behavior in Fire 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aqueous Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not pertinent 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Union Carbide Corp. Chemicals and Plastics Div. 274 Park Avenue New York, N.Y. 10017 2. The Dow Chemical Co. 2030 Dow Center Midland, Mich. 48640																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-P Q	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial 99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirements 10.4 Venting: Open flame (inert)																												
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 60%;">Category</th> <th style="width: 40%;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td> Vapor Irritant</td> <td>0</td> </tr> <tr> <td> Liquid or Solid Irritant</td> <td>0</td> </tr> <tr> <td> Poisons</td> <td>0</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td> Human Toxicity</td> <td>0</td> </tr> <tr> <td> Aquatic Toxicity</td> <td>0</td> </tr> <tr> <td> Aesthetic Effect</td> <td>0</td> </tr> <tr> <td>Reactivity</td> <td></td> </tr> <tr> <td> Other Chemicals</td> <td>1</td> </tr> <tr> <td> Water</td> <td>0</td> </tr> <tr> <td> Self Reaction</td> <td>0</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed	Category	Rating	Fire	1	Health		Vapor Irritant	0	Liquid or Solid Irritant	0	Poisons	0	Water Pollution		Human Toxicity	0	Aquatic Toxicity	0	Aesthetic Effect	0	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 192.26 13.3 Boiling Point at 1 atm: 529°F = 273°C = 546°K -49°F = -45°C = 228°K 13.4 Freezing Point: (sets to glass) -49°F = -45°C = 228°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.022 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Data not available 13.13 Heat of Combustion (est.): -13,700 Btu/lb = -7,610 cal/g = -318 x 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Fire	1																												
Health																													
Vapor Irritant	0																												
Liquid or Solid Irritant	0																												
Poisons	0																												
Water Pollution																													
Human Toxicity	0																												
Aquatic Toxicity	0																												
Aesthetic Effect	0																												
Reactivity																													
Other Chemicals	1																												
Water	0																												
Self Reaction	0																												

(Continued on pages 6 and 8)

NOTES

TPO

TRIS(AZIRIDINYL)PHOSPHINE OXIDE

Common Synonyms APO Tri(1-aziridinyl)phosphine oxide Phosphoric acid triethylen- amide Triethylenephosphoramide		Solid White Mixes with water
1. HAZARD STATEMENTS H 302: Harmful if swallowed H 314: Causes skin irritation H 332: Causes respiratory irritation H 336: May be irritating to the eyes		
Fire	Not flammable. POISONOUS GASES MAY BE PRODUCED WHEN HEATED.	
Exposure	Corrosive to skin and eyes SOLID Irritating to skin and eyes Harmful if swallowed H 302: Harmful if swallowed H 314: Causes skin irritation H 332: Causes respiratory irritation H 336: May be irritating to the eyes	
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes Not recommended for use in water bodies Not recommended for use in water bodies	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445.4) Issue warning: corrosive water contaminant Disperse and flush		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: APO Phosphoric acid triethylenamide Triethylenephosphoramide Tri(1-aziridinyl) phosphine oxide 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: (CH₂CH₂N)₃PO or C₆H₁₂N₃PO 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Data not available
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Protective clothing and gloves to prevent contact with skin goggles 5.2 Symptoms Following Exposure: Inhalation (unless a heavy mist is formed) causes symptoms similar to those observed after ingestion. Contact with liquid or powder causes irritation of eyes and (on prolonged contact) irritation and burns of skin. Burns are slow to develop and slow to heal. May sensitize on repeated contact. Ingestion causes depression, anorexia, and diarrhea appearing 2-3 days before death, followed by terminal dyspnea incoordination epistaxis salivation prostration and convulsions 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air. EYES: flush with water at once for at least 15 min. get medical attention. SKIN: flush with water at once followed by vinegar and dilute hydrogen peroxide. INGESTION: only symptomatic and supportive measures are available 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 oral rat LD₅₀ = 37 mg/kg 5.7 Late Toxicity: None observed 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Phosphoric acid mist may form in fire Toxic oxides of nitrogen may form 6.6 Behavior in Fire: Data not available 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: 5.5 mg/kg LD₅₀ 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction unless in presence of acids or strong caustics 7.2 Reactivity with Common Materials: Slow decomposition; not considered hazardous 7.3 Stability During Transport: Stable if cool 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Violent polymerization occurs at about 25°F. Acid fumes also cause polymerization at ordinary temperatures 7.6 Inhibitor of Polymerization: None used	9. SELECTED MANUFACTURERS Chemrad Corporation P. O. Box 152 Port Washington, N. Y. 11050
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) NS	10. SHIPPING INFORMATION 10.1 Grades or Purity: 85% solution in acetone-methylene chloride 10.2 Storage Temperature: Below 100°F 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 173.16 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: 106°F = 41°C = 314°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: (vs) > 1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Data not available

U.S. Government Printing Office

(Continued on pages 5 and 6)

TPT

TURPENTINE

Common Synonyms Spirits of turpentine Turps Gum turpentine Wood turpentine	Waters: liquid Colorless Penetrating, unpleasant odor Floats on water. Irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
 Exposure	VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause nausea, vomiting, headache, difficult breathing, or loss of consciousness. LIQUID POISONOUS IF SWALLOWED Irritating to skin and eyes.
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment. Should be removed. Chemical and physical treatment.	2 LABEL 
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: D.D. turpentine Sulfate turpentine Gum turpentine Turps Spirits of turpentine Wood turpentine 3.2 Coast Guard Compatibility Classification: Olefin 3.3 Chemical Formula: C ₁₀ H ₁₆ 3.4 IMCO/United Nations Numerical Designation: 33.1299	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Aromatic, rather insistent, penetrating.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: One-piece rubber or neoprene apron, goggles, gloves, and rubber shoes. 5.2 Symptoms Following Exposure: Vapors cause headache, confusion, respiratory distress. Liquid irritates skin. If ingested, irritates the entire digestive system and may cause kidney and liver damage. Causes severe pneumonia. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air; call doctor; administer artificial respiration and oxygen if required. INGESTION: give water and induce vomiting; call doctor. EYES: flush with water for at least 15 min. SKIN: wipe off; wash with soap and water. 5.4 Toxicity by Inhalation (T₁ threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: 70 ppm for 30 min 5.6 Toxicity by Ingestion: Grade 2 ED ₀₁ 0.5 to 5 g/kg 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause slight stinging of the eyes or respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause staining and reddening of the skin. 5.10 Odor Threshold: Data not available.	

6 FIRE HAZARDS 6.1 Flash Point: 95°F (35°C) 6.2 Flammable Limits in Air: 0.5% (LFL) 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Forms heavy black smoke and soot. 6.7 Ignition Temperature: 488°F 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 2.4 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: 100 ppm */fish toxic, fresh water * Time period not specified. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9 SELECTED MANUFACTURERS 1 Hercules Inc. Hattiesburg, Miss. 39401 2 Tennessee Chemicals Inc. Newport Division Pensacola, Fla. 32501 3 Union Camp Corp. Chemical Division Jacksonville, Fla. 32205																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) F+T1	10 SHIPPING INFORMATION 10.1 Grades or Purities: A wide variety of grades and purities are shipped. All have about the same hazardous properties. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Ventiling: Open (flame arrester).																																				
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="971 1443 1219 1705"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr><td>Fire</td><td>1</td></tr> <tr><td>Health</td><td></td></tr> <tr><td> Vapor Irritant</td><td>1</td></tr> <tr><td> Liquid or Solid Irritant</td><td>1</td></tr> <tr><td> Poison</td><td>1</td></tr> <tr><td>Water Pollution</td><td></td></tr> <tr><td> Human Toxicity</td><td>2</td></tr> <tr><td> Aquatic Toxicity</td><td>3</td></tr> <tr><td> Acute Effects</td><td>2</td></tr> <tr><td>Reactivity</td><td></td></tr> <tr><td> Other Chemicals</td><td>1</td></tr> <tr><td> Water</td><td>0</td></tr> <tr><td> Self Reaction</td><td>0</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications <table data-bbox="971 1727 1219 1814"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr><td>Health Hazard (Blue)</td><td>1</td></tr> <tr><td>Flammability (Red)</td><td>3</td></tr> <tr><td>Reactivity (Yellow)</td><td>0</td></tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poison	1	Water Pollution		Human Toxicity	2	Aquatic Toxicity	3	Acute Effects	2	Reactivity		Other Chemicals	1	Water	0	Self Reaction	0	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	3	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: Not pertinent. 13.3 Boiling Point at 1 atm: 342-350°F = 178-166°C = 423-433°K 13.4 Freezing Point: Not pertinent. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.86 at 15°C (liquid) 13.8 Liquid Surface Tension: Data not available. 13.9 Liquid Water Interfacial Tension: 14 dynes/cm = 0.014 N/m at 22.7°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent. 13.12 Latent Heat of Vaporization: Not pertinent. 13.13 Heat of Combustion: Data not available. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
Category	Rating																																				
Fire	1																																				
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Vapor Irritant	1																																				
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NOTES

REVISED 1978

UND

UNDECANOL

Common Synonyms Acobol, C-11 (under-1s), Undecanol, Undecyl alcohol, Undecanol	Solid or liquid Colorless Mild odor Floats on water
See also: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 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839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000
Fire Combustible Exothermic with oxidizing agents	Combustible Exothermic with oxidizing agents
Exposure CALL FOR MEDICAL AID LIQUID Irritating to eyes IRRITANT to skin, eyes, nose, throat, and lungs	CALL FOR MEDICAL AID LIQUID Irritating to eyes IRRITANT to skin, eyes, nose, throat, and lungs
Water Pollution Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes Not biodegradable Not persistent in the environment	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes Not biodegradable Not persistent in the environment
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Mechanical containment Should be removed Chemical and physical treatment	2 LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Hendecanol, alcohol 1-Hendecanol, n-Hendecylalcohol, 1-Undecanol, Undecyl alcohol, Undecylalcohol 3.2 Coast Guard Compatibility Classification: Alcohol 3.3 Chemical Formula: $C_{11}H_{24}O$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Faint, alcoholic
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: Liquid can irritate eyes 5.3 Treatment for Exposure: Wash eyes with water for at least 15 min 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 5 to 8 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: None 5.9 Liquid or Solid Irritant Characteristics: No appreciable hazard. Practically harmless to the skin 5.10 Odor Threshold: Not pertinent	

6 FIRE HAZARDS 6.1 Flash Point: 200°F O.C. 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Foam, carbon dioxide, or dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterlow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): 12.1% (theor.) N ₂ O ₅ = 5.5% (theor.) 1 day 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Union Carbide Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) A-T-1	10 SHIPPING INFORMATION 10.1 Grade or Purity: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 172.30 13.3 Boiling Point at 1 atm: 473°F = 245°C = 518°K 13.4 Freezing Point: 60.6°F = 15.9°C = 289.1°K 13.5 Critical Temperature: 739°F = 393°C = 666°K 13.6 Critical Pressure: 398 psia = 21 atm = 2.1 MN/m ² 13.7 Specific Gravity: 0.835 at 20°C (liquid) 13.8 Liquid Surface Tension: 26.5 dynes/cm = 0.0265 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: 14.5 dyne/cm = 0.0145 N/m at 20°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.032 13.1

UDC

1-UNDECENE

Common Synonyms n-Nonylethylene	Liquid	Colorless	Mild odor
Floats on water			
Stop discharge if possible. Control dispersion if it is not safe with liquids. Isolate and remove immediately if it is not safe to collect and place in a safe container.			
Fire	Combustible Extinguish with foam, dry chemical, carbon dioxide. Water may be ineffective, use only if fire is exposed to a large area with water.		
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. Harmful if swallowed. Avoid contact with eyes, skin, and clothing. If contact occurs, wash with plenty of water. If IN EYES, hold eyelids open and flush with plenty of water. If SWALLOWED, do not induce vomiting. Have victim drink water if conscious. DO NOT INDUCE VOMITING.		
Water Pollution	Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water or lakes. Notify local health and wildlife officials. Notify personnel of nearby water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 44-4) Mechanical containment. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: n-Nonylethylene 3.2 Coast Guard Compatibility Classification: Olefin 3.3 Chemical Formula: C ₁₁ H ₂₄ CH ₂ CH ₃ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild, pleasant	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, rubber gloves. 5.2 Symptoms Following Exposure: Aspiration hazard if inhaled. Slight skin and eye irritation. No irritation hazard expected. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air. INGESTION: do NOT lavage or induce vomiting; give vegetable oil and demulcents; call a doctor. EYES: flush with water for 15 min. SKIN: wipe off; wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Data not available. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Slight smarting of eyes and respiratory system at high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin. 5.10 Odor Threshold: Data not available.			

6. FIRE HAZARDS 6.1 Flash Point: 160°F (66°C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Foam, dry chemical, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 4.8 mm/min.	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterfowl Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.	9. SELECTED MANUFACTURERS The Humphrey Chemical Co. Duane Street North Haven, Conn. 06473.
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 44-3) A T U	10. SHIPPING INFORMATION 10.1 Grades or Purty: Technical 99. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: No requirement. 10.4 Venting: Open (flame arresters).
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Combustible Liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed. 12.3 NFPA Hazard Classifications: Not listed.	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 154.2. 13.3 Boiling Point at 1 atm: 175.9°F = 192.7°C = 465.9°K. 13.4 Freezing Point: -24.5°F = -3.5°C = 227.5°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 0.750 at 20°C (liquids). 13.8 Liquid Surface Tension: 23.4 dynes/cm = 0.0234 N/m at 20°C. 13.9 Liquid-Water Interfacial Tension: (test) 40 dynes/cm = 0.040 N/m at 20°C. 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.05. 13.12 Latent Heat of Vaporization: 154 Btu/lb = 55 kcal/kg = 5.5 x 10 ⁴ J/kg. 13.13 Heat of Combustion: -19,084 Btu/lb = -2,062 cal/g = -44 x 10 ³ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.
NOTES	

(Continued on pages 5 and 6)

UDB

n-UNDECYL BENZENE

Common Synonyms 1 Phenylundecane		Liquid	Colorless	Mild odor
		Floats on water		
Fire		Combustible Flash point: 285°F (141°C) Boiling point: 300°F (150°C)		
Exposure		LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. If inhaled may cause irritation of the respiratory tract. If swallowed, do not induce vomiting. Seek medical attention.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. Fouling to shoreline. May be dangerous if it enters water intakes.		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Mechanical containment Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1-Phenylundecane 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: C ₁₂ H ₂₄ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Mild		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield and rubber gloves 5.2 Symptoms Following Exposure: Ingestion may cause intestinal disturbances. Contact with eyes causes mild irritation. 5.3 Treatment for Exposure: INGESTION: induce vomiting if large amount has been swallowed. EYES: flush with water. SKIN: remove spills on skin; clothing by washing with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: 285°F (141°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: From dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: May attack some forms of plastics 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 The Humphrey Chemical Co. Devine Street North Haven, Conn. 06471 2 Conoco Chemicals Park 90 Plaza East Saddle Brook, N.J. 07662 3 Fisher Scientific Co. 711 Forbes Ave. Pittsburgh, Pa. 15219
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Mixture with decylbenzene and dodecylbenzene, all of which have same general properties 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A-T-U	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 232.4 13.3 Boiling Point at 1 atm: 601°F = 316°C = 589°K 13.4 Freezing Point: 21°F = -6°C = 268°K 13.5 Critical Temperature: 918.1°F = 492.3°C = 765°K 13.6 Critical Pressure: 234 psia = 15.9 atm = 1.61 MN/m² 13.7 Specific Gravity: 0.855 at 20°C (liquid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 101.77 Btu/lb = 46.26 cal/g = 2.354 X 10⁵ J/kg 13.13 Heat of Combustion: -19,490 Btu/lb = -10,830 cal/g = -453.1 X 10³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
<i>(Continued on page 5448)</i>	
NOTES	

URA

URANYL ACETATE

Common Synonyms: Uranyl acetate dihydrate Uranium acetate Uranium oxoacetate dihydrate Bis (acetate) diuranium Uranium acetate dihydrate		Solid Yellow Slight vinegar odor Sinks and mixes slowly with water
Fire		
Exposure		
Water Pollution		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant Restrict access Dispense and flush		2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Bis(acetato)diuranium Uranium acetate, Uranium acetate dihydrate, Uranium oxoacetate dihydrate, Uranyl acetate dihydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $UO_2C_2H_3O_2 \cdot 2H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow 4.3 Odor: Slight vinegar
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved dust respirator, goggles or face shield, protective clothing 5.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Contact with eyes cause irritation. 5.3 Treatment for Exposure: Get medical attention after all exposures to this compound. INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting. EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ (as uranium) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade III Dose 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS

- 6.1 Flash Point: Not flammable
- 6.2 Flammable Limits in Air: Not flammable
- 6.3 Fire Extinguishing Agents: Not pertinent
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
- 6.5 Special Hazards of Combustion Products: Not pertinent
- 6.6 Behavior in Fire: Not pertinent
- 6.7 Ignition Temperature: Not pertinent
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: 1.7 ppm/96 hr fathead minnow 11 m soft water
- 8.2 Waterfowl Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): Data not available
- 8.4 Food Chain Concentration Potential: Data not available

9. SELECTED MANUFACTURERS

- 1. Varian and Chemical Co.
666 South Front St.
Elizabeth, N.J. 07202
- 2. J. T. Baker Chemical Co.
Phillipsburg, N.J. 08865
- 3. Mallinckrodt Chemical Works
2nd and Mallinckrodt St.
St. Louis, Mo. 63103

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Dissolves and reacts to give a milky solution. The reaction is not hazardous.
- 7.2 Reactivity with Common Materials: Not pertinent
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Commercial Reagent
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
 NS

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
- 13.2 Molecular Weight: 424.2
- 13.3 Boiling Point at 1 atm: Not pertinent (decomposes)
- 13.4 Freezing Point: Not pertinent
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 2.99 at 20°C (solid)
- 13.8 Liquid Surface Tension: Not pertinent
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: Not pertinent
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

(continued on pages 1 and 2)

NOTES

URANYL NITRATE

51 **Personal Protective Equipment:** Dust mask, gloves, goggles

52 **Symptoms Following Exposure:** 1. Accurate inhalation of dust may cause irritation of lungs and delayed symptoms similar to those observed after ingestion. Dust, mucus, eyes and skin and may be absorbed through skin on prolonged exposure. Ingestion causes irritation of mouth and stomach, inflammation of kidneys and liver develops 1 to 4 days after exposure

53 **Treatment for Exposure:** 1. INHALATION: remove victim to fresh air. EYES: flush with water for at least 15 min., see physician if irritation persists. SKIN: wash thoroughly with soap and water. INGESTION: administer large doses of sodium bicarbonate (This will convert the uranium salt to the bicarbonate which is much less toxic). Additional treatment is symptomatic get medical attention

54 **Toxicity by Inhalation (Threshold Limit Value):** .05 mg m⁻³

55 **Short-Term Inhalation Limits:** Data not available

56 **Toxicity by Ingestion:** Grade 1, LD₅₀ 50 to 400 mg/kg

57 **Late Toxicity:** Delayed inflammation of kidneys. Airborne radioactive particles have apparently been responsible for a significantly increased death rate from lung cancer among long term uranium miners

58 **Vapor (Gas) Irritant Characteristics:** Data not available

59 **Liquid or Solid Irritant Characteristics:** Data not available

510 **Odor Threshold:** Not pertinent

NOTES

URS

URANYL SULFATE

Common Synonyms Uranyl sulfate trihydrate Uranium sulfate Uranium sulfate trihydrate		Subd	Yellow	Odorless
		Sinks and mixes with water		
Avoid contact with wind and dust. Keep away from children. May be irritating to the eyes. Avoid contact with discharged material. Avoid contact with polluted water bodies.				
Fire	Not flammable			
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If swallowed, induce vomiting and flush with plenty of water. If swallowed, induce vomiting and flush with plenty of water. If swallowed, induce vomiting and flush with plenty of water. SOLID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush skin with plenty of water. If IN EYES, hold eyelids open, flush with plenty of water. IF SWALLOWED, DO NOT INDUCE VOMITING. Give victim 1 to 2 water orally and have them drink more. IF SWALLOWED, induce vomiting and have them drink more. IF SWALLOWED, induce vomiting and have them drink more.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Not toxic to fish and waterfowl. Not toxic to birds and waterfowl.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant Restrict access Dispense and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Uranium sulfate, Uranium sulfate trihydrate, Uranyl sulfate trihydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: UO2SO4 · 3H2O 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved dust respirator, goggles or face shield, protective clothing 5.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Contact with eyes causes irritation. 5.3 Treatment for Exposure: Get medical attention after all exposures to this compound. INGESTION: Give large amounts of water, induce vomiting. EYES: Flush with water for at least 15 min. SKIN: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.2 mg/m ³ (as uranium) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade I LD50 15 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: 115 ppm/96 hr fathead minnow/TLM; hard water 2.8 ppm/96 hr fathead minnow/TLM; soft water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Data not available	
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Varfacid Chemical Co. 666 South Front St. Elizabeth, N.J. 07202 2. Gallard Schlessinger Chemical Mfg. Co. 584 Mineola Ave. Carle Place, N.Y. 11514 3. Ventron Corp. P.O. Box 159 Beverly, Mass. 01915	
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS		10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial, Pure 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Radioactive material 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 420.2 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 3.28 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	
(Continued on pages 1 and 2)			
NOTES			

URE

UREA

Common Synonyms Carbamide Carbonyldiamide		Solid crystals or pellets White Odorless
		Sinks and mixes with water
Fire	Combustible	
Exposure	Not harmful	
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 444.4) Disperse and flush		2. LABELS No hazard label required by code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Carbamide Carbonyldiamide 3.2 Coast Guard Competibility Classification: Not applicable 3.3 Chemical Formula: <chem>NH2CONH2</chem> 3.4 IMCO United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Odorless or very ammonia-like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, dust mask 5.2 Symptoms Following Exposure: May irritate eyes 5.3 Treatment for Exposure: Wash eyes with water 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: None 5.8 Vapor (Gas) Irritant Characteristics: Not irritant 5.9 Liquid or Solid Irritant Characteristics: None 5.10 Odor Threshold: Not pertinent		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Water 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Melts and decomposes generating ammonia 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not flammable		8. WATER POLLUTION 8.1 Aquatic Toxicity: No data for 24 hr. tests when added to freshwater No data for 24 hr. tests when added to freshwater 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Occurs only above melting point of 132°C, yielding ammonia and other products. The decomposition is not explosive 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Inco Chemical Corp. Ammonia Division Morgantown, NJ 07093 2. E. I. du Pont de Nemours & Co. Synthetic Division Dallas, TX 75221 3. Inco Chemical Co. Yazoo City, Miss. 39364
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444.1 NN		10. SHIPPING INFORMATION 10.1 Grades or Purity: Ammonia grades and purities which depend on manufacturing process and intended use. All have essentially the same hazardous properties 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 60.06 13.3 Boiling Point at 1 atm: Decomposes 13.4 Freezing Point, 15°C: $-133.5 \pm 0.05^\circ\text{C}$ 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.79 at 20°C (water) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: -1313 Btu/lb -2724 cal/g $-114.02 \times 10^3 \text{ J/g}$ 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: -108 Btu/lb -60 cal/g $-2.52 \times 10^3 \text{ J/g}$ 13.16 Heat of Polymerization: Not pertinent
NOTES		

UPO

UREA PEROXIDE

Common Synonyms Urea hydrogen peroxide Hydrogen peroxide carbamide Urea hydrogen peroxide salt Carbamide peroxide Carbonyl diamine peroxide		Solid White Mixes with water	Odorless
Fire	Combustible May cause fire on contact with combustibles POISONOUS GASES MAY BE PRODUCED IN FIRE. Containers may explode in fire		
Exposure	SOLID Irritating to skin and eyes.		
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446-1) Issue warning oxidizing material Restrict access Disperse and flush		2. LABEL 	
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Carbamide peroxide Carbonyl diamine peroxide Hydrogen peroxide carbamide Percarbamide Polyhydrol Urea, Urea hydrogen peroxide 3.2 Coast Guard Compatibility Classification Not applicable 3.3 Chemical Formula: CO(NH ₂) ₂ H ₂ O 3.4 IMCO/United Nations Numerical Designation: N.E. 1511		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None	
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves eye protective goggles 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose from hydrogen peroxide formed when heated. Contact with eyes causes severe damage. Contact with moist skin causes temporary stinging or burning sensation. Ingestion causes irritation of mouth and stomach. 5.3 Treatment for Exposure: INHALATION: remove victim from exposure call physician. EYES: wash thoroughly with large quantities of water for at least 15 min. call physician. SKIN: flush with water. INGESTION: give large amounts of water get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent			

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not pertinent (combustible solid, may cause fire upon contact with ordinary combustibles)
- 6.2 **Flammable Limits in Air:** Not pertinent
- 6.3 **Fire Extinguishing Agents:** Inert powders (e.g., sand) and foam water
- 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
- 6.5 **Special Hazards of Combustion Products:** Irritating anoxic gas may be formed in fire
- 6.6 **Behavior in Fire:** Melts and decomposes giving off oxygen and ammonia. Increases severity of fire. Containers may explode
- 6.7 **Ignition Temperature:** >600 °C
- 6.8 **Electrical Hazard:** Data not available
- 6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** Forms solution of hydrogen peroxide; non-hazardous reaction
- 7.2 **Reactivity with Common Materials:** No significant reaction at ordinary temperatures. At 50 °C (122 °F) reacts with dust and rubbers
- 7.3 **Stability During Transport:** Stable below 60 °C (140 °F)
- 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 7.5 **Polymerization:** Not pertinent
- 7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
- 8.2 **Waterford Toxicity:** Data not available
- 8.3 **Biological Oxygen Demand (BOD):** None
- 8.4 **Food Chain Concentration Potential:** None

9 SELECTED MANUFACTURERS

1. The Norac Company, Inc.
 405 South Motor Avenue
 P.O. Box 1
 Azusa, Calif. 91702
2. Degussa Incorporated
 Chemicals Division
 2 Pennsylvanian Plaza
 New York, N.Y. 10001
3. Gallard Schlenker Chemical Mfg. Co.
 584 Mincola Avenue
 Carle Place, N.Y. 11514

10 SHIPPING INFORMATION

- 10.1 **Grades or Purity:** 98-100%
- 10.2 **Storage Temperature:** Below 60 °C (140 °F)
- 10.3 **Inert Atmosphere:** No requirement
- 10.4 **Venting:** Open flame arresters

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)
 N

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Organic Peroxide
- 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
- 12.3 **NFPA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15 °C and 1 atm:** Solid
- 13.2 **Molecular Weight:** 94.1
- 13.3 **Boiling Point at 1 atm:** Not pertinent (decomposes)
- 13.4 **Freezing Point:** Not pertinent
- 13.5 **Critical Temperature:** Not pertinent
- 13.6 **Critical Pressure:** Not pertinent
- 13.7 **Specific Gravity:** 0.8 at 20 °C (solid)
- 13.8 **Liquid Surface Tension:** Not pertinent
- 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
- 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 13.12 **Latent Heat of Vaporization:** Not pertinent
- 13.13 **Heat of Combustion:** Data not available
- 13.14 **Heat of Decomposition:** -540 Btu/lb
 = -600 cal/g = -12.5 x 10³ J/kg
- 13.15 **Heat of Solution:** Not pertinent
- 13.16 **Heat of Polymerization:** Not pertinent

(continued on pages 5 and 6)

NOTES

VAL

VALERALDEHYDE

Common Synonyms Amyl aldehyde Valeric aldehyde Pentanal Valeral		Water Solubility Soluble		Odorless Fruity odor																																											
Floats on water. Flammable; irritating vapor is produced.																																															
Fire FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.																																															
Exposure VAPOR Irritating to eyes, nose, and throat. LIQUID Irritating to skin and eyes.																																															
Water Pollution Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes.																																															
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-4. Toxic when in high concentrations. Flammable area. Dispersion advised.			2. LABEL 																																												
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Amyl aldehyde Pentanal Valeral Valeric aldehyde 3.2 Coast Guard Compatibility Classification: NAHNSA 3.3 Chemical Formula: $C_5H_{10}O$ 3.4 IMCO United Nations Numerical Designation: 12.02			4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Fruity																																												
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: See Response Methods Handbook, CG 444-4. 5.2 Symptoms Following Exposure: Irritation to eyes, nose, and throat. 5.3 Treatment for Exposure: If inhaled, move to fresh air. If on skin, wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm (10 mg/m³). 5.5 Short-Term Inhalation Limits: 100 ppm (10 mg/m³). 5.6 Toxicity by Ingestion: Irritation to mouth and throat. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor is a mild irritant to the eyes, nose, and throat. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard to the skin and eyes. 5.10 Odor Threshold: 100 ppm (10 mg/m³).																																															
6. FIRE HAZARDS 6.1 Flash Point: 14°F (6°C) 6.2 Flammable Limits in Air: Data not available. 6.3 Fire Extinguishing Agents: Foam, dry chemical, carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Not pertinent. 6.6 Behavior in Fire: Not pertinent. 6.7 Ignition Temperature: Data not available. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 1.9 mm/min.																																															
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: No reaction. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Not pertinent. 7.6 Inhibitor of Polymerization: Not pertinent.																																															
8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterlow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): 200 mg/l (5 days). 8.4 Food Chain Concentration Potential: None.																																															
9. SELECTED MANUFACTURERS Valeraldehyde Corp. Chemicals and Plastics Division 270 Park Ave. New York, N.Y. 10017																																															
10. SHIPPING INFORMATION 10.1 Grades or Purity: 95% min. 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Not required. 10.4 Venting: Open to atmosphere.																																															
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-5. A-P-Q-T-L																																															
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NFPA Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>1. Health</td> <td>1</td> </tr> <tr> <td>2. Flammability</td> <td>2</td> </tr> <tr> <td>3. Reactivity</td> <td>1</td> </tr> <tr> <td>4. Special</td> <td>1</td> </tr> <tr> <td>5. Environmental</td> <td>1</td> </tr> <tr> <td>6. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>7. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>8. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>9. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>10. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>11. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>12. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>13. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>14. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>15. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>16. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>17. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>18. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>19. Hazardous Waste</td> <td>1</td> </tr> <tr> <td>20. Hazardous Waste</td> <td>1</td> </tr> </tbody> </table>						Category	Rating	1. Health	1	2. Flammability	2	3. Reactivity	1	4. Special	1	5. Environmental	1	6. Hazardous Waste	1	7. Hazardous Waste	1	8. Hazardous Waste	1	9. Hazardous Waste	1	10. Hazardous Waste	1	11. Hazardous Waste	1	12. Hazardous Waste	1	13. Hazardous Waste	1	14. Hazardous Waste	1	15. Hazardous Waste	1	16. Hazardous Waste	1	17. Hazardous Waste	1	18. Hazardous Waste	1	19. Hazardous Waste	1	20. Hazardous Waste	1
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18. Hazardous Waste	1																																														
19. Hazardous Waste	1																																														
20. Hazardous Waste	1																																														
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid. 13.2 Molecular Weight: 98.12. 13.3 Boiling Point at 1 atm: 127.1°C (260.8°F). 13.4 Freezing Point: -12.1°C (9.4°F). 13.5 Critical Temperature: 254.1°C (487.4°F). 13.6 Critical Pressure: 33.8 atm (3430 kPa). 13.7 Specific Gravity: 0.81 (20°C/20°C). 13.8 Liquid Surface Tension: 24.5 dyne/cm (20°C). 13.9 Liquid-Water Interfacial Tension: 10.5 dyne/cm (20°C). 13.10 Vapor (Gas) Specific Gravity: Not pertinent. 13.11 Ratio of Specific Heats of Vapor (Gas): 1.17. 13.12 Latent Heat of Vaporization: 35.5 kJ/mol (8.5 kcal/mol). 13.13 Heat of Combustion: 2850 kJ/mol (683 kcal/mol). 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: Not pertinent.																																															
NOTES																																															

VOT

VANADIUM OXYTRICHLORIDE

Common Synonyms Vanadyl trichloride Trichlorovanadium Vanadyl chloride	Liquid Lemon yellow Sharp unpleasant odor Sinks and mixes violently with water
Fire	Not flammable
 Exposure	VAPOR Irritating to eyes, nose and throat If inhaled will cause coughing or difficulty breathing LIQUID POISONOUS IF SWALLOWED OR IF SKIN IS EXPOSED Irritating to skin and eyes Harmful if swallowed
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Procedures Handbook, CG 446-4) Isopropyl alcohol, acetone or kerosene Restrict access Dispose and track	2. LABEL 
3. CHEMICAL DESIGNATIONS 21 Synonyms: Trichlorovanadium Vanadylchloride Vanadyltrichloride 32 Corrosive Compatibility Classification: Not listed 33 Chemical Formula: VOCI ₃ 34 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Lemon yellow 43 Odor: Acid
5. HEALTH HAZARDS 51 Personal Protective Equipment: Acid vapor mask, rubber gloves, face shield and resistant clothing 52 Symptoms Following Exposure: Inhalation: Vapor causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes severe irritation. 53 Treatment for Exposure: If in contact with skin after all exposure to this compound, IMMEDIATELY remove to fresh air, give artificial respiration if necessary. INGESTION: Give large amount of water. EYES: Flush with water for 15 min. SKIN: Remove exposed areas free of the chemical with a dry cloth, then flush thoroughly with water. 54 Toxicity by Inhalation (Threshold Limit Value): Data not available 55 Short-Term Inhalation Limits: 1 ppm (TLV) ceiling level. Based on fact that compound decomposes in moist air into vanadic acid and HCl. 56 Toxicity by Ingestion: Grade 1 oral rat LD ₅₀ = 4.0 mg/kg 57 Late Toxicity: Repeated exposures may cause disorientation of long-term use of acetone, anemia, kidney disorders, and blindness. 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: 10 ppm (TLV) based on decomposition of compound in moist air	

6. FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used: Water, unless in flooding amounts, should not be used on a liquid fire. 65 Special Hazards of Combustion Products: Irritating fumes of hydrogen chloride may form in fires. 66 Behavior in Fire: 67 Ignition Temperature: Not pertinent 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not pertinent	8. WATER POLLUTION 81 Aquatic Toxicity: See vanadic acid 82 Waterflow Toxicity: Data not available 83 Biological Oxygen Demand (BOD): None 84 Food Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 71 Reactivity with Water: Reacts to form a solution of hydrochloric acid 72 Reactivity with Common Materials: In presence of moisture will corrode most metals 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Flush with water and sprinkle with powdered limestone or mix with dilute solution of sodium bicarbonate or soda ash 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Foster Mineral Co. Route 100 Easton, Pa. 18040 2. National Chemical Company Specialty Chemical Div. Westport, Conn. 06880 3. Ventron, Inc. P.O. Box 159 Beverly, Mass. 01915
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A 11	10. SHIPPING INFORMATION 101 Grade or Purity: Technical 99% 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Pressure vacuum
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Corrosive liquid 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid 132 Molecular Weight: 173.1 133 Boiling Point at 1 atm: 240°C = 464°F = 493°K 134 Freezing Point: 120°C = 248°F = 393°K 135 Critical Temperature: Data not available 136 Critical Pressure: Data not available 137 Specific Gravity (20°C/20°C liquid): Data not available 138 Liquid Surface Tension: Data not available 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: 5.0 1311 Ratio of Specific Heats of Vapor (Gas): Data not available 1312 Latent Heat of Vaporization: Data not available 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Data not available 1316 Heat of Polymerization: Not pertinent
NOTES 1. compound in moist air	

VOX

VANADIUM PENTOXIDE

Common Synonyms Vanadic anhydride Vanadium pentoxide		Solid	Yellowish brown	Odorless
		Sinks in water		
Fire		Not flammable Will increase the intensity of a fire		
Exposure		DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. If swallowed will cause nausea.		
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE See Response Methods Manual, CG 404.4 Should be removed Aerial or land physical treatment		2. LABELS No hazard label required by U.S. Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Vanadic anhydride Vanadium pentoxide 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: V ₂ O ₅ 3.4 HSBC/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow-orange powdery; dark gray flakes or yellowish brown 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: No MOPP approach, operator, helper, packer, picker, or prolonged exposure 5.2 Symptoms Following Exposure: Irritation of dust in eye, nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation. Eczema may develop. 5.3 Treatment for Exposure: INHALATION: Move to fresh air. Remove clothing. Do not make the person vomit. INGESTION: Induce vomiting. Get medical attention. EYES: Flush with water for at least 15 min. SKIN: Flush with water. Wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 mg/m ³ 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 oral LD ₅₀ (Toxic Agent Index) 5.7 Late Toxicity: Repeated exposure may cause discoloration of the eye, loss of appetite, anemia, kidney disorders, and fibrosis. 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				
6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: May increase intensity of fire when in contact with combustible materials. 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent				
8. WATER POLLUTION 8.1 Aquatic Toxicity: 11 ppm, 96 hr, fathead minnow, TL ₅₀ , hard water 11 ppm, 96 hr, fathead minnow, TL ₅₀ , soft water 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Data not available				
9. SELECTED MANUFACTURERS Easton Minerals Rising Hill Fertus Products Kerr-McGee Chemical Corp. Noble Systems Odebrecht Norton Chemical Co. Industrie Chimiques du Wendport Chemicals				
10. SHIPPING INFORMATION 10.1 Grade or Purity: Commercial 99.99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open				
11. HAZARD ASSESSMENT CODE See Method Assessment Manual, CG 404.3 11		12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAZ Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed		
13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 182.02 13.3 Boiling Point at 1 atm: Not pertinent decomposes 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 5.16 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent				
NOTES				

VSF

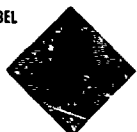
VANADYL SULFATE

Common Synonyms Vanadium oxydisulfate Vanadyl sulfate dihydrate		Solid	Pale blue	Odorless
Sinks and mixes with water				
Avoid contact with solid and avoid dust. Avoid contact with skin, eyes, nose and mouth. If possible, use proper respiratory protection. Wash thoroughly after use. Do not eat, drink or smoke while using. Notify medical personnel if you are exposed.				
Fire	Not flammable			
Exposure	CAUTION FOR MEDICAL USE DUST: Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If swallowed will cause nausea or vomiting. If in contact with skin, wash with plenty of water. If in contact with eyes, flush with water for at least 15 minutes. If in contact with clothing, remove clothing and wash with water. If swallowed, do not induce vomiting. If in contact with skin, wash with water. If in contact with eyes, flush with water for at least 15 minutes. If in contact with clothing, remove clothing and wash with water. If swallowed, do not induce vomiting. If in contact with skin, wash with water. If in contact with eyes, flush with water for at least 15 minutes. If in contact with clothing, remove clothing and wash with water. If swallowed, do not induce vomiting.			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes. Notify personnel if it enters water intakes.			
1. RESPONSE TO DISCHARGE (See Response Measures Handbook CG 446-6) Issue warning: water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Vanadium oxydisulfate Vanadyl sulfate dihydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: VOSO ₄ · 2H ₂ O 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Pale blue 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion causes irritation of mouth and stomach. Contact with eyes or skin causes irritation. Eczema may develop. (Results of prolonged exposure are described in section 5.7) 5.3 Treatment for Exposure: INHALATION: move to fresh air; if exposure to dust has been severe, get medical attention. INGESTION: give large amount of water; induce vomiting; get medical attention. EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 3, LD ₅₀ 500 mg/kg 5.7 Late Toxicity: Repeated exposures may cause discoloration of tongue, loss of appetite, anemia, kidney disorders, and blindness 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: 36 ppm/96 hr./fathead minnow/11 m hard water 48 ppm/96 hr./fathead minnow/11 m soft water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Gallard-Schlesinger Chemical Mfg. Co. 584 Minerva Ave. Certe Place, N. Y. 11514 2. Eastman Organic Chemicals Rochester, N. Y. 14650 3. Ventron Inc. P. O. Box 139 Beverly, Mass. 01915
	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial Pure 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook CG 446-3) SS	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 199.1 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: (approx.) 2.5 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Vapor Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (γ_s): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 MFPA Hazard Classifications: Not listed	
(continued on pages 5 and 6) NOTES	

VAM

VINYL ACETATE

Common Synonyms VvAc Vinyl monomer	Waters liquid Colorless Pleasant fruity odor Floats on water. Flammable. Irritating vapor is produced.
Step discharge, if possible, keep person away. Shut off the gas, if necessary, and if the fire is not out, avoid contact with liquid and vapor. Stay upwind and use water spray to knock down vapors. If fire and person are discharged, handle as follows: 1. If fire is not out, keep person away.	
Fire	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and safety glasses when working with liquid and vapor. Extinguish with dry, foaming, or carbon dioxide extinguishers. Do not use water.
Exposure	CONTIFORMAL ACUP VAPOR Irritating to eyes, nose and throat. If inhaled, will cause dizziness or difficult breathing. May cause drowsiness. If inhaled, may cause drowsiness or difficulty breathing. LIQUID Irritating to skin and eyes. Harmful if swallowed or if spilled on skin. Remove clothing if contaminated. Wash with plenty of water. If swallowed, do not induce vomiting.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS Fouling to shoreline. May be dangerous if it enters water intakes. Notify state and local authorities.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning of high flammability and contaminant. Evacuate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 31 Synonyms: VAM Vinyl monomer VvAc 32 Coast Guard Compatibility Classification: Vinyl acetate 33 Chemical Formula: $\text{CH}_3\text{COOCH}=\text{CH}_2$ 34 IMCO United Nations Numerical Designation: 32130	4. OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Not unpleasant, sweet-smell in small quantities; pleasant, fruity characteristic.
5. HEALTH HAZARDS 51 Personal Protective Equipment: Approved canister or air-supplied mask, goggles or face shield, rubber or plastic gloves. 52 Symptoms Following Exposure: High vapor concentrations cause drowsiness. Liquid irritates eyes and may irritate skin. 53 Treatment for Exposure: INHALATION: Remove victim to fresh air, give artificial respiration if required. EYES: Flush with water for at least 15 min. 54 Toxicity by Inhalation (Threshold Limit Value): 10 ppm 55 Short-Term Inhalation Limits: Data not available. 56 Toxicity by Ingestion: Grade 2 (LD ₅₀ 5 to 8 g/kg rat). 57 Late Toxicity: Data not available. 58 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary. 59 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause irritation and reddening of the skin. 60 Odor Threshold: 0.12 ppm	

6. FIRE HAZARDS 61 Flash Point: 18°C (64°F) 62 Flammable Limits in Air: 2.6-13.4 63 Fire Extinguishing Agents: Carbon dioxide or dry chemical for small fires; ordinary foam for large fires. 64 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 65 Special Hazards of Combustion Products: Not pertinent. 66 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. May polymerize when heated in a fire and rupture container. 67 Ignition Temperature: 500°F 68 Electrical Hazard: Class I, Group I 69 Burning Rate: 35 mm/min	8. WATER POLLUTION 81 Aquatic Toxicity: 18 ppm 96 hr bioassay; 11 mg/l 96 hr water; >100 ppm 48 hr bioassay; 10 mg/l salt water. 82 Waterfowl Toxicity: Data not available. 83 Biological Oxygen Demand (BOD): 62% of theoretical in 5 days, freshwater, acclimated seed. 84 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction. 72 Reactivity with Common Materials: No reaction. 73 Stability During Transport: Stable. 74 Neutralizing Agents for Acids and Caustics: Not pertinent. 75 Polymerization: Can occur when in contact with peroxides and strong acids, but only under extreme conditions. 76 Inhibitor of Polymerization: 4-5 ppm or 14-17 ppm hydroquinone. Shipments usually also contain 200 ppm of diphenylamine.	9. SELECTED MANUFACTURERS 1 Celanese Corp. Celanese Chemical Co. Division 245 Park Ave. New York, N.Y. 10017 2 National Distillers & Chemical Corp. U.S. Industrial Chemicals Co. Division Houston, Tex. 77001 3 Union Carbide Corp. Chemicals and Plastics Division 27 Park Ave. New York, N.Y. 10017																																				
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 414-3 A P-J-T-V-W-Z	10. SHIPPING INFORMATION 101 Grades or Purity: Grade A (Diphenylamine inhibited) 99.8% Grade H (Hydroquinone inhibited) 99.8% 102 Storage Temperature: Ambient. 103 Inert Atmosphere: No requirement. 104 Venting: Pressure, vacuum.																																				
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Flammable liquid. 122 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="922 1441 1161 1725"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Health</td><td></td></tr> <tr> <td>Vapor Irritant</td><td>1</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>1</td></tr> <tr> <td>Poisons</td><td>2</td></tr> <tr> <td>Water Pollution</td><td></td></tr> <tr> <td>Human Toxicity</td><td>2</td></tr> <tr> <td>Aquatic Toxicity</td><td>1</td></tr> <tr> <td>Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td></td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>1</td></tr> </tbody> </table> 123 NFPA Hazard Classifications: <table data-bbox="922 1747 1161 1834"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>2</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Rating	Fire	3	Health		Vapor Irritant	1	Liquid or Solid Irritant	1	Poisons	2	Water Pollution		Human Toxicity	2	Aquatic Toxicity	1	Aesthetic Effect	2	Reactivity		Other Chemicals	2	Water	0	Self Reaction	1	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	2	Reactivity (Yellow)	2	13. PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Liquid. 132 Molecular Weight: 86.09 133 Boiling Point at 1 atm: 163.2°F = 72.9°C = 341.7°K 134 Freezing Point: -118.0°F = -82.2°C = 191.4°K 135 Critical Temperature: 486.1°F = 252.3°C = 525°K 136 Critical Pressure: 617 atm = 42 psia = 4.25 MN/m ² 137 Specific Gravity: 0.934 at 15°C (liquid) 138 Liquid Surface Tension: 23.95 dynes/cm = 0.0239 N/m at 20°C 139 Liquid-Water Interfacial Tension: 16.140 dynes/cm = 0.0161 N/m at 20°C 1310 Vapor (Gas) Specific Gravity: Not pertinent. 1311 Ratio of Specific Heats of Vapor (Gas): 1.103 1312 Latent Heat of Vaporization: 16.5 Btu/lb = 90 cal/g = 379 J/g at 15°C 1313 Heat of Combustion: -774 Btu/lb = -449 cal/g = -226.9 kJ/kg at 15°C 1314 Heat of Decomposition: Not pertinent. 1315 Heat of Solution: Not pertinent. 1316 Heat of Polymerization: -439 Btu/lb = -244 cal/g = -10.2 J/g
Category	Rating																																				
Fire	3																																				
Health																																					
Vapor Irritant	1																																				
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Reactivity (Yellow)	2																																				
NOTES (Continued on page 5 and 6)																																					

REVISED 1978

VCM

VINYL CHLORIDE

Common Synonyms Chloroethene VCL Vinyl Chloride Monomer	Liquidified compressed gas Colorless Sweet odor Liquid floats and boils on water. Flammable, irritating, visible vapor cloud is produced.
Fire	FLAMMABLE POISONOUS GAS IS PRODUCED IN FIRE Flashback along vapor trail may occur. May explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause dizziness or difficult breathing. LIQUID Will cause frostbite.
Water Pollution	Not harmful to aquatic life.
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.3) Issue warning: high flammability. Evacuate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Chloroethene, Chloroethylene, Vinyl Chloride Monomer, VCL, VCM. 3.2 Coast Guard Compatibility Classification: Vinyl halides. 3.3 Chemical Formula: $\text{CH}_2=\text{CHCl}$. 3.4 IMCO/United Nations Numerical Designation: 201036.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquidified gas. 4.2 Color: Colorless. 4.3 Odor: Pleasant, sweet.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves and shoes; gas tight goggles; organic vapor canister or self-contained breathing apparatus. 5.2 Symptoms Following Exposure: INHALATION: high concentrations caused dizziness, anesthesia, lung irritation. SKIN: may cause frostbite; phenol inhibitor may be absorbed through skin if large amounts of liquid evaporate. 5.3 Treatment for Exposure: INHALATION: remove patient to fresh air and keep him quiet and warm; call a doctor; give artificial respiration if breathing stops. EYES AND SKIN: flush with plenty of water for at least 15 min; for eyes seek medical attention; remove contaminated clothing. 5.4 Toxicity by Inhalation (Threshold Limit Value): 200 ppm. 5.5 Short-Term Inhalation Limits: 500 ppm for 5 min. 5.6 Toxicity by Ingestion: Not pertinent. 5.7 Late Toxicity: Chronic exposure may cause liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation such that personnel will find high concentrations unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain may cause smarting and reddening of skin. May cause frostbite. 5.10 Odor Threshold: 200 ppm.	

6 FIRE HAZARDS

- 6.1 **Flash Point:** -110°F (0°C)
 6.2 **Flammable Limits in Air:** 3% - 26%
 6.3 **Fire Extinguishing Agents:** For small fire use dry chemical or carbon dioxide. For large fires stop flow of gas. Cool exposed containers with water.
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent.
 6.5 **Special Hazards of Combustion Products:** Forms highly toxic combustion products such as hydrogen chloride, phosgene, and carbon monoxide.
 6.6 **Behavior in Fire:** Container may explode in fire. Gas is heavier than air and may travel considerable distance to a source of ignition and flash back.
 6.7 **Ignition Temperature:** 862°F
 6.8 **Electrical Hazard:** Class I Group D
 6.9 **Burning Rate:** 4.3 mm/min

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction.
 7.2 **Reactivity with Common Materials:** No reaction.
 7.3 **Stability During Transport:** Stable.
 7.4 **Neutralizing Agents for Acids and Bases:** Not pertinent.
 7.5 **Polymerization:** Polymerizes in presence of air, sunlight or heat unless stabilized by inhibitors.
 7.6 **Inhibitor of Polymerization:** Not normally used, except when high temperatures are expected. Then 40-100 ppm of phenol used.

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** None.
 8.2 **Waterway Toxicity:** None.
 8.3 **Biological Oxygen Demand (BOD):** None.
 8.4 **Food Chain Concentration Potential:** None.

9 SELECTED MANUFACTURERS

1. Dow Chemical Co.
 Midland, Mich. 48640
 2. The B. I. Goodrich Co.
 6100 Oak Tree Blvd.
 Cleveland, Ohio 44131
 3. PPG Industries, Inc.
 Chemical Division
 Graysville, Puerto Rico 00656

10. SHIPPING INFORMATION

- 10.1 **Grades or Purity:** Commercial or technical 99.4%
 10.2 **Storage Temperature:** Under pressure ambient.
 At atm. pressure low.
 10.3 **Inert Atmosphere:** No requirement.
 10.4 **Venting:** Under pressure safety relief.
 At atm. pressure pressure-vacuum.

11 HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446.3)
 ABCDEFGZ

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Flammable compressed gas.
 12.2 **NAS Hazard Rating for Bulk Water Transportation:**
- | Category | Rating |
|--------------------------|--------|
| Fire | 4 |
| Health | |
| Vapor Irritant | 2 |
| Liquid or Solid Irritant | 1 |
| Poisons | 2 |
| Water Pollution | |
| Human Toxicity | 0 |
| Aquatic Toxicity | 0 |
| Ecotoxic Effect | 0 |
| Reactivity | |
| Other Chemicals | 2 |
| Water | 0 |
| Self Reaction | 2 |
- 12.3 **NFPA Hazard Classifications:**
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 4 |
| Reactivity (Yellow) | 1 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Gas.
 13.2 **Molecular Weight:** 62.50.
 13.3 **Boiling Point at 1 atm:** 72°F = 13°C = 259.4°K .
 13.4 **Freezing Point:** -244.6°F = -153.1°C = -119.4°K .
 13.5 **Critical Temperature:** 317.1°F = 158.4°C = 431.6°K .
 13.6 **Critical Pressure:** 775 psia = 52.7 atm = 5.34 MN/m.
 13.7 **Specific Gravity:** 0.969 at -13°C (liquid).
 13.8 **Liquid Surface Tension:** 16.0 dynes/cm = 0.0160 N/m at 25°C .
 13.9 **Liquid-Water Interfacial Tension:** (est.) 30 dynes/cm = 0.03 N/m at 20°C .
 13.10 **Vapor (Gas) Specific Gravity:** 2.2.
 13.11 **Ratio of Specific Heats of Vapor (Gas):** 1.186.
 13.12 **Latent Heat of Vaporization:** 160 Btu/lb = 88 cal/g = 3.7×10^4 J/kg.
 13.13 **Heat of Combustion:** -8136 Btu/lb = -4520 cal/g = -1891 kJ/kg.
 13.14 **Heat of Decomposition:** Not pertinent.
 13.15 **Heat of Solution:** Not pertinent.
 13.16 **Heat of Polymerization:** -729 Btu/lb = -405 cal/g = -16.9×10^4 J/kg.

(Continued on pages 5 and 6)

NOTES

VINYL FLUORIDE, INHIBITED

Common Synonyms Fluoroethylene Monofluoroethylene	Liquefied compressed gas Colorless Faint odor Floats and boils on water. Flammable visible vapor cloud is produced
Shut off the gas supply. Call fire department. Avoid contact with liquid. Keep people away. Stop discharging. Seal. Stop up with dry water, cover with wet vapor. Extinguish with water, foam or alcohol. Notify fire department. Clean up and dispose.	
Fire	FLAMMABLE. POISONOUS GASES ARE PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Let fire burn. Stop flow of gas if possible. Cool exposed containers with water until removed from fire. Do not extinguish with water.
Exposure	Chloroform is irritant. VAPOR If inhaled will cause headache, or dizziness. May cause frostbite. Irritation of the skin may occur. LIQUID Will cause frostbite. Flow of liquid may cause frostbite on contact. DO NOT RE-BREATHE EXHAUST
Water Pollution	Not harmful to aquatic life
1. RESPONSE TO DISCHARGE (See Response Methods Handbook CG 446.4) Issue warning - high flammability Air contaminant Restrict access Isolate area	2. LABEL
	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped). Liquefied compressed gas 4.2 Color: Colorless 4.3 Odor: Faint ethereal
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Fluoroethylene Monofluoroethylene 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $\text{CH}_2=\text{CHF}$ 3.4 IMCO/United Nations Numerical Designation: 21860	
5. HEALTH HAZARDS	5.1 Personal Protective Equipment: Protective gloves safety glasses self contained breathing apparatus 5.2 Symptoms Following Exposure: Inhalation of vapor causes slight intoxication, some shortness of breath. Liquid may cause frostbite of eyes or skin. 5.3 Treatment for Exposure: INHALATION: remove victim to fresh air. SKIN: if frostbite has occurred immerse in warm water. Treat burn. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Not pertinent (gas at normal temperatures) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available

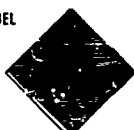
6 FIRE HAZARDS Flash Point: Not pertinent (flammable compressed liquefied gas) 6.1 Flammable Limits in Air: 2.6% - 21.7% 6.2 Fire Extinguishing Agents: 1 ctf fire burn shut off flow of gas, cool adjacent containers with water 6.3 Fire Extinguishing Agents Not to be Used: Not pertinent 6.4 Special Hazards of Combustion Products: Toxic hydrogen fluoride gas is generated in a fire 6.5 Behavior in Fire: Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. Containers may explode 6.6 Ignition Temperature: 225°C 6.7 Electrical Hazard: Data not available 6.8 Burning Rate: Not pertinent 7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: In the absence of inhibitor polymerization can occur 7.6 Inhibitor of Polymerization: Terpine B - 0.2%	8 WATER POLLUTION 8.1 Aquatic Toxicity: None 8.2 Waterfowl Toxicity: None 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None 9 SELECTED MANUFACTURERS 1. E. I. duPont de Nemours & Co., Inc. Organic Chemicals Department Freon Products Division Nemours Building Wilmington, Del. 19895 2. Matheson Gas Products Co. East Rutherford, N. J. 07073 3. Scientific Gas Products, Inc. 513 Rantan Center Edison, N. J. 08817 10 SHIPPING INFORMATION 10.1 Grades or Purity: 99.9+ 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Safety relief								
11 HAZARD ASSESSMENT CODE (See 1990 Assessment Handbook, CG 446.3) A B C D E F G Z 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable compressed gas 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td>1</td> </tr> <tr> <td>Flammability (Red)</td> <td>2</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>3</td> </tr> </tbody> </table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	2	Reactivity (Yellow)	3	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Gas 13.2 Molecular Weight: 46.1 13.3 Boiling Point at 1 atm.: -98.3° = -147.0° C = 201° K 13.4 Freezing Point: -158.1° = -101.5° C = 112° K 13.5 Critical Temperature: 130.5° F = 54.7° C = 327.9° K 13.6 Critical Pressure: 70.9 psia = 51.6 atm = 5.24 MN/m² 13.7 Specific Gravity: 0.707 at 0° C (liquid) = 1.005 N/m³ at 15° C 13.8 Liquid Surface Tension: > dynes/cm 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 1.0 13.11 Ratio of Specific Heats of Vapor (G_s): 1.2097 13.12 Latent Heat of Vaporization: 136 Btu/lb = 36.5 cal/g = 3.62 x 10⁵ J/kg 13.13 Heat of Combustion (est.): -6,900 Btu/lb = -3,600 cal/g = -1.51 x 10⁷ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Data not available
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	2								
Reactivity (Yellow)	3								

(Continued on pages 3 and 4)

NOTES

VCI

VINYLIDENE CHLORIDE, INHIBITED

Common Synonyms 1,1-Dichloroethylene unsym. Dichloroethylene	Waters: liquid Colorless Sweet odor Sinks in water. Flammable; irritating vapor is produced. Boiling point is 99°F.
Avoid contact with liquid. Keep away from heat and flame. Do not breathe vapor. Do not get liquid on skin or clothes. If on skin, wash with plenty of water. If on clothes, remove and wash separately.	
Fire	FLAMMABLE. POISONOUS GAS IS PRODUCED IN FIRE. Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause dizziness or difficulty breathing. LIQUID Will burn skin and eyes. Harmful if swallowed.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1 RESPONSE TO DISCHARGE See Response Methods Handbook (CG 446-3). Issue warning: high flammability. Evacuate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,1-Dichloroethylene; unsym. Dichloroethylene. 3.2 Coast Guard Compatibility Classification: Vinyl halides. 3.3 Chemical Formula: $C_2H_2Cl_2$. 3.4 IMCO United Nations Numerical Designation: 311004.	4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid. 4.2 Color: Colorless. 4.3 Odor: Sweet, like carbon tetrachloride or chloroform.
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Approved canister or air supply of mask; eye protection; head, rubber gloves and boots. 5.2 Symptoms Following Exposure: Vapor can cause dizziness and drowsiness, headache, nausea, anesthesia. Irritation to eyes and skin. 5.3 Treatment for Exposure: INHALATION: If any illness develops, remove person to fresh air promptly. Keep warm and quiet; do not medical attention if breathing stops, start artificial respiration. INGESTION: Not likely a problem; no known antidote; treat symptomatically. EYES OR SKIN: Flush with plenty of water for at least 15 min; get medical attention for eyes; remove contaminated clothing and wash before reuse. 5.4 Toxicity by Inhalation (Threshold Limit Value): 25 ppm (ceiling). 5.5 Short-Term Inhalation Limit: Data not available. 5.6 Toxicity by Ingestion: Grade 3; Oral LD ₅₀ of rat = 84 mg/kg (adrenalexonomized rat). 5.7 Lave Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes irritation of such that persons will find high concentration unpleasant. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Causes stinging; skin of first degree burns on short exposure; may cause secondary to contact exposure. 5.10 Odor Threshold: 10 ppm (as table).	

6 FIRE HAZARDS 6.1 Flash Point: 0°F O.C. 6.2 Flammable Limits in Air: 3.5% - 16.0%. 6.3 Fire Extinguishing Agents: Foam; carbon dioxide; dry chemical. 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective. 6.5 Special Hazards of Combustion Products: Toxic hydrochloride and phosgene are generated in fires. 6.6 Behavior in Fire: May explode in fire due to polymerization. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back. 6.7 Ignition Temperature: 988 - 1031°F. 6.8 Electrical Hazard: Not pertinent. 6.9 Burning Rate: 2" per min.	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available. 8.2 Waterflow Toxicity: Data not available. 8.3 Biological Oxygen Demand (BOD): Data not available. 8.4 Food Chain Concentration Potential: None.																																				
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction. 7.2 Reactivity with Common Materials: Copper and aluminum can cause polymerization. 7.3 Stability During Transport: Stable. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent. 7.5 Polymerization: Can occur if exposed to sunlight, air, copper, aluminum, heat. 7.6 Inhibitor of Polymerization: 200 ppm ethyl ether of hydroquinone (0.005% solution).	9 SELECTED MANUFACTURERS 1. Dow Chemical Co. Midland, Mich. 48640 2. PPG Industries, Inc. Industrial Chemicals Division Gateway Center Pittsburgh, Pa. 15222 3. Vulcan Materials Co. Chemicals Division Wichita, Kans. 67201																																				
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook (CG 446-3)). 0000Z	10. SHIPPING INFORMATION 10.1 Grades or Purity: 99% 10.2 Storage Temperature: Ambient. 10.3 Inert Atmosphere: Padded. 10.4 Venting: Pressure vacuum.																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid. 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="926 1425 1158 1683"> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Fire</td><td>3</td></tr> <tr> <td>Poison</td><td>3</td></tr> <tr> <td>Vapor Irritant</td><td>2</td></tr> <tr> <td>Liquid or Solid Irritant</td><td>2</td></tr> <tr> <td>Poisons</td><td>3</td></tr> <tr> <td>Aquatic Poison</td><td>0</td></tr> <tr> <td>Human Toxicity</td><td>0</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Aesthetic Effect</td><td>2</td></tr> <tr> <td>Reactivity</td><td>2</td></tr> <tr> <td>Other Chemicals</td><td>2</td></tr> <tr> <td>Water</td><td>0</td></tr> <tr> <td>Self Reaction</td><td>3</td></tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table data-bbox="926 1705 1158 1791"> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>4</td></tr> <tr> <td>Reactivity (Yellow)</td><td>2</td></tr> </tbody> </table>	Category	Rating	Fire	3	Poison	3	Vapor Irritant	2	Liquid or Solid Irritant	2	Poisons	3	Aquatic Poison	0	Human Toxicity	0	Aquatic Toxicity	2	Aesthetic Effect	2	Reactivity	2	Other Chemicals	2	Water	0	Self Reaction	3	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	4	Reactivity (Yellow)	2	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Liquid. 13.2 Molecular Weight: 96.93. 13.3 Boiling Point at 1 atm.: 99°F = 31.6°C = 304.8°K. 13.4 Freezing Point: -137.6°F = -122.0°C = 151.2°K. 13.5 Critical Temperature: Not pertinent. 13.6 Critical Pressure: Not pertinent. 13.7 Specific Gravity: 1.21 at 20°C (liquids). 13.8 Liquid Surface Tension: 24 dynes/cm at 62°F (20°C) at 1 atm. 13.9 Liquid-Water Interfacial Tension: 37 dynes/cm = 0.037 N/m at 22°C. 13.10 Vapor (Gas) Specific Gravity: 1.3. 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available. 13.12 Latent Heat of Vaporization: 130 Btu/lb = 72 cal/g = 3.0 X 10 ³ J/kg. 13.13 Heat of Combustion: 4560 Btu/lb = 2700 cal/g = 1.1 X 10 ⁴ J/kg. 13.14 Heat of Decomposition: Not pertinent. 13.15 Heat of Solution: Not pertinent. 13.16 Heat of Polymerization: 333 Btu/lb = 185 cal/g = 7.7 X 10 ³ J/kg.
Category	Rating																																				
Fire	3																																				
Poison	3																																				
Vapor Irritant	2																																				
Liquid or Solid Irritant	2																																				
Poisons	3																																				
Aquatic Poison	0																																				
Human Toxicity	0																																				
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NOTES Continued on next page.																																					

REVISED 1978

VME

VINYL METHYL ETHER, INHIBITED

Common Synonyms: Methyl vinyl ether Methoxyethylene	Liquidified compressed gas. Colorless. Sweet pleasant odor. Floats and may boil on water. Boiling point is 54°F.
Fire	FLAMMABLE Containers may explode in fire. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. (continued on page 2)
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled will cause headache, dizziness, or loss of consciousness. LIQUID Irritating to eyes. Will cause frostbite. Harmful if swallowed. (continued on page 2)
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Manual Handbook, CG 445-4. Issue warning: high flammability, air contaminant. Restrict access. Evacuate area.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Methoxyethylene, Methyl vinyl ether. 3.2 Coast Guard Compatibility Classification: Not applicable. 3.3 Chemical Formula: $CH_2=CH-O-CH_3$. 3.4 IMCO/United Nations Numerical Designation: 2108.	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquidified compressed gas. 4.2 Color: Colorless. 4.3 Odor: Sweet, pleasant.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Organic vapor mask, plastic or rubber gloves, safety glasses. 5.2 Symptoms Following Exposure: Inhalation cause irritation, blurring of vision, headache, dizziness, irritation, loss of consciousness. Liquid or concentrated vapor irritates eyes and cause frostbite of skin. Aspiration of the liquid will cause chemical pneumonitis. 5.3 Treatment for Exposure, INHALATION: remove victim to fresh air. Breathing is difficult, administer oxygen, call physician. EYES: wash with copious quantities of water, consult an eye specialist. SKIN: wash with copious quantities of water, treat frostbite by use of warm water or blanching. INGESTION: do NOT induce vomit, get medical attention. 5.4 Toxicity by Inhalation (Threshold Limit value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ is 5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.	

6. FIRE HAZARDS

- 6.1 Flash Point: -69°F (-55°C).
 6.2 Flammable Limits in Air: 2.6% - 19%.
 6.3 Fire Extinguishing Agents: Let fire burn, shut off gas flow, extinguish small fires with dry chemical or carbon dioxide.
 6.4 Fire Extinguishing Agents Not to be Used: Water may be ineffective.
 6.5 Special Hazards of Combustion Products: Not pertinent.
 6.6 Behavior in Fire: Containers may explode. Vapor is heavier than air and may travel a considerable distance to a source of ignition and flash back.
 6.7 Ignition Temperature: Data not available.
 6.8 Electrical Hazard: Data not available.
 6.9 Burning Rate: Not pertinent.

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: Reacts slowly to form acetaldehyde; reaction is not hazardous unless water is hot or acids are present.
 7.2 Reactivity with Common Materials: Acids will cause polymerization.
 7.3 Stability During Transport: Stable if kept free from acids.
 7.4 Neutralizing Agents for Acids and Cautistics: Not pertinent.
 7.5 Polymerization: Can polymerize in the presence of acids.
 7.6 Inhibitor of Polymerization: Diethylamine, triethanolamine, solid potassium hydroxide.

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available.
 8.2 Waterfowl Toxicity: Data not available.
 8.3 Biological Oxygen Demand (BOD): Data not available.
 8.4 Food Chain Concentration Potential: None.

9. SELECTED MANUFACTURERS

1. GAI Corporation
 140 West 54th Street
 New York, N.Y. 10020.
 2. Union Carbide Corporation
 Chemicals and Plastics Division
 270 Park Avenue
 New York, N.Y. 10017.
 3. Matheson Gas Products Co.
 East Rutherford, N.J. 07073.

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: 99.7%+.
 10.2 Storage Temperature: Ambient.
 10.3 Inert Atmosphere: No requirement.
 10.4 Venting: Safety relief.

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 445-3)
 ABCDEFG

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Flammable compressed gas.
 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed.
 12.3 NFPA Hazard Classifications:
- | Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | |
| Flammability (Red) | 4 |
| Reactivity (Yellow) | 2 |

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Gas.
 13.2 Molecular Weight: 58.1.
 13.3 Boiling Point at 1 atm: 41.8°F = 5.5°C = 278.7°K.
 13.4 Freezing Point: -188.1° = -122°C = 151°K.
 13.5 Critical Temperature: Not pertinent.
 13.6 Critical Pressure: Not pertinent.
 13.7 Specific Gravity: 0.777 at 0°C (liquid).
 13.8 Liquid Surface Tension, (cent): 10 dynes/cm = 0.010 N/m at 0°C.
 13.9 Liquid-Water Interfacial Tension, (cent): 25 dynes/cm = 0.025 N/m at 0°C.
 13.10 Vapor (Gas) Specific Gravity: 2.0.
 13.11 Ratio of Specific Heats of Vapor (Gas): (cp/cv) 1.1473.
 13.12 Latent Heat of Vaporization: (cent) 110 Btu/lb = 100 cal/g = 4.2 x 10³ J/kg.
 13.13 Heat of Combustion: (cent) -14,200 Btu/lb = -7,900 cal/g = -33 x 10³ J/kg.
 13.14 Heat of Decomposition: Not pertinent.
 13.15 Heat of Solution: Not pertinent.
 13.16 Heat of Polymerization: Data not available.

(Continued on pages 2 and 3)

NOTES

VNT

VINYL TOLUENE

Common Synonyms p-Methylstyrene	Waters: liquid Colorless Unpleasant odor Floats on water
1. Physical Description 2. Physical Properties 3. Chemical Properties	
Fire	Combustible Containers may explode in fire Waxes, greases, oils, etc. Extinguish with water spray or foam Do not use alcohol, acetone, or other flammable solvents
Exposure	CAUTION: MEDICAL USE ONLY LIQUID Irritating to skin and eyes Harmful if swallowed Respiratory irritant Inhalation: Irritation of the respiratory tract Ingestion: Irritation of the gastrointestinal tract Skin Contact: Irritation of the skin Eye Contact: Irritation of the eyes
Water Pollution	Effect of low concentrations on aquatic life is unknown Floating to shoreline May be dangerous if it enters water intakes Not biodegradable Not readily metabolized
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 44-1 Mechanical containment Should be removed Chemical and physical treatment	2 LABELS No hazard label required by Code of Federal Regulations
3 CHEMICAL DESIGNATIONS 31 Synonyms: Methylstyrene 32 Coast Guard Compatibility Classification Olefin 33 Chemical Formula: $\text{CH}_2=\text{CH}(\text{CH}_3)$ 34 IMCO United Nations Numerical Designation: Not listed	4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Liquid 42 Color: Colorless 43 Odor: Disagreeable
5 HEALTH HAZARDS 51 Personal Protective Equipment: A respirator and suitable gloves should be worn when handling this material. 52 Symptoms Following Exposure: Vapors irritate the eyes, nose, and throat. High concentrations of vapors cause dizziness and headache. Liquid may cause skin irritation. 53 Treatment for Exposure: INHALATION: Remove person to fresh air. Give artificial respiration if breathing is stopped. If swallowed, DO NOT induce vomiting. If known or suspected ingestion, give 1-2 glasses of water. If skin contact, wash with soap and water. 54 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 55 Short-Term Inhalation Limits: 400 ppm (15 min) 56 Toxicity by Ingestion: Grade 2 LD₅₀ 1.5 g/kg (rat) 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Vapors cause moderate irritation of the eyes and throat. High concentrations are unpleasant. The liquid is corrosive. 59 Liquid or Solid Irritant Characteristics: Minimum hazard. Irritation of the skin and eyes. 60 Odor Threshold: 50 ppm	

6 FIRE HAZARDS 61 Flash Point: 117 F (42 C) (25 F C) 62 Flammable Limits in Air: 6.8 - 11 63 Fire Extinguishing Agents: Water, foam, carbon dioxide, or dry chemical 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Containers may explode or rupture in a fire due to polymerization 67 Ignition Temperature: 742 F 68 Electrical Hazard: Not pertinent 69 Burning Rate: 1.0 in/min	8 WATER POLLUTION 81 Aquatic Toxicity: Data not available 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Data not available 84 Food Chain Concentration Potential: None																																				
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: No reaction 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Slow at room temperature but will polymerize rapidly when heated. Also polymerized by metal salts such as those of iron or aluminum 76 Inhibitor of Polymerization: 100 ppm tertiary butylcatechol	9 SELECTED MANUFACTURERS 1. Borden Inc. Borden Chemical Division 80 W. Broad St. Cleveland, OH 44114 2. Dow Chemical Co. Midland Mainland Division 1901 Graham Rd. 290 N. Main St. P.O. Box 1000 Georgetown, MA 01030																																				
11 HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 44-1 N 2 2	10 SHIPPING INFORMATION 101 Grades or Purity: 99.2% 102 Storage Temperature: Ambient 103 Inert Atmosphere: Not required 104 Venting: Open to atmosphere																																				
12 HAZARD CLASSIFICATIONS 121 Code of Federal Regulations Combustible Liquid 122 HAS Hazard Rating for Bulk Water Transportation <table> <thead> <tr> <th>Category</th><th>Rating</th></tr> </thead> <tbody> <tr> <td>Flammable</td><td>2</td></tr> <tr> <td>Health</td><td>2</td></tr> <tr> <td>Acute Toxicity</td><td>3</td></tr> <tr> <td>Equine Acute Toxicity</td><td>3</td></tr> <tr> <td>Reproductive Toxicity</td><td>2</td></tr> <tr> <td>Water Pollution</td><td>3</td></tr> <tr> <td>Human Toxicity</td><td>3</td></tr> <tr> <td>Aquatic Toxicity</td><td>2</td></tr> <tr> <td>Acute Toxicity</td><td>2</td></tr> <tr> <td>Reproductive</td><td>3</td></tr> <tr> <td>Other Chemical</td><td>3</td></tr> <tr> <td>Water</td><td>3</td></tr> <tr> <td>Self-heating</td><td>3</td></tr> </tbody> </table> 123 NFPA Hazard Classifications. <table> <thead> <tr> <th>Category</th><th>Classification</th></tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td><td>2</td></tr> <tr> <td>Flammability (Red)</td><td>3</td></tr> <tr> <td>Reactivity (Yellow)</td><td>3</td></tr> </tbody> </table>	Category	Rating	Flammable	2	Health	2	Acute Toxicity	3	Equine Acute Toxicity	3	Reproductive Toxicity	2	Water Pollution	3	Human Toxicity	3	Aquatic Toxicity	2	Acute Toxicity	2	Reproductive	3	Other Chemical	3	Water	3	Self-heating	3	Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	3	Reactivity (Yellow)	3	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: 1 liquid 132 Molecular Weight: 92.12 133 Boiling Point at 1 atm: 117 F (42 C) (25 F C) 134 Freezing Point: -100 F (-73 C) (25 F C) 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: 0.872 (20 C liquid) 138 Liquid Surface Tension: 28.5 dyne/cm (20 C liquid) 139 Liquid-Water Interfacial Tension: 35 dyne/cm (20 C liquid) 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: 50.5 Btu/lb (11.8 kcal/mol) 1313 Heat of Combustion: 11,000 Btu/lb (26.0 kcal/mol) 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: -24.5 Btu/lb (5.8 kcal/mol)
Category	Rating																																				
Flammable	2																																				
Health	2																																				
Acute Toxicity	3																																				
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NOTES																																					

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VTS

VINYLTRICHLOROSILANE

Common Synonyms Trichlorovinylsilane Trichlorovinylsilane Trichlorovinylsilane	Liquid Colorless to light yellow Sharp choking odor Reacts violently with water. Irritating gas is produced on contact with water.
Fire	FLAMMABLE POISONOUS GASES MAY BE PRODUCED IN FIRE Containers may explode in fire Flashback along vapor trail may occur Vapor may explode if ignited in an enclosed area Toxic, chloro and phosphoric gases may be formed in fire
Exposure	VAPOR Irritating to eyes, nose and throat Harmful if inhaled LIQUID Will burn skin and eyes Harmful if swallowed May cause severe skin irritation May cause severe eye irritation May cause severe respiratory irritation May cause severe gastrointestinal irritation May cause severe neurological irritation May cause severe reproductive irritation May cause severe developmental irritation May cause severe immunological irritation May cause severe carcinogenic irritation May cause severe mutagenic irritation May cause severe teratogenic irritation May cause severe fetotoxic irritation May cause severe lactotoxic irritation May cause severe reproductive irritation May cause severe developmental irritation May cause severe immunological irritation May cause severe carcinogenic irritation May cause severe mutagenic irritation May cause severe teratogenic irritation May cause severe fetotoxic irritation May cause severe lactotoxic irritation
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 445-1) Issue warning: High flammability containing air contaminant Restrict access Dispense as flush with care	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Trichlorovinylsilane Trichlorovinylsilane Trichlorovinylsilane 3.2 Coast Guard Competibility Classification: Not applicable 3.3 Chemical Formula: CH ₂ =CHSiCl ₃ 3.4 IMCO/United Nations Numerical Designation: 2.1 (Flam)	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless to pale yellow 4.3 Odor: Sharp, choking, like hydrochloric acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Avoid vapor type respiratory protection; rubber gloves; chemical worker's goggles; other protective equipment as necessary to protect skin and eyes. 5.2 Symptoms Following Exposure: Inhalation causes irritation of mucous membranes. Vapor irritates eyes. Contact with liquid causes severe burns of eyes and skin. Ingestion causes burns of mouth and stomach. 5.3 Treatment for Exposure: Get medical attention following all exposures to this compound. INHALATION: Remove victim from exposure; give artificial respiration if required. EYES: Flush with water for 15 min. SKIN: Flush with water. INGESTION: Do NOT induce vomiting; give large amount of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion, Grade 2 oral LD₅₀: 2.0 g/kg (approx) 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Vapors cause severe irritation of eyes and throat and can cause eye and lung injury. They cannot be tolerated even at low concentrations. 5.9 Liquid or Solid Irritant Characteristics: Severe skin irritant. Causes second- and third-degree burns on short contact and causes irritation of the eyes. 5.10 Odor Threshold: Data not available	

6. FIRE HAZARDS 6.1 Flash Point: 60 F (15.6 C) 6.2 Flammable Limits in Air: 3.1 (LFL) 6.3 Fire Extinguishing Agents: Dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Water, foam 6.5 Special Hazards of Combustion Products: Toxic, chloro and phosphoric gases may be formed in fire 6.6 Behavior in Fire: Difficult to extinguish; reignition may occur. Contact with water applied to adjacent fires produces irritating hydrogen chloride gas. 6.7 Ignition Temperature: 541 F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: 2.4 mm/min	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts vigorously, evolving hydrogen chloride (hydrochloric acid) 7.2 Reactivity with Common Materials: Reacts with surface moisture to evolve hydrogen chloride, which will corrode certain metals and form flammable hydrogen gas. 7.3 Stability During Transport: Stable if protected from moisture 7.4 Neutralizing Agents for Acids and Caustics: Flush with water; rinse with sodium bicarbonate or lime solution 7.5 Polymerization: May occur in absence of inhibitor 7.6 Inhibitor of Polymerization: Diphenylamine, Hydroquinone	9. SELECTED MANUFACTURERS 1. Union Carbide Corp. Chemicals and Plastics Division 270 Park Avenue New York, N.Y. 10017 2. Dow Corning Corporation P.O. Box 902 Midland, Mich. 48640 3. Dynamit Nobel of America, Inc. 105 Shorehurst Court Northvale, N.J. 07647																												
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 445-3) X.O	10. SHIPPING INFORMATION 10.1 Grades or Purity: 98+%, max 5% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Pressure/vacuum 13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 161.5 13.3 Boiling Point at 1 atm: 45.1 F = 9.5°C = 283.5 K 13.4 Freezing Point: -119 F = -89°C = 173 K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.26 at 20°C (liquids) 13.8 Liquid Surface Tension: res. 1.28 dynes/cm = 0.024 N/m at 20°C 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: 4.64 13.11 Ratio of Specific Heats of Vapor (Gas): Data not available 13.12 Latent Heat of Vaporization: 85 Btu/lb = 49 cal/g = 2.0 x 10 ⁵ J/kg 13.13 Heat of Combustion: (est.) 4,477 Btu/lb = 2,400 cal/g = 100 x 10 ³ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not pertinent																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table data-bbox="913 1441 1135 1725"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Vapor Irritant</td> <td>4</td> </tr> <tr> <td>Liquid or Solid Irritant</td> <td>4</td> </tr> <tr> <td>Poisons</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td>1</td> </tr> <tr> <td>Human Toxicity</td> <td>1</td> </tr> <tr> <td>Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td>Vegetative Effect</td> <td>1</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> <tr> <td>Other Chemicals</td> <td>1</td> </tr> <tr> <td>Water</td> <td>4</td> </tr> <tr> <td>Self Reaction</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: Not listed	Category	Rating	Fire	1	Health	1	Vapor Irritant	4	Liquid or Solid Irritant	4	Poisons	1	Water Pollution	1	Human Toxicity	1	Aquatic Toxicity	1	Vegetative Effect	1	Reactivity	1	Other Chemicals	1	Water	4	Self Reaction	1	NOTES
Category	Rating																												
Fire	1																												
Health	1																												
Vapor Irritant	4																												
Liquid or Solid Irritant	4																												
Poisons	1																												
Water Pollution	1																												
Human Toxicity	1																												
Aquatic Toxicity	1																												
Vegetative Effect	1																												
Reactivity	1																												
Other Chemicals	1																												
Water	4																												
Self Reaction	1																												

(Continued on page 2 and 3)

WCA

WAXES: CARNAUBA

Common Synonyms Thick liquid (beated) Yellow to dark brownish green Odorless Floats on water and solidifies	
Physical State (as shipped) Liquid	
Fire Combustible	
Exposure LIQUID Will burn skin and eyes. Respiratory irritation may occur if inhaled. May be dangerous if it enters water intakes.	
Water Pollution Effect of low concentrations on aquatic life is unknown. Floating to shoreline. May be dangerous if it enters water intakes. Not a health hazard if swallowed. Not a major environmental concern.	
1. RESPONSE TO DISCHARGE See Response to Emergency Handbook, CG 444-4 Mechanical containment Should be removed Chemical and physical treatment	2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Toxic 3.3 Chemical Formula: Not pertinent 3.4 IMCO United Nations Numerical Designation: Not used	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Yellow to dark brownish green 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield, protective gloves and clothing for hot liquid wax. 5.2 Symptoms Following Exposure: Hot wax can burn skin and eyes. 5.3 Treatment for Exposure: SKIN OR EYE CONTACT: remove solidified wax from skin with soap and water; if in eyes, get victim to nearest safe water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Not pertinent 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Not volatile 5.9 Liquid or Solid Irritant Characteristics: Hot wax can burn skin and eyes. 5.10 Odor Threshold: Not pertinent	

6. FIRE HAZARDS 6.1 Flash Point: 240 F (115 C) (NIST EOC) 6.2 Flammable Limits in Air: Not pertinent 6.3 Fire Extinguishing Agents: Water, foam, dry chemicals, or carbon dioxide. 6.4 Fire Extinguishing Agents Not to be Used: Water or foam may cause frothing. 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. Para Commodities Corp. 111 Calvert St. Harrison, N.Y. 10528 2. W. R. Grace & Co. Cornelia Wax Refining Corp. Division 50 National Rd. Edison, N.J. 08817 3. Frank L. Ross Co. 610 Ash St. Jersey City, N.J. 07304
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-4 A 11	10. SHIPPING INFORMATION 10.1 Grades or Purity: Shipped in a variety of grades, depending on source of wax and intended use. All have about the same hazardous properties. 10.2 Storage Temperature: Elevated 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: Not pertinent 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: 176-187°F = 80-87°C or 353-359°K 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 0.998 at 25°C (solid) 13.8 Liquid Surface Tension: 32 dynes/cm = 0.032 N/m at 100°C 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Data not available 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

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XLM

m-XYLENE

Common Synonyms 1,3-Dimethylbenzene Xylene	Waters: liquid Colorless Sweet odor Floats on water. Flammable, irritating vapor is produced.
	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose, and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness.
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 444-4. 1. Use water, high foam, or other suitable extinguishing agent. 2. Do not use water directly on liquid.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: m-Dimethylbenzene Xylene 3.2 Coast Guard Compatibility Classification: Aromatic Hydrocarbon 3.3 Chemical Formula: C ₈ H ₁₀ 3.4 MCO United Nations Numerical Designation: 1202	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Pungent, characteristic
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Air respirator, eye protection, gloves, and full-body protective suit. 5.2 Symptoms Following Exposure: Vapor causes headache and dizziness. Liquid irritates eyes and skin. Ingestion causes severe burning. Liquid can trap and develop pulmonary edema. Ingestion causes nausea, vomiting, headache, and loss of consciousness. Kidneys and liver damage can occur. 5.3 Treatment for Exposure: INHALATION: Remove to fresh air. If breathing is difficult, give oxygen. If unconscious, give artificial respiration. EYES: Flush with water for 15 minutes. SKIN: Wash with soap and water. If absorbed, give medical attention. 5.4 Toxicity by Inhalation (Threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: 100 ppm (15 min) 5.6 Toxicity by Ingestion: Grade 3 (LD ₅₀ 1.5 g/kg) 5.7 Late Toxicity: Kidney and liver damage 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes irritation to eyes, nose, and throat. Liquid causes irritation to skin. 5.9 Liquid or Solid Irritant Characteristics: May irritate eyes, nose, and throat. Liquid causes irritation to skin. 5.10 Odor Threshold: 0.01 ppm	

6. FIRE HAZARDS 6.1 Flash Point: 42°C (108°F) 6.2 Flammable Limits in Air: 1.1% to 7.4% 6.3 Fire Extinguishing Agents: Water, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: None 6.5 Special Hazards of Combustion Products: None 6.6 Behavior in Fire: Vapor may flash back along trail. Liquid may pool and burn. 6.7 Ignition Temperature: 460°C (850°F) 6.8 Electrical Hazard: Class II, III, IV 6.9 Burning Rate: None	8. WATER POLLUTION 8.1 Aquatic Toxicity: 20 mg/L (200 ppm) in water 8.2 Waterlow Toxicity: 100 mg/L in water 8.3 Biological Oxygen Demand (BOD): 100 mg/L in water 8.4 Food Chain Concentration Potential: 100 mg/L in water																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: None 7.2 Reactivity with Common Materials: None 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: None 7.5 Polymerization: None 7.6 Inhibitor of Polymerization: None	9. SELECTED MANUFACTURERS APC Chemical Co. DuPont Chemicals Eastman Chemical Co. Ethyl Corporation Hercules Inc. International Chemicals Corp. M. W. Kellogg Co. Phillips Petroleum Co. Union Carbide Corp.																												
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook, CG 444-4. A 11	10. SHIPPING INFORMATION 10.1 Grades or Purity: Research grade 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Not required																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: 1910.106 12.2 NAS Hazard Rating for Bulk Water Transportation <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Flammable</td> <td>1</td> </tr> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> <tr> <td>Stability</td> <td>1</td> </tr> <tr> <td>Volatility</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td>1</td> </tr> <tr> <td>Waste</td> <td>1</td> </tr> <tr> <td>Other</td> <td>1</td> </tr> <tr> <td>Overall</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health</td> <td>1</td> </tr> <tr> <td>Flammability</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> </tbody> </table>	Category	Rating	Flammable	1	Health	1	Reactivity	1	Stability	1	Volatility	1	Water Pollution	1	Waste	1	Other	1	Overall	1	Category	Classification	Health	1	Flammability	2	Reactivity	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 106.16 13.3 Boiling Point at 1 atm: 109.2°C (228.6°F) 13.4 Freezing Point: -47.9°C (-52.2°F) 13.5 Critical Temperature: 253.1°C (487.6°F) 13.6 Critical Pressure: 4.14 atm (32.9 psi) (3.44 MN/m ²) 13.7 Specific Gravity: 0.854 at 20°C (liquid) 13.8 Liquid Surface Tension: 24.5 dynes/cm (0.255 N/m) at 20°C 13.9 Liquid-Water Interfacial Tension: 16.4 dynes/cm (0.034 N/m) at 30°C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: 43.1 kJ/mol (10.3 kcal/mol) 13.13 Heat of Combustion: -44.4 kJ/mol (-10.6 kcal/mol) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Category	Rating																												
Flammable	1																												
Health	1																												
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Flammability	2																												
Reactivity	1																												
NOTES																													

XLO

o-XYLENE

Chemical Synonyms 1,2-Dimethylbenzene Xylene	Water: liquid Colorless Sweet odor Fluats on water. Flammable; irritating vapor is produced.
Fire	FLAMMABLE Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area.
Exposure	VAPOR Irritating to eyes, nose and throat. If inhaled, will cause headache, difficult breathing, or loss of consciousness. LIQUID Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, or loss of consciousness.
Water Pollution	Dangerous to aquatic life in high concentrations. Fouling to shoreline. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE (See Resource Inventory Management, CG 446-4) Toxic warning: high flammability. Evacuate area. Should be removed. Chemical and physical treatment.	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: 1,2-Dimethylbenzene 3.2 Coast Guard Compatibility Classification: Ammoniacal hydrocarbon 3.3 Chemical Formula: C_8H_{10} 3.4 HMCO/United Nations Numerical Designation: 1.2+107	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: colorless 4.3 Odor: Benzene-like characteristic, aromatic.
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: approved canister or air supplied mask, goggles or face shield, plastic gloves and boots. 5.2 Symptoms Following Exposure: Vapors cause headache and dizziness. Liquid irritates eyes and skin. If taken into lungs, causes severe coughing, distress, and rapidly developing pulmonary edema. If inhaled, causes nausea, vomiting, cramps, headache and coma. Can be fatal. Kidney and liver damage can occur. 5.3 Treatment for Exposure: INHALATION: remove to fresh air, administer artificial respiration and oxygen if required, call a doctor. INGESTION: DO NOT induce vomiting, call a doctor. EYES: flush with water, or irrigate for 15 min. SKIN: wipe off, flush with soap and water. 5.4 Toxicity by Inhalation (TLV, threshold Limit Value): 100 ppm 5.5 Short-Term Inhalation Limits: 300 ppm for 30 min 5.6 Toxicity by Ingestion: Grade 3 LD ₅₀ 50 to 400 mg/kg 5.7 Late Toxicity: kidney and liver damage. 5.8 Vapor (Gas) Irritant Characteristics: Vapor causes slight smarting in the eyes and respiratory system if present in high concentrations. The effect is temporary. 5.9 Liquid or Solid Irritant Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause staining and reddening of the skin. 5.10 Odor Threshold: 0	

6. FIRE HAZARDS 6.1 Flash Point: 111°F (44°C) 6.2 Flammable Limits in Air: 1.1% to 7.1% 6.3 Fire Extinguishing Agents: Foam, CO ₂ , dry chemical 6.4 Fire Extinguishing Agents Not to be Used: Water (may cause steam explosion) 6.5 Special Hazards of Combustion Products: None known 6.6 Behavior in Fire: Vapors may ignite, causing fire or explosion. 6.7 Ignition Temperature: 500°F (260°C) 6.8 Electrical Hazard: Class I (Group 1) 6.9 Burning Rate: None	8. WATER POLLUTION 8.1 Aquatic Toxicity: None known 8.2 Waterfowl Toxicity: None known 8.3 Biological Oxygen Demand (BOD): None known 8.4 Food Chain Concentration Potential: None known																												
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: None known 7.2 Reactivity with Common Materials: None known 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: None known 7.5 Polymerization: None known 7.6 Inhibitor of Polymerization: None known	9. SELECTED MANUFACTURERS Aldrich Chemical Co. ARCO Chemical Co., Division of American Petroleum Institute Phillips Petroleum Co. Union Carbide Corp. Petroleum Development Co. Ltd. New York Air Liquide Corp. Noble Chemical Co. Petroleum Development Co. Ltd. Hess Inc., Toledo, Ohio																												
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, CG 446-3 3, 1, 1	10. SHIPPING INFORMATION 10.1 Grades or Purities: Research and Pure and Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Vessels: Approved for transport in pressure vessels																												
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable Liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1"> <thead> <tr> <th>Category</th> <th>Rating</th> </tr> </thead> <tbody> <tr> <td>Flammable</td> <td>1</td> </tr> <tr> <td>Reactive</td> <td>1</td> </tr> <tr> <td>Corrosive</td> <td>1</td> </tr> <tr> <td>Other</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td>1</td> </tr> <tr> <td>Hazardous to the Environment</td> <td>1</td> </tr> <tr> <td>Other</td> <td>1</td> </tr> <tr> <td>Water</td> <td>1</td> </tr> <tr> <td>Not Reactive</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard</td> <td>1</td> </tr> <tr> <td>Flammability</td> <td>1</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> </tbody> </table>	Category	Rating	Flammable	1	Reactive	1	Corrosive	1	Other	1	Water Pollution	1	Hazardous to the Environment	1	Other	1	Water	1	Not Reactive	1	Category	Classification	Health Hazard	1	Flammability	1	Reactivity	1	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Liquid 13.2 Molecular Weight: 106.16 13.3 Boiling Point at 1 atm: 110.6°C (231.1°F) 13.4 Freezing Point: -95.3°C (-140.5°F) 13.5 Critical Temperature: 254.1°C (487.4°F) 13.6 Critical Pressure: 44.1 atm (6482 psia) = 4.752 MN/m ² 13.7 Specific Gravity: 0.88 at 20°C (68°F) 13.8 Liquid Surface Tension: 28.5 dyne/cm at 20°C (68°F) 13.9 Liquid-Water Interfacial Tension: 28.5 dyne/cm at 20°C (68°F) 13.10 Vapor (Gas) Specific Gravity: 3.66 (air = 1) 13.11 Ratio of Specific Heats of Vapor (Gas): 1.06 13.12 Latent Heat of Vaporization: 44.1 kJ/mol = 10.5 kcal/mol 13.13 Heat of Combustion: -47.99 kJ/mol = -11.4 kcal/mol 13.14 Heat of Decomposition: None present 13.15 Heat of Solution: None present 13.16 Heat of Polymerization: None present
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Flammable	1																												
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NOTES																													

REVISED 1978

6 FIRE HAZARDS 6.1 Flash Point: > 100 °C 6.2 Flammable Limits in Air: Not available 6.3 Fire Extinguishing Agents: Water, dry chemical, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: None known 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Vapor ignites. Burns and may cause irritation of skin if in contact with skin and health hazard. 6.7 Ignition Temperature: > 300 °C 6.8 Electrical Hazard: Class I (Group D) 6.9 Burning Rate: Not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: None known 8.2 Waterford Toxicity: None available 8.3 Biological Oxygen Demand (BOD): 0.0 to 0.5 days 8.4 Food Chain Concentration Potential: None available																																				
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: Not reactive 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS Amoco Chemical Corp. 30 East Randolph Drive Chicago, IL 60601 ARCO Chemical 200 South Broadway Philadelphia, PA 19103 Chemical Services Co. Industrial Chemical Division 100 Bayview San Francisco, CA 94134																																				
10 SHIPPING INFORMATION 10.1 Grades or Purity: Research 99.99% Pure 99.9% Technical 99.9% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open flame or other prohibited																																					
11. HAZARD ASSESSMENT CODE See Hazard Assessment Manual, 12th ed., p. 21 A 1 1	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm.: Liquid 13.2 Molecular Weight: 106.15 13.3 Boiling Point at 1 atm.: 203.2 °F = 151.1 °C = 411.1 °K 13.4 Freezing Point: 5.9 °F = -15.0 °C = 266.1 °K 13.5 Critical Temperature: 629.2 °F = 331.9 °C = 610.2 °K 13.6 Critical Pressure: 509.4 atm = 44.65 psia = 3.510 MPa 13.7 Specific Gravity: 1.361 at 20 °C (liquids) 13.8 Liquid Surface Tension: 24.1 dynes/cm = 0.0241 N/m at 20 °C 13.9 Liquid-Water Interfacial Tension: 17.1 dynes/cm = 0.0171 N/m at 20 °C 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): 1.071 13.12 Latent Heat of Vaporization: 150 Btu/lb = 41.8 kJ/g = 4.18 x 10⁴ J/kg 13.13 Heat of Combustion: -17,100 Btu/lb = -17,100 kJ/kg = -40.4 x 10⁴ J/kg 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent																																				
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Flammable liquid 12.2 NAS Hazard Rating for Bulk Water Transportation: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Rating</th> </tr> </thead> <tbody> <tr> <td>Fire</td> <td>1</td> </tr> <tr> <td>Health</td> <td></td> </tr> <tr> <td> Vapor Irritant</td> <td>1</td> </tr> <tr> <td> Liquid or Solid Irritant</td> <td></td> </tr> <tr> <td> Poisonous</td> <td>1</td> </tr> <tr> <td>Water Pollution</td> <td></td> </tr> <tr> <td> Human Toxicity</td> <td>1</td> </tr> <tr> <td> Aquatic Toxicity</td> <td>1</td> </tr> <tr> <td> Acute Toxicity</td> <td>2</td> </tr> <tr> <td>Reactive</td> <td></td> </tr> <tr> <td> Other Chemicals</td> <td>1</td> </tr> <tr> <td> Water</td> <td>0</td> </tr> <tr> <td> Self-Reaction</td> <td>1</td> </tr> </tbody> </table> 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Category</th> <th style="text-align: left;">Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard (Blue)</td> <td></td> </tr> <tr> <td>Flammability (Red)</td> <td>1</td> </tr> <tr> <td>Reactivity (Yellow)</td> <td>1</td> </tr> </tbody> </table>	Category	Rating	Fire	1	Health		Vapor Irritant	1	Liquid or Solid Irritant		Poisonous	1	Water Pollution		Human Toxicity	1	Aquatic Toxicity	1	Acute Toxicity	2	Reactive		Other Chemicals	1	Water	0	Self-Reaction	1	Category	Classification	Health Hazard (Blue)		Flammability (Red)	1	Reactivity (Yellow)	1	NOTES
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Reactivity (Yellow)	1																																				

XYLENOL

[illegible]

6 FIRE HAZARDS 6.1 Flash Point: Data not available 6.2 Flammable Limits in Air: 1.1 - 11.1 6.3 Fire Extinguishing Agents: Water, dry chemical, foam, carbon dioxide 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Toxic vapors of unknown hazard upon burning 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: 1110°F 6.8 Electrical Hazard: Data not available 6.9 Burning Rate: Data not available	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available * Type: 48 hr. lethal fresh water * Time period not specified 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data not available								
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Calsolene Oil Company Petroleum Chemicals Parrish Plaza East Nashville, Tenn. 37203 2. Koppers Company, Incorporated Organic Materials Division 14 Koppers Building Pittsburgh, Pa. 15224 3. Crowley Talc Production Co. 267 Madison Avenue New York, N.Y. 10017								
10 SHIPPING INFORMATION 10.1 Grades or Purities: 99.5% minimum * Other commercial grades include 24, 24.5, 25, 25.5, and 26% purities of these. Properties are similar to those of the 24.5% compound. 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Open flame arrestor									
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manual, 11-104 A11111	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid - white 13.2 Molecular Weight: 128.17 13.3 Boiling Point at 1 atm: 244.5 - 245.5°C 13.4 Freezing Point: 24.5 - 25.5°C 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.07 at 15°C 13.8 Liquid Surface Tension: 35.5 dyne/cm at 20°C 13.9 Liquid-Water Interfacial Tension: 1.5 dyne/cm at 20°C 13.10 Vapor (Gas) Specific Gravity: 4.76 13.11 Ratio of Specific Heats of Vapor (Gas): 1.12 13.12 Latent Heat of Vaporization: 4.76 kcal/mole at 24.5°C 13.13 Heat of Combustion: 11.1 kcal/mole 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent								
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not used 12.2 NAS Hazard Rating for Bulk Water Transportation: Not used 12.3 NFPA Hazard Classifications: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Category</th> <th>Classification</th> </tr> </thead> <tbody> <tr> <td>Health Hazard</td> <td>2</td> </tr> <tr> <td>Flammability</td> <td>2</td> </tr> <tr> <td>Reactivity</td> <td>1</td> </tr> </tbody> </table>		Category	Classification	Health Hazard	2	Flammability	2	Reactivity	1
Category	Classification								
Health Hazard	2								
Flammability	2								
Reactivity	1								
5 HEALTH HAZARDS (Cont'd) Acute and subacute toxicity studies with the powder followed by dermal irritation in rats were conducted with powder of product. Irritation did not follow immediately, gave mild irritation, such as, "highly irritating to glass of water" or "irritation to skin of throat". Repeat procedure and irritation of eye of rat under same conditions should be left to develop after routine heavy pulsed ultrasonic waves. 5.1 Toxicity by Inhalation (Threshold Limit Value): 4 mg/m³ 5.2 Short Term Inhalation Limits: 11.1 mg/m³ for 15 min 5.3 Toxicity by Ingestion: Data not available 5.4 Skin Toxicity: Data not available 5.5 Vapor (Gas) Irritant Characteristics: Data not available 5.6 Liquid or Solid Irritant Characteristics: Data not available 5.7 Odor Threshold: Data not available									

ZNA

ZINC ACETATE

Common Synonyms Zinc acetate dihydrate Dicarbomethoxy zinc Zinc diacetate Acetic acid zinc salt		Solid White Faint vinegar odor Sinks and mixes with water
Notes: 1. Not flammable with solid form but flammable as a gas. 2. Not a severe irritant but may cause irritation if inhaled. 3. Not a severe irritant but may cause irritation if swallowed.		
Fire	Not flammable	
Exposure	ALL FOR MEDICAL USE: DUST: Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If swallowed will cause nausea and vomiting. SOLID: Irritating to skin and eyes. If swallowed will cause nausea and vomiting. REMARKS: 1. Not a severe irritant but may cause irritation if inhaled. 2. Not a severe irritant but may cause irritation if swallowed. 3. Not a severe irritant but may cause irritation if inhaled.	
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS. May be dangerous if it enters water intakes. Not a severe irritant but may cause irritation if inhaled.	
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Acetic acid zinc salt; Dicarbomethoxy zinc; Zinc acetate dihydrate; Zinc diacetate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $Zn(C_2H_3O_2)_2$ or $Zn(C_2H_3O_2)_2 \cdot 2H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Faint acetic acid
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Bu. Mines approved respirator; rubber gloves; chemical goggles 5.2 Symptoms Following Exposure: Inhalation causes mild irritation of nose and throat; coughing and sneezing. Ingestion can cause irritation or corrosion of the alimentary tract, resulting in vomiting. Contact with dust causes irritation of eyes and mild irritation of skin. 5.3 Treatment for Exposure: INHALATION: move to fresh air; if exposure is severe, get medical attention. INGESTION: induce vomiting, followed by prompt and complete gastric lavage with water. EYES: flush with water for at least 10 min.; consult physician if irritation persists. SKIN: wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: $GL_{LD} 2,1 \text{ Dg } 0.5 \text{ g/kg}$ 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.008 ppm with fathead minnow 11 m soft water 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Zinc is not considered to be bioconcentrative even though it accumulates in some organisms								
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1. The Harshaw Chemical Co. 1945 E. 37 St. Cleveland, Ohio 44106 2. Allied Chemical Corp. Specialty Chemicals Div. P. O. Box 1057R Morristown, N. J. 07960 3. Union Carbide Corp. Chemicals and Plastics Div. 270 Park Avenue New York, N. Y. 10017								
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent 99% Commercial 98.4% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open								
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications <table><tr><td>Category</td><td>Classification</td></tr><tr><td>Health Hazard (Blue)</td><td>1</td></tr><tr><td>Flammability (Red)</td><td>1</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>	Category	Classification	Health Hazard (Blue)	1	Flammability (Red)	1	Reactivity (Yellow)	0	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 219.49 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.74 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: (approx) -0.5 Btu/lb $= -0.3 \text{ cal/g} = -0.01 \times 10^3 \text{ J/kg}$ 13.16 Heat of Polymerization: Not pertinent
Category	Classification								
Health Hazard (Blue)	1								
Flammability (Red)	1								
Reactivity (Yellow)	0								
16. continued on pages 4 and 5									
NOTES									

(Continued on pages 5 and 6)

ZAC

ZINC AMMONIUM CHLORIDE

Common Synonyms Ammonium perchlorozincate Ammonium zinc chloride	Solid White Odorless Smks and mixes with water.
Avoid contact with solid and dust. Keep skin away. Stay in fume hood if possible. In fume hood, avoid direct contact with material. Notify local air pollution agency if released.	
Fire	Not flammable
Exposure	CALL FOR MEDICAL AID DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If exposed to dust, clothing and flush with plenty of water. If on skin, flush with plenty of water. If in eyes, hold open, flush with plenty of water. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Remove contact lenses. Follow with water. Flush affected area with plenty of water. If in eyes, hold open, flush with plenty of water. If SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. If SWALLOWED and victim is UNCONSCIOUS, DO NOT HAVE NO CONVICTIONS. Do not induce vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local pollution control agency. Notify local health department if water intakes.
1 RESPONSE TO DISCHARGE (See Response Method Handbook CG 446-1) Dilute and flush.	2 LABELS No hazard label required by Code of Federal Regulations.
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Ammonium perchlorozincate; Ammonium zinc chloride 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $ZnCl_2 \cdot 3NH_4Cl$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves. 5.2 Symptoms Following Exposure: Inhalation: Dust irritates nose and throat. Ingestion: can cause irritation or corrosion of the alimentary tract. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: Remove from exposure, begin artificial respiration if breathing has ceased. INGESTION: induce vomiting, followed by prompt and complete gastric lavage, cathartics and demulcents. EYES: flush with water for at least 15 min. SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available	

6 FIRE HAZARDS

- 6.1 **Flesh Point:** Not flammable
 6.2 **Flammable Limits in Air:** Not flammable
 6.3 **Fire Extinguishing Agents:** Not pertinent
 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
 6.5 **Special Hazards of Combustion Products:** Not pertinent
 6.6 **Behavior in Fire:**
 6.7 **Ignition Temperature:** Not pertinent
 6.8 **Electrical Hazard:** Not pertinent
 6.9 **Burning Rate:** Not pertinent

8. WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
 8.2 **Waterfowl Toxicity:** Data not available
 8.3 **Biological Oxygen Demand (BOD):** Data not available
 8.4 **Food Chain Concentration Potential:** Zinc accumulates in some organisms but is not considered to be bioconcentrative

9 SELECTED MANUFACTURERS

1. Chemical and Pigment Co.
600 Nichols Road
Pittsburg, Calif. 94565
2. Pfaltz and Bauer, Inc.
175 Fairfield Ave.
Stamford, Conn. 06902

7 CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
 7.2 **Reactivity with Common Materials:**
 7.3 **Stability During Transport:** Stable
 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
 7.5 **Polymerization:** Not pertinent
 7.6 **Inhibitor of Polymerization:** Not pertinent

10. SHIPPING INFORMATION

- 10.1 **Grade or Purity:** Commercial
 10.2 **Storage Temperature:** Ambient
 10.3 **Inert Atmosphere:** No requirement
 10.4 **Venting:** Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook CG 446-3)
 SS

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed
 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
 12.3 **NFPA Hazard Classifications:** Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid
 13.2 **Molecular Weight:** 296.8
 13.3 **Boiling Point at 1 atm:** (sublimes)
 $644^{\circ}\text{F} = 340^{\circ}\text{C} = 613^{\circ}\text{K}$
 13.4 **Freezing Point:** Not pertinent
 13.5 **Critical Temperature:** Not pertinent
 13.6 **Critical Pressure:** Not pertinent
 13.7 **Specific Gravity:** 1.81 at 20°C (solid)
 13.8 **Liquid Surface Tension:** Not pertinent
 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
 13.12 **Latent Heat of Vaporization:** Not pertinent
 13.13 **Heat of Combustion:** Not pertinent
 13.14 **Heat of Decomposition:** Not pertinent
 13.15 **Heat of Solution:** Data not available
 13.16 **Heat of Polymerization:** Not pertinent

(Continue from pages 5 and 6)

NOTES

ZAR

ZINC ARSENATE

Common Synonyms		Sol'd	Colorless	Odorless
		Sinks in water		
AVOID CONTACT WITH SOLID AND DUST. KEEP PILE AWAY FROM OTHERS. Wash hands thoroughly after handling. Do not eat, drink, or smoke while handling.				
Fire	Not flammable			
	CALL FOR MEDICAL AID DUST POISONOUS IF INHALED Irritating to eyes, nose and throat May cause respiratory irritation Eyes: Flush with water for at least 15 minutes If in the eyes, do not rub SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes If swallowed, do not induce vomiting If in eyes, flush with water for at least 15 minutes If swallowed, do not induce vomiting If in eyes, flush with water for at least 15 minutes If swallowed, do not induce vomiting			
<u>Exposure</u>				
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes. Not recommended for use in water. Not recommended for use in water.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Issue warning: poison water contaminant Restrict access Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: (approx.) (ZnO) ₄ (As ₂ O ₃) ₄ 3.4 IMCO/United Nations Numerical Designation: 6.1/1712		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Colorless 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, rubber gloves 5.2 Symptoms Following Exposure: Dust may irritate eyes. Ingestion or excessive inhalation of dust causes burning of mouth, abdominal pain, vomiting, diarrhea with hemorrhage, dehydration, jaundice, and collapse 5.3 Treatment for Exposure: EYES: flush with water to remove dust. INGESTION: immediately induce evacuation of intestinal tract by inducing vomiting and giving gastric lavage and saline cathartics; see physician at once; consider development of arsenic poisoning 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.5 mg/m 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Data not available 5.7 Late Toxicity: May be carcinogenic. Arsenic poisoning may develop 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Not pertinent				

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents Not pertinent 6.4 Fire Extinguishing Agents Not to be Used Not pertinent 6.5 Special Hazards of Combustion Products. Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate. Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential Data not available
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials. No reaction 7.3 Stability During Transport. Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization. Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS Pfaltz and Bauer, Inc. 126-04 Northern Boulevard Flushing, N. Y. 11356
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446.3) II	10. SHIPPING INFORMATION 10.1 Grades or Purify: Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting. Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications. Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 866 (approx.) 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 3.31 at 15°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition. Not pertinent 13.15 Heat of Solution. Not pertinent 13.16 Heat of Polymerization. Not pertinent

(continued on pages 5 and 6)

NOTES

ZBO

ZINC BORATE

Common Synonyms		Solid	White	Odorless
		Sinks in water		
HAZARD STATEMENT				
No hazard statement required by Code of Federal Regulations				
Fire	Not flammable			
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting HUMPHREY CHEMICAL CORP. P.O. BOX 21 EDGEMOND ARSENAL, MD 21010 IN A CLOSED CONTAINER, IT MAY BE DANGEROUS TO OPEN.			
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes.			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446.4) Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula* (approx): $ZnO \cdot 3B_2O_3 \cdot 3H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves				
5.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Ingestion can cause gastrointestinal disturbances, convulsions, central nervous depressions, skin eruptions, shock, and death. Contact with eyes or skin causes irritation				
5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: administer gastric lavage with warm tap water, saline cathartics, consult physician. EYES or SKIN: flush with water				
5.4 Toxicity by Inhalation (Threshold Limit Value): 10 mg/m ³ (as boron oxide)				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade I, LD ₅₀ 15 g/kg				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gas) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Not pertinent				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Zinc accumulates in some organisms but is not considered to be bioconcentrative
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. U. S. Borax & Chemical Co. 3075 Wilshire Blvd. Los Angeles, Calif. 90010 2. Humphrey Chemical Corp. P.O. Box 21 Edgewood Arsenal, Md. 21010 3. American Hoechst Corp. Chemicals and Plastics Div. Rt. 202, 206 North Somerville, N.J. 08876
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Manual, CG 446.3) II	10 SHIPPING INFORMATION 10.1 Grades or Purity: Commercial grades contain 45-52% zinc oxide, 29-35% boric anhydride 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 434.75 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.7 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
Continued on pages 4 and 5	
NOTES	

Continued on pages 5 and 6

ZBR

ZINC BROMIDE

Common Synonyms		Sol'd	White	Odorless
Sinks and mixes with water				
Fire		Not flammable		
Exposure		DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.		
Water Pollution		Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.		
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant. Dispers: and flush.		2. LABELS No hazard label required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms. 3.2 Coast Guard Compatibility Classification: Not listed. 3.3 Chemical Formula: ZnBr ₂ . 3.4 IMCO/United Nations Numerical Designation: Not listed.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None		
5 HEALTH HAZARDS				
5.1 Personal Protective Equipment: Chemical goggles or face shield, rubber gloves, dust mask.				
5.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Ingestion may cause irritation or corrosion of the alimentary tract. If large amount is swallowed and not followed by vomiting, drowsiness and other symptoms of bromide poisoning may occur. Contact with eyes or skin causes irritation.				
5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water, induce vomiting, followed by prompt and complete gastric lavage, catharsis, and demulcents. EYES or SKIN: wash immediately with large volumes of water.				
5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available.				
5.5 Short-Term Inhalation Limits: Data not available.				
5.6 Toxicity by Ingestion: Grade 2.1 D ₅₀ 0.5-5 g/kg.				
5.7 Late Toxicity: Data not available.				
5.8 Vapor (Gas) Irritant Characteristics: Data not available.				
5.9 Liquid or Solid Irritant Characteristics: Data not available.				
5.10 Odor Threshold: Data not available.				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Not pertinent 8.4 Food Chain Concentration Potential Zinc accumulates in some organisms, but is not considered to be bioconcentrated
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. American Hoechst Corp. Chemicals and Plastics Div. Rt. 202, 706 North Somerville, N.J. 08876 2. Michigan Chemical Corp. 1511 Greenwood Chicago, Ill. 60611 3. Fisher Scientific Co. 711 Forbes Ave. Pittsburgh, Pa. 15219
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) NA 12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	10 SHIPPING INFORMATION 10.1 Grades or Purity: Technical 99+ 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open 13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 225.48 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 4.22 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Rate of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

ZCL

ZINC CHLORIDE

Common Synonyms	Solid White solid Odorless Solid sinks and mixes with water
Fire	Not flammable
Exposure	SOLID OR SOLUTION Irritating to skin and eyes If swallowed, will cause nausea or vomiting ENVIRONMENTAL Harmful to aquatic life in very low concentrations May be dangerous if it enters water intakes
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 4-19, 41 Issue warning - water contaminant Disperse and flush	2. LABEL 
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not applicable 3.3 Chemical Formula: $ZnCl_2$ 3.4 IMCO United Nations Numerical Designation: 1502	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: Odorless
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Goggles or face shield 5.2 Symptoms Following Exposure: Solid or water solution is astringent and can irritate the eyes. When ingested, can cause irritation, severe irritation of the face, nausea, vomiting, and diarrhea. 5.3 Treatment for Exposure: INGESTION: Give large volumes of water and induce vomiting (see process call indicator TMS) wash with water for at least 15 min. 5.4 Toxicity by Inhalation (Threshold Limit Value): 1 mg/m ³ dust 5.5 Short-Term Inhalation Limits: Not pertinent 5.6 Toxicity by Ingestion: Grade I LD ₅₀ 50 to 500 mg/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Non-volatile 5.9 Liquid or Solid Irritant Characteristics: Solid irritates skin on prolonged contact 5.10 Odor Threshold: Not pertinent	

6. FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: Not pertinent 6.7 Ignition Temperature: Not flammable 6.8 Electrical Hazards: Not pertinent 6.9 Burning Rate: Not flammable	8. WATER POLLUTION 8.1 Aquatic Toxicity: 72 ppm 96 hr medium bluefish, 11 in fresh water 95 ppm 48 hr zebrafish, 11 in salt water 8.2 Waterbody Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: No reaction 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9. SELECTED MANUFACTURERS 1 Allied Chemical Corp. Industrial Chemicals Division Morristown, N.J. 07960 2 Gould Marathon Batteries Co. Wausau, Wis. 54982 3 Mallinckrodt Chemical Works Industrial Chemicals Division Pond and Mallinckrodt Sts. St. Louis, Mo. 63160
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 4-2-3) NS	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent USP 20% solution in water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Venting: Data not available
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Corrosive Material 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 136.28 13.3 Boiling Point at 1 atm: Very high 13.4 Freezing Point: 411°K = 233°C = 456°F 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 2.91 at 25°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
NOTES	

continued on pages 9 and 8

ZCR

ZINC CHROMATE

Common Synonyms Zinc chromate(VI) hydrate Zinc yellow Butterscup yellow		Solid	Yellow	Odorless
		Sinks in water		
Fire	Not flammable			
Exposure	DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.			
1 RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4. Should be removed. Chemical and physical treatment.		2. LABELS No hazard label required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Butterscup yellow Zinc chromate(VI) hydrate; Zinc yellow 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: (approx.) 4ZnO.K ₂ O.4Cr ₂ O ₃ .3H ₂ O 3.4 IMCO/United Nations Numerical Designations: Not listed.		4 OBSERVABLE CHARACTERISTICS 4.1 Physical State, (as shipped): Solid 4.2 Color: Yellow 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Suitable respirator for dusts; rubber gloves; chemical goggles or face shield. 5.2 Symptoms Following Exposure: Inhalation of dust causes irritation of nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract; circulatory collapse; and toxic nephritis. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air; if exposure has been severe, get medical attention. INGESTION: induce vomiting, followed by prompt and complete gastric lavage; cathartics and demulcents. EYES: flush with water. SKIN: wash thoroughly with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 0.1 mg/m ³ 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: (Grade 2) LD ₅₀ 0.5 g/kg. 5.7 Late Toxicity: Possible lung cancer. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Unknown.				

6 FIRE HAZARDS 6.1 Flash Point: Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Both chromium and zinc are concentrated by some organisms but are not considered to be bioconcentrators in a spill situation									
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9 SELECTED MANUFACTURERS 1. Mineral Pigments Corp. 7011 Murkirk Road Beltsville, Md. 20705 2. Fisher Scientific Co. 711 Forbes Ave. Pittsburgh, Pa. 15219 3. Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902									
		10 SHIPPING INFORMATION 10.1 Grade or Purity: Commercial, 99% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open									
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3). SS		13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 874 (approx.) 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 3.43 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent									
12 HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: <table><tr><th>Category</th><th>Classification</th></tr><tr><td>Health Hazard (Blue)</td><td>2</td></tr><tr><td>Flammability (Red)</td><td>0</td></tr><tr><td>Reactivity (Yellow)</td><td>0</td></tr></table>		Category	Classification	Health Hazard (Blue)	2	Flammability (Red)	0	Reactivity (Yellow)	0		
Category	Classification										
Health Hazard (Blue)	2										
Flammability (Red)	0										
Reactivity (Yellow)	0										
16 continued on pages 1 and 6 NOTES											

(Continued on pages 4 and 5)

ZDP

ZINC DIALKYL DITHIOPHOSPHATE

Common Synonyms Zinc dibenzyl dithiophosphate Zinc dibenzyl phosphorodithioate		Solid or liquid Straw yellow to green Sweet, alcohol like odor Sinks in water
Fire	Combustible Irritating gases may be produced when heated	
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing LIQUID OR SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting	
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes	
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-41 Issue warning - water contaminant detect devices Should be removed Chemical and physical treatment		2. LABELS No hazard label required by Code of Federal Regulations
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Zinc O-benzyl dithiophosphorodithioate; Zinc dibenzyl dithiophosphate; Zinc dibenzyl phosphorodithioate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $[(C_6H_5)_2PS_2]_2Zn$ where R = C ₆ H ₅ , alkyl 3.4 IMCO/United Nations Numerical Designation: 6.1 D09		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid or liquid 4.2 Color: Straw yellow to yellow green 4.3 Odor: Sweet, alcohol like
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, safety glasses or face shield, dust respirator for solid form 5.2 Symptoms Following Exposure: (All commercially available members of this class share about the same health hazards.) Inhalation of dust can cause respiratory discomfort. Ingestion causes irritation of mouth and stomach. Contact with eyes causes moderate to severe irritation. Contact with skin causes mild irritation. 5.3 Treatment for Exposure: INHALATION: Move from exposure. INGESTION: If large amounts have been ingested, induce vomiting. EYES: Flush with copious amounts of water. If irritation persists, consult a physician. SKIN: Wash affected areas with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2.1 D09 S. N/A 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available		

6. FIRE HAZARDS 6.1 Flash Point: 300°F (150°C) 6.2 Flammable Limits in Air: Data not available 6.3 Fire Extinguishing Agents: Water, dry chemical, foam can be desirable 6.4 Fire Extinguishing Agents Not to be Used: 6.5 Special Hazards of Combustion Products: Irritating oxides of sulfur and phosphorus may form in fire. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Data not available 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent		8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterway Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Zinc accumulates in some organisms but is not considered to be bioconcentratable
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: No reaction at ordinary temperatures 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent		9. SELECTED MANUFACTURERS 1. Etno Corporation P. O. Box 6918 Cleveland, Ohio 44109 2. Monsanto Company 800 N. Lindbergh Blvd. St. Louis, Mo. 63166
11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-31) (Liquid) V X N (Solid) H		10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical 62% on inert filler 10.2 Storage Temperature: Below 66°C (150°F) 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open (flame arrester)
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 MFPA Hazard Classifications: Not listed		13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 1,013°C and 1 atm: Solid or liquid 13.2 Molecular Weight: 488 (approx.) 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.12 - 1.26 at 20°C (liquid); 1.6 at 20°C (solid) 13.8 Liquid Surface Tension: Data not available 13.9 Liquid-Water Interfacial Tension: Data not available 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent
6 copies of this page, 1 and 8		
NOTES		

ZFB

ZINC FLUOROBORATE

Common Synonyms Zinc Fluoroborate solution		Liquid	Colorless	Odorless
		Sinks and mixes with water		
Fire	Not flammable			
Exposure	ALL EXPOSURES LIQUID Irritating to skin and eyes. If swallowed will cause nausea and vomiting EYES: Flush with plenty of water, get medical attention. SKIN: Flush with plenty of water, get medical attention. INGESTION: Give gastric lavage, cathartics, and demulcents.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 446-4. Flush with water. Water contaminants. Dispense and flush.		2. LABELS No hazard label required by Code of Federal Regulations.		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Zinc fluoroborate solution 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $ZnBF_4 \cdot 11H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Rubber gloves, safety glasses or face shield. 5.2 Symptoms Following Exposure: Ingestion may cause irritation or corrosion of the alimentary tract. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INGESTION: Give gastric lavage, cathartics, and demulcents. EYES: Flush with plenty of water, get medical attention. SKIN: Flush with plenty of water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS

- 6.1 Flash Point: Not flammable
- 6.2 Flammable Limits in Air: Not flammable
- 6.3 Fire Extinguishing Agents: Not pertinent
- 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
- 6.5 Special Hazards of Combustion Products: Not pertinent
- 6.6 Behavior in Fire:
- 6.7 Ignition Temperature: Not pertinent
- 6.8 Electrical Hazard: Not pertinent
- 6.9 Burning Rate: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: Data not available
- 8.2 Waterlow Toxicity: Data not available
- 8.3 Biological Oxygen Demand (BOD): None
- 8.4 Food Chain Concentration Potential: Zinc accumulates in some organisms but is not considered to be bioconcentrative.

9. SELECTED MANUFACTURERS

- 1. Allied Chemical Corp.
P.O. Box 1087R
Morristown, N.J. 07960
- 2. Platts and Bauer, Inc.
175 Fairfield Ave.
Stamford, Conn. 06902

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
- 7.2 Reactivity with Common Materials:
- 7.3 Stability During Transport: Stable
- 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 7.5 Polymerization: Not pertinent
- 7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Purified 41% solution in water
- 10.2 Storage Temperature: Ambient
- 10.3 Inert Atmosphere: No requirement
- 10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

(See Hazard Assessment Handbook, CG 446-3)
A-P

12. HAZARD CLASSIFICATION

- 12.1 Code of Federal Regulations: Not listed
- 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed
- 12.3 NFPA Hazard Classifications: Not listed

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Liquid
- 13.2 Molecular Weight: 238.94 (anhydrous)
- 13.3 Boiling Point at 1 atm: approx. 1212°F = 650°C = 1212°F
- 13.4 Freezing Point: Data not available
- 13.5 Critical Temperature: Not pertinent
- 13.6 Critical Pressure: Not pertinent
- 13.7 Specific Gravity: 1.45 at 20°C (liquid)
- 13.8 Liquid Surface Tension: Data not available
- 13.9 Liquid-Water Interfacial Tension: Not pertinent
- 13.10 Vapor (Gas) Specific Gravity: Not pertinent
- 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
- 13.12 Latent Heat of Vaporization: Not pertinent
- 13.13 Heat of Combustion: Not pertinent
- 13.14 Heat of Decomposition: Not pertinent
- 13.15 Heat of Solution: Not pertinent
- 13.16 Heat of Polymerization: Not pertinent

NOTES

ZNT

ZINC NITRATE

Common Synonyms: Zinc nitrate hexahydrate		Solid	White	Odorless
		Sinks and mixes with water		
ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED DATE 01-11-2010 BY 60322 UCBAW				
Fire	Not flammable Will increase the intensity of a fire POISONOUS GASES MAY BE PRODUCED IN FIRE When heated, zinc nitrate decomposes to form nitrogen dioxide, a toxic gas, and zinc oxide.			
Exposure	ALL INFORMATION CONTAINED HEREIN IS UNCLASSIFIED DATE 01-11-2010 BY 60322 UCBAW DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing If swallowed will cause nausea and vomiting SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting IF IN CONTACT WITH WATER, IT WILL FORM A TOXIC GAS, NITROGEN DIOXIDE.			
Water Pollution	HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes.			
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 44-41 Disperse and flush		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Zinc nitrate hexahydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $Zn(NO_3)_2 \cdot 6H_2O$ 3.4 IBCO/United Nations Numerical Designation: 1.1.1514		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White, colorless 4.3 Odor: None		
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract. Contact with skin causes irritation, which may be delayed. Contact with eyes causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INSTENTLY induce vomiting, followed by prompt and complete gastric lavage. cathartics and demulcents. EYES: flush with water, consult a physician. SKIN: wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ is 1.7 g/kg body weight 5.7 Late Toxicity: Causes enlarged liver, spleen, and bone marrow in rabbits 5.8 Vapor (G-3) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Unknown				

6. FIRE HAZARDS

- 6.1 Flash Point: Not flammable
6.2 Flammable Limits in Air: Not flammable
6.3 Fire Extinguishing Agents: Not pertinent
6.4 Fire Extinguishing Agents Not to be Used: Not pertinent
6.5 Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire
6.6 Behavior in Fire: May increase intensity of fire when in contact with combustible material
6.7 Ignition Temperature: Not pertinent
6.8 Electrical Hazard: Not pertinent
6.9 Burning Rate: Not pertinent

8. WATER POLLUTION

- 8.1 Aquatic Toxicity: 1.00 ppm 3 mo. tadpoles survived but no limb buds, fresh water
0.2 ppm 48 hr. barnacles with lethargic water
8.2 Waterfowl Toxicity: Data not available
8.3 Biological Oxygen Demand (BOD): None
8.4 Food Chain Concentration Potential: None is accumulated in some organisms but is not considered to be bioconcentratable

9. SELECTED MANUFACTURERS

1. The Harshaw Chemical Co.
1945 E. 97th St.
Cleveland, Ohio 44116
2. J. T. Baker Chemical Co.
Phillipsburg, N. J. 08865
3. Mannesmann Chemical Works
2nd and Mallinckrodt Streets
St. Louis, Mo. 63160

7. CHEMICAL REACTIVITY

- 7.1 Reactivity with Water: No reaction
7.2 Reactivity with Common Materials:
7.3 Stability During Transport: Stable
7.4 Neutralizing Agents for Acids and Caustics: Not pertinent
7.5 Polymerization: Not pertinent
7.6 Inhibitor of Polymerization: Not pertinent

10. SHIPPING INFORMATION

- 10.1 Grades or Purity: Reagent Technical
10.2 Storage Temperature: Ambient
10.3 Inert Atmosphere: Not required
10.4 Venting: Open

11. HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 44-41
NN

12. HAZARD CLASSIFICATIONS

- 12.1 Code of Federal Regulations: Solid oxidizing material
12.2 NFPA Hazard Rating for Bulk Water Transportation: Not listed
12.3 NFPA Hazard Classification:

Category	Classification
Health Hazard (Blue)	1
Flammability (Red)	0
Reactivity (Yellow)	0

13. PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 Physical State at 15°C and 1 atm: Solid
13.2 Molecular Weight: 297.44
13.3 Boiling Point at 1 atm: Not pertinent
13.4 Freezing Point: 57°C = 13.6°C = 100°F
13.5 Critical Temperature: Not pertinent
13.6 Critical Pressure: Not pertinent
13.7 Specific Gravity: 2.01 at 20°C (solids)
13.8 Liquid Surface Tension: Not pertinent
13.9 Liquid-Water Interfacial Tension: Not pertinent
13.10 Vapor (Gas) Specific Gravity: Not pertinent
13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent
13.12 Latent Heat of Vaporization: Not pertinent
13.13 Heat of Combustion: Not pertinent
13.14 Heat of Decomposition: Not pertinent
13.15 Heat of Solution: Not pertinent
13.16 Heat of Polymerization: Not pertinent

NOTES

ZPS

ZINC PHENOLSULFONATE

Synonyms Zinc p-phenolsulfonate Zinc sulfonate Zinc sulfonate Zinc phenolsulfonate octahydrate	Solid White Odorless Sinks and mixes with water
Fire	Not flammable Irritating gases may be produced when heated.
Exposure	DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting.
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.
1. RESPONSE TO DISCHARGE See Response Methods Handbook, CG 445-41. Three warning: water contaminant. Dispense and flush.	2. LABELS No hazard label required by United Federal Regulations.
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: p-Hydroxybenzenesulfonic acid zinc salt; Zinc p-phenolsulfonate; Zinc phenolsulfonate octahydrate; Zinc sulfonate; Zinc sulfonate 3.2 Coast Guard Competitively Classification: Not listed 3.3 Chemical Formula: $(C_6H_4SO_3)(H_2SO_4)Zn$ 3.4 IMCO/United Nations Numerical Designation: Not listed	4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles, face shield, protective gloves. 5.2 Symptoms Following Exposure: Inhalation of dust may irritate nose and throat. Ingestion of large doses has emetic and laxative effects; can cause irritation of the alimentary tract. Contact with the eyes causes irritation; contact with the skin causes mild irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air; INGESTION: if large amount has been swallowed induce vomiting followed by prompt and complete gastric lavage; cathartics and demulcents; EYES or SKIN: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available. 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 1.5 g/kg. 5.7 Late Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Odorless.	

6 FIRE HAZARDS

- 6.1 **Flash Point:** Not flammable
- 6.2 **Flammable Limits in Air:** Not flammable
- 6.3 **Fire Extinguishing Agents:** Not pertinent
- 6.4 **Fire Extinguishing Agents Not to be Used:** Not pertinent
- 6.5 **Special Hazards of Combustion Products:** Irritating oxides of sulfur may form in fire.
- 6.6 **Behavior in Fire:**
- 6.7 **Ignition Temperature:** Not pertinent
- 6.8 **Electrical Hazards:** Not pertinent
- 6.9 **Burning Rate:** Not pertinent

7. CHEMICAL REACTIVITY

- 7.1 **Reactivity with Water:** No reaction
- 7.2 **Reactivity with Common Materials:**
- 7.3 **Stability During Transport:** Stable
- 7.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 7.5 **Polymerization:** Not pertinent
- 7.6 **Inhibitor of Polymerization:** Not pertinent

8 WATER POLLUTION

- 8.1 **Aquatic Toxicity:** Data not available
- 8.2 **Waterway Toxicity:** Data not available
- 8.3 **Biological Oxygen Demand (BOD):** Data not available
- 8.4 **Food Chain Concentration Potential:** Zinc is accumulated by some organisms but is not considered to be bio-stressful.

9. SELECTED MANUFACTURERS

- 1. Allied Chemical Corp.
Specialty Chemicals Div.
P.O. Box 987R
Morristown, N.J. 07960
- 2. Matlock and Chemical Works
2nd and Main Street
St. Louis, Mo. 63102
- 3. Pfaffens, Bauer, Inc.
175 Eastfield Ave.
Mammoth Lakes, Ca. 93542

10. SHIPPING INFORMATION

- 10.1 **Grades or Purities:** Purity
- 10.2 **Storage Temperature:** 25°C
- 10.3 **Inert Atmosphere:** Not required
- 10.4 **Venting:** Open

11 HAZARD ASSESSMENT CODE

See Hazard Assessment Handbook, CG 445-2
 55

12. HAZARD CLASSIFICATIONS

- 12.1 **Code of Federal Regulations:** Not listed
- 12.2 **NAS Hazard Rating for Bulk Water Transportation:** Not listed
- 12.3 **NIHA Hazard Classifications:** Not listed

13 PHYSICAL AND CHEMICAL PROPERTIES

- 13.1 **Physical State at 15°C and 1 atm:** Solid
- 13.2 **Molecular Weight:** 255.5
- 13.3 **Boiling Point at 1 atm: (decomposes)** 240°C at 15 mm; 140°C
- 13.4 **Freezing Point:** Not pertinent
- 13.5 **Critical Temperature:** Not pertinent
- 13.6 **Critical Pressure:** Not pertinent
- 13.7 **Specific Gravity:** > 1 at 20°C (solid)
- 13.8 **Liquid Surface Tension:** Not pertinent
- 13.9 **Liquid-Water Interfacial Tension:** Not pertinent
- 13.10 **Vapor (Gas) Specific Gravity:** Not pertinent
- 13.11 **Ratio of Specific Heats of Vapor (Gas):** Not pertinent
- 13.12 **Latent Heat of Vaporization:** Not pertinent
- 13.13 **Heat of Combustion:** Not pertinent
- 13.14 **Heat of Decomposition:** Not pertinent
- 13.15 **Heat of Solution:** Not pertinent
- 13.16 **Heat of Polymerization:** Not pertinent

Continued on pages 2 and 3

NOTES

Caution: Strongly Irritant		Solid	Grey to black	Faint odor
		Sinks in water		
Fire		Not flammable Irritating gases may be produced when heated		
		DUST Irritating to eyes, nose and throat. If inhaled will cause dizziness, difficult breathing, or loss of consciousness.		
Exposure		SOLID POISONOUS IF SWALLOWED Irritating to skin and eyes. If swallowed will cause dizziness, nausea, vomiting or loss of consciousness.		
Water Pollution		Tests of low concentrations on aquatic life is unknown. May be dangerous if it enters a water intake.		
1. RESPONSE TO DISCHARGE See Response/Control Manual, CG 446-4 Issue material: provide water Control spillage at containment Remove excess Should be removed Chemical and physical treatment		2. LABEL 		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: No common synonyms 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: ZnP_2 3.4 IMCO/United Nations Numerical Designation: 6.1 (P) 2		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Grey to grey-black 4.3 Odor: Faint phosphorous		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Dust mask or self-contained breathing apparatus, goggles, or face shield, protective gloves. 5.2 Symptoms Following Exposure: When inhaled or ingested, compound releases phosphine which causes faintness, weakness, nausea, vomiting, dizziness, pain in head, pressure change in nose, rate of respiration, throat constriction, paralysis, and coma. If contact with eyes or on face causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air; give artificial respiration if required; get medical attention for phosphine poisoning. INGESTION: give one tablespoonful of mustard in a glass of warm water; repeat and if vomit fluid is clear, avoid use of all other calls a physician immediately; have patient lie down and keep warm. EYES: flush with water for at least 15 mins. SKIN: flush with water; wash with soap and water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 4 oral LD ₅₀ = 40 mg/kg rat 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS 6.1 Flash Point: Not determinable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: The water foam is dry chemical on adjacent fires. 6.4 Fire Extinguishing Agents Not to be Used: Any agent which would react with the carbon disulfide or the regulated agent or with the phosphine gas, and spontaneous flammable gases. 6.5 Special Hazards of Combustion Products: Irritating smoke of phosphorus may be formed at fires. 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not pertinent 6.8 Electrical Hazard: Not pertinent 6.9 Burning Rate: Not pertinent	8 WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Water-solubility: 1.0 g per 100 g 8.3 Biological Oxygen Demand (BOD): Data not available 8.4 Food Chain Concentration Potential: Data is available, but the concentration is not considered to be bioaccumulative.
7 CHEMICAL REACTIVITY 7.1 Reactivity with Water: Reacts slowly with water, more rapidly with dilute acid to form phosphine gas, which is toxic and spontaneously flammable. 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable unless exposed to moisture. Toxic phosphine gas may then be released and collect in closed spaces. 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization: Not pertinent 7.6 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1. Union Carbide Corp. Industrial Chemicals Div. Norge Park, N.Y. 10442 2. American Cyanamid Corp. Chemicals and Plastics Div. PO Box 202, 200 North Somerville, N.J. 08876 Escher-Schmidt Co. 731 Forbes Ave. Pittsburgh, Pa. 15219
11 HAZARD ASSESSMENT CODE See Hazard Assessment Manualpage CG-400-30 II 12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Poisonous solid, Class B 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13 PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 74.12 13.3 Boiling Point at 1 atm: 101.2°C = 210.2°F (0.1013 MPa) 13.4 Freezing Point: (melting point) -107°C = -161°F (0.1013 MPa) 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: 1.263 at 15°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: 4,410 kcal/mole = 18,450 kJ/mole (solid) 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent

ZINC SILICOFLUORIDE

6. FIRE HAZARDS 6.1 Flash Point: Not determined 6.2 Flammable Limits in Air: Not determined 6.3 Fire Extinguishing Agents: Not permitted 6.4 Fire Extinguishing Agents Not to be Used: Not permitted 6.5 Special Hazards of Combustion Products: Toxic and irritant; may cause severe burns and skin irritation; smoke is irritating to eyes 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not permitted 6.8 Electrical Hazard: Not permitted 6.9 Burning Rate: Not permitted	8. WATER POLLUTION 8.1 Aquatic Toxicity: Data not available 8.2 Waterland Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: None as accumulated by some organisms but is not considered to be bioaccumulating
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not reactive 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Caustics: Not permitted 7.5 Polymerization: Not permitted 7.6 Inhibitor of Polymerization: Not permitted	9. SELECTED MANUFACTURERS W. M. Ciba Ltd. Agricultural Chemicals Group Bullington, Mid. 2, 20 2. Agrichemicals P.O. Box 10 Piquetteville, Ontario, E1A 1A6 4. American Chemical Corp. Chemicals and Plastics Div. P.O. Box 200 North Somerville, N.J. 08876
11. HAZARD ASSESSMENT CODE See Hazard Assessment Handbook (GHS 44-3) XX	10. SHIPPING INFORMATION 10.1 Grades or Purity: Technical, 99.9% 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not required 10.4 Vending: None
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 134 13.3 Boiling Point at 1 atm: 145°C (decolorizes) 132-142°C (decolorizes) (lit.) 13.4 Freezing Point: Not permitted 13.5 Critical Temperature: Not permitted 13.6 Critical Pressure: Not permitted 13.7 Specific Gravity: 2.10 at 20°C (solid) 13.8 Liquid Surface Tension: Not permitted 13.9 Liquid-Water Interfacial Tension: Not permitted 13.10 Vapor (Gas) Specific Gravity: Not permitted 13.11 Ratio of Specific Heats of Vapor (Gas): Not permitted 13.12 Latent Heat of Vaporization: Not permitted 13.13 Heat of Combustion: Not permitted 13.14 Heat of Decomposition: Not permitted 13.15 Heat of Solution: Data not available 13.16 Heat of Polymerization: Not permitted

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NOTES

Common Synonyms White vinyl Zinc vinyl Zinc sulfate heptahydrate		Solid Sinks and mixes with water	White Odorless
Fire		Not flammable	
Exposure		DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting	
Water Pollution		HARMFUL TO AQUATIC LIFE IN VERY LOW CONCENTRATIONS May be dangerous if it enters water intakes	
1. RESPONSE TO DISCHARGE (See Response Information Summary CG 444-4) Dispense and Flush		2. LABELS No hazard label required by Federal or Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: White vinyl, Zinc sulfate heptahydrate, Zinc vinyl 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $ZnSO_4 \cdot 7H_2O$ 3.4 HSO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Colorless 4.3 Odor: None	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: The usual goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Irritation of eyes, nose, irritation of nose and throat Irritation can cause irritation or corrosion of the alimentary tract. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: induce vomiting followed by prompt and complete gastric lavage with water and demulcents. EYE OR SKIN: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): Data not available 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 0.5 g/kg 5.7 Late Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			

6. FIRE HAZARDS 6.1 Flash Point: Not determined 6.2 Flammable Limits in Air: Not determined 6.3 Fire Extinguishing Agents: Not determined 6.4 Fire Extinguishing Agents Not to be Used: Not determined 6.5 Special Hazards of Combustion Products: Not determined 6.6 Behavior in Fire: 6.7 Ignition Temperature: Not determined 6.8 Electrical Hazard: Not determined 6.9 Burning Rate: Not determined	8. WATER POLLUTION 8.1 Aquatic Toxicity: 0.1 mg/L in 100 hr static bioassay test 4.0 ppm/L in rainbow trout 14 d fresh water *Water to be not specified 8.2 Waterfowl Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD): None 8.4 Food Chain Concentration Potential: Data is accumulated by some organisms but is not considered to be bioaccumulative
7. CHEMICAL REACTIVITY 7.1 Reactivity with Water: Not determined 7.2 Reactivity with Common Materials: 7.3 Stability During Transport: Stable 7.4 Neutralizing Agents for Acids and Bases: Not determined 7.5 Polymerization: Not determined 7.6 Inhibitor of Polymerization: Not determined	9. SELECTED MANUFACTURERS 1. Chemical and Physical 2. National Bureau of Standards 3. Eagle-Picher Industries, Inc. Agricultural Chemicals Division P.O. Box 100 Columbia, Mo. 65201 5. J. I. Baker Chemical Co. Philadelphia, Pa. 19106
	10. SHIPPING INFORMATION 10.1 Grades or Purity: Reagent Technical 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: Not recommended 10.4 Venting: Open
11. HAZARD ASSESSMENT CODE See Material Safety Data Sheet, Section 9, GHS 055	13. PHYSICAL AND CHEMICAL PROPERTIES 13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 207.15 13.3 Boiling Point at 1 atm: Not determined 13.4 Freezing Point: 100°C (212°F) 13.5 Critical Temperature: Not determined 13.6 Critical Pressure: Not determined 13.7 Specific Gravity: 1.66 at 20°C (solid) 13.8 Liquid Surface Tension: Not determined 13.9 Liquid-Water Interfacial Tension: Not determined 13.10 Vapor (Gas) Specific Gravity: Not determined 13.11 Ratio of Specific Heats of Vapor (Gas): Not determined 13.12 Latent Heat of Vaporization: Not determined 13.13 Heat of Combustion: Not determined 13.14 Heat of Decomposition: Not determined 13.15 Heat of Solution: Not determined 13.16 Heat of Polymerization: Not determined
12. HAZARD CLASSIFICATIONS 12.1 Code of Federal Regulations: Not listed 12.2 HAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	

NOTES

ZCA

ZIRCONIUM ACETATE

Common Synonyms		Liquid	White	Weak vinegar odor
		Sinks and mixes with water		
Avoid contact with liquid. Keep away from eyes. Separate if possible. Isolate in case of spillage or leakage. Notify local fire and police in case of emergency.				
Fire	Not flammable			
Exposure	CALL FOR MEDICAL AID LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contact lenses if they are in eyes. Flush with water for at least 15 minutes. IF IN EYES - Flush with water for at least 15 minutes. IF SWALLOWED - Do not induce vomiting. Give small amount of water to drink. IF SWALLOWED - Do not induce vomiting. Give small amount of water to drink. Notify local fire and police in case of emergency.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local fire and police in case of emergency.			
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning - water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations		
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Zirconium acetate solution 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $Zr(C_2H_3O_2)_4 \cdot H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Liquid 4.2 Color: Colorless 4.3 Odor: Weak vinegar		
5. HEALTH HAZARDS				
5.1 Personal Protective Equipment: Rubber gloves, chemical goggles or face shield				
5.2 Symptoms Following Exposure: Has only a mild pharmacologic reaction. Contact with eyes or skin may cause irritation.				
5.3 Treatment for Exposure - INGESTION: Give large amount of water. EYES: Flush with water for at least 15 min. consult a physician if irritation persists. SKIN: Flush with water.				
5.4 Toxicity by Inhalation (Threshold Limit Value): 5 mg/m ³ (as Zr consumed)				
5.5 Short-Term Inhalation Limits: Data not available				
5.6 Toxicity by Ingestion: Grade 2 LD ₅₀ 5.2 g/kg (rat)				
5.7 Late Toxicity: Data not available				
5.8 Vapor (Gaseous) Irritant Characteristics: Data not available				
5.9 Liquid or Solid Irritant Characteristics: Data not available				
5.10 Odor Threshold: Data not available				

6 FIRE HAZARDS		8 WATER POLLUTION		
6.1	Flash Point: Not flammable	8.1	Aquatic Toxicity: Data not available	
6.2	Flammable Limits in Air: Not flammable	8.2	Waterfowl Toxicity: Data not available	
6.3	Fire Extinguishing Agents: Not pertinent	8.3	Biological Oxygen Demand (BOD): Data not available	
6.4	Fire Extinguishing Agents Not to be Used: Not pertinent	8.4	Food Chain Concentration Potential: Data not available	
6.5	Special Hazards of Combustion Products: Not pertinent	9. SELECTED MANUFACTURERS 1. The Harshaw Chemical Co. 1945 E. 97 St. Cleveland, Ohio 44106 2. Gallard Schlenker Chemical Mfg. Co. 584 Mineola Ave. Corte Place, N.Y. 11514 3. Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902		
6.6	Behavior in Fire			
6.7	Ignition Temperature: Not pertinent			
6.8	Electrical Hazard: Not pertinent			
6.9	Burning Rate: Not pertinent			
7. CHEMICAL REACTIVITY		10 SHIPPING INFORMATION 10.1 Grades or Purities: 25% solution in water 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open		
7.1	Reactivity with Water: No reaction			
7.2	Reactivity with Common Materials:			
7.3	Stability During Transport: Stable			
7.4	Neutralizing Agents for Acids and Caustics: Not pertinent			
7.5	Polymerization: Not pertinent	11. HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) A P		
7.6	Inhibitor for Polymerization: Not pertinent			
12 HAZARD CLASSIFICATIONS		13. PHYSICAL AND CHEMICAL PROPERTIES		
12.1	Code of Federal Regulations: Not listed	13.1	Physical State at 15°C and 1 atm: Liquid	
12.2	NAS Hazard Rating for Bulk Water Transportation: Not listed	13.2	Molecular Weight: 327 (soluble only)	
12.3	NFPA Hazard Classifications	13.3	Boiling Point at 1 atm: Not pertinent	
	Category	Classification	13.4	Freezing Point: Not pertinent
	Health Hazard (blue)	0	13.5	Critical Temperature: Not pertinent
	Flammability (Red)	0	13.6	Critical Pressure: Not pertinent
	Reactivity (Yellow)	0	13.7	Specific Gravity: 1.37 at 20°C (liquid)
			13.8	Liquid Surface Tension: Data not available
			13.9	Liquid-Water Interfacial Tension: Not pertinent
			13.10	Vapor (Gas) Specific Gravity: Not pertinent
			13.11	Ratio of Specific Heats of Vapor (Gas): Not pertinent
			13.12	Latent Heat of Vaporization: Not pertinent
			13.13	Heat of Combustion: Not pertinent
			13.14	Heat of Decomposition: Not pertinent
			13.15	Heat of Solution: Not pertinent
			13.16	Heat of Polymerization: Not pertinent
		Continued on page 5 and 6		
NOTES				

ZIR

ZIRCONIUM NITRATE

Common Synonyms Zirconium nitrate pentahydrate	Solid	White	Odorless
Sinks and mixes with water			
Fire	Not flammable Will increase the intensity of a fire POISONOUS GASES MAY BE PRODUCED IN FIRE		
Exposure	DUST Irritating to eyes, nose and throat If inhaled will cause coughing or difficult breathing SOLID Irritating to skin and eyes If swallowed will cause nausea and vomiting		
Water Pollution	Effect of low concentrations on aquatic life is unknown May be dangerous if it enters water intakes		
1. RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning, water contaminant Disperse and flush		2. LABELS No hazard label required by Code of Federal Regulations	
3. CHEMICAL DESIGNATIONS 3.1 Synonyms: Zirconium nitrate pentahydrate 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: $Zr(NO_3)_4 \cdot 5H_2O$ 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: White 4.3 Odor: None	
5. HEALTH HAZARDS 5.1 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves 5.2 Symptoms Following Exposure: Has only a mild pharmacological action. Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water. EYE EXPOSURE: flush with water. 5.4 Toxicity by Inhalation (Threshold Limit value): Data not available (as zirconium) 5.5 Short-Term Inhalation Limits: Data not available 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 2.5 g/kg rat 5.7 Lute Toxicity: Data not available 5.8 Vapor (Gas) Irritant Characteristics: Data not available 5.9 Liquid or Solid Irritant Characteristics: Data not available 5.10 Odor Threshold: Data not available			

6 FIRE HAZARDS		8 WATER POLLUTION	
6.1	Flash Point: Not flammable but may intensify fire	8.1	Aquatic Toxicity: Data not available
6.2	Flammable Limits in Air: Not flammable	8.2	Waterlow Toxicity: Data not available
6.3	Fire Extinguishing Agent: Not pertinent	8.3	Biological Oxygen Demand (BOD): None
6.4	Fire Extinguishing Agents Not to be Used: Not pertinent	8.4	Food Chain Concentration Potential: Data not available
6.5	Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fire		
6.6	Behavior in Fire: May increase intensity of fire when in contact with combustible materials	9 SELECTED MANUFACTURERS	
6.7	Ignition Temperature: Not pertinent	1	Varlac and Chemical Co. 666 South Front Street Elizabeth, N. J. 07202
6.8	Electrical Hazard: Not pertinent	2	Gallard-Schlesinger Chemical Mfg. Co. 584 Mincola Ave. Castle Place, N. Y. 11514
6.9	Burning Rate: Not pertinent	3	Pfaltz and Bauer, Inc. 375 Fairfield Ave. Stamford, Conn. 06902
7 CHEMICAL REACTIVITY			
7.1	Reactivity with Water: Dissolves to give an acid solution	10 SHIPPING INFORMATION	
7.2	Reactivity with Common Materials: Will corrode most metals	10.1	Grades or Purity: Commercial 99+%
7.3	Stability During Transport: Stable	10.2	Storage Temperature: Ambient
7.4	Neutralizing Agents for Acids and Caustics: Flush with water	10.3	Inert Atmosphere: No requirement
7.5	Polymerization: Not pertinent	10.4	Venting: Open
7.6	Inhibitor of Polymerization: Not pertinent		
11 HAZARD ASSESSMENT CODE (See Hazard Assessment Handbook, CG 446-3) SS		13. PHYSICAL AND CHEMICAL PROPERTIES	
12 HAZARD CLASSIFICATIONS		13.1	Physical State at 15°C and 1 atm: Solid
12.1	Code of Federal Regulations: Not listed	13.2	Molecular Weight: 429.3
12.2	NAS Hazard Rating for Bulk Water Transportation: Not listed	13.3	Boiling Point at 1 atm: Not pertinent (decomposes)
12.3	NFPA Hazard Classifications: Not listed	13.4	Freezing Point: Not pertinent
		13.5	Critical Temperature: Not pertinent
		13.6	Critical Pressure: Not pertinent
		13.7	Specific Gravity: > 1 at 20°C (solid)
		13.8	Liquid Surface Tension: Not pertinent
		13.9	Liquid-Water Interfacial Tension: Not pertinent
		13.10	Vapor (Gas) Specific Gravity: Not pertinent
		13.11	Ratio of Specific Heats of Vapor (Gas): Not pertinent
		13.12	Latent Heat of Vaporization: Not pertinent
		13.13	Heat of Combustion: Not pertinent
		13.14	Heat of Decomposition: Not pertinent
		13.15	Heat of Solution: Not pertinent
		13.16	Heat of Polymerization: Not pertinent
		CG 446-3 revised on pages 5 and 6	
NOTES			

ZrO	ZIRCONIUM OXYCHLORIDE
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ZrO	ZIRCONIUM OXYCHLORIDE
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Common Synonyms Zinc-yl chloride Basic zincum chloride Zincinum oxychloride hydrate Zincinum oxide chloride		Solid	White to yellow	Odorless
		Sinks and mixes with water		
Avoid contact with skin, eyes or clothing. Stop use if irritation occurs. In case of contact, flush area with water. Notify local health and pollution control agency.				
Fire	Not flammable			
Exposure	GEL FOR MEDICAL USE DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. Inhalation may irritate mucous membranes of respiratory tract. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. Swallowing large amounts may cause severe irritation of digestive tract. POISONOUS SWALLOWED: If small amount has been swallowed, drink water or milk. DO NOT INDUCE VOMITING. CONSULT PHYSICIAN OR POISON CONTROL CENTER IMMEDIATELY. INGESTION OF LARGE AMOUNTS MAY BE FATAL.			
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes.			
1 RESPONSE TO DISCHARGE (See Response Methods Handbook CG 648-4) Issue warning - water contaminant. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.		
3 CHEMICAL DESIGNATIONS 3.1 Synonyms: Basic zincum chloride Zincinum oxide chloride Zincinum oxychloride hydrate Zincyl chloride 3.2 Coast Guard Compatibility Classification: Not listed 3.3 Chemical Formula: ZnOCl ₂ · 5H ₂ O 3.4 IMCO/United Nations Numerical Designation: Not listed		4. OBSERVABLE CHARACTERISTICS 4.1 Physical State (as shipped): Solid 4.2 Color: Yellow to white 4.3 Odor: None		
5 HEALTH HAZARDS 5.1 Personal Protective Equipment: Safety glasses or face shield; protective gloves; dust mask. 5.2 Symptoms Following Exposure: Has only a mild pharmacological action. Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation. 5.3 Treatment for Exposure: INHALATION: Move to fresh air. INGESTION: Give large amount of water. EYES OR SKIN: Flush with water. 5.4 Toxicity by Inhalation (Threshold Limit Value): 5 mg/m (as zincum). 5.5 Short-Term Inhalation Limits: Data not available. 5.6 Toxicity by Ingestion: Grade 2 oral LD ₅₀ = 4.5 g/kg rat. 5.7 Lethal Toxicity: Data not available. 5.8 Vapor (Gas) Irritant Characteristics: Data not available. 5.9 Liquid or Solid Irritant Characteristics: Data not available. 5.10 Odor Threshold: Data not available.				

6. FIRE HAZARDS	7. CHEMICAL REACTIVITY	8. WATER POLLUTION
6.1 Flash Point Not flammable 6.2 Flammable Limits in Air: Not flammable 6.3 Fire Extinguishing Agents: Not pertinent 6.4 Fire Extinguishing Agents Not to be Used: Not pertinent 6.5 Special Hazards of Combustion Products: Not pertinent 6.6 Behavior in Fire: 6.7 Ignition Temperature Not pertinent 6.8 Electrical Hazard Not pertinent 6.9 Burning Rate Not pertinent	7.1 Reactivity with Water: No reaction 7.2 Reactivity with Common Materials: 7.3 Stability During Transport Stable 7.4 Neutralizing Agents for Acids and Caustics: Not pertinent 7.5 Polymerization Not pertinent 7.6 Inhibitor of Polymerization Not pertinent	8.1 Aquatic Toxicity: 240 ppm/96 hr./fathead minnow - H₂O hard water 19 ppm/96 hr./fathead minnow - H₂O soft water 8.2 Waterflow Toxicity: Data not available 8.3 Biological Oxygen Demand (BOD) None 8.4 Food Chain Concentration Potential: Data not available
	9. SELECTED MANUFACTURERS	
	1. SI Industries Inc. I AM Division 4511 Hyde Park Blvd. Niagara Falls, N. Y. 14305 2. Ventron Inc. P. O. Box 159 Beverly, Mass. 01915 3. Gallard Schlesinger Chemical Mfg. Co. 554 Minerva Ave. Carle Place, N. Y. 11514	
	10. SHIPPING INFORMATION	
	10.1 Grades or Purity: Technical Pure 10.2 Storage Temperature: Ambient 10.3 Inert Atmosphere: No requirement 10.4 Venting: Open	
	11. HAZARD ASSESSMENT CODE	
	(See Hazard Assessment Handbook, CG 446-3) SS	
	12. HAZARD CLASSIFICATIONS	
	12.1 Code of Federal Regulations: Not listed 12.2 NAS Hazard Rating for Bulk Water Transportation: Not listed 12.3 NFPA Hazard Classifications: Not listed	
	13. PHYSICAL AND CHEMICAL PROPERTIES	
	13.1 Physical State at 15°C and 1 atm: Solid 13.2 Molecular Weight: 322.3 13.3 Boiling Point at 1 atm: Not pertinent (decomposes) 13.4 Freezing Point: Not pertinent 13.5 Critical Temperature: Not pertinent 13.6 Critical Pressure: Not pertinent 13.7 Specific Gravity: > 1 at 20°C (solid) 13.8 Liquid Surface Tension: Not pertinent 13.9 Liquid-Water Interfacial Tension: Not pertinent 13.10 Vapor (Gas) Specific Gravity: Not pertinent 13.11 Ratio of Specific Heats of Vapor (Gas): Not pertinent 13.12 Latent Heat of Vaporization: Not pertinent 13.13 Heat of Combustion: Not pertinent 13.14 Heat of Decomposition: Not pertinent 13.15 Heat of Solution: Not pertinent 13.16 Heat of Polymerization: Not pertinent	

(See heading page 4 and 5)

NOTES

ZCS

ZIRCONIUM SULFATE

Common Synonyms Disulfatozirconic acid Zirconium sulfate tetrahydrate		Solid White Odorless Sinks and mixes with water
Avoid contact with solid and dust. Keep away from fire. In case of fire, use dry chemical or carbon dioxide extinguisher. Do not use water.		
Fire	Not flammable	
Exposure	ALL FOR MEDICAL USE DUST Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If eyes are affected, flush with plenty of water. If on skin, wash with plenty of water. SOLID Irritating to skin and eyes. If swallowed will cause nausea and vomiting. If swallowed, do not induce vomiting. If on skin, wash with plenty of water. If in eyes, flush with plenty of water. If swallowed, do not induce vomiting. If on skin, wash with plenty of water.	
Water Pollution	Effect of low concentrations on aquatic life is unknown. May be dangerous to water intakes. Notify local health authorities. Notify police in case of spill.	
1 RESPONSE TO DISCHARGE (See Response Methods Handbook, CG 446-4) Issue warning: water contaminant. Disperse and flush.		2. LABELS No hazard label required by Code of Federal Regulations.
3. CHEMICAL DESIGNATIONS 31 Synonyms: Disulfatozirconic acid, Zirconium sulfate tetrahydrate 32 Coast Guard Compatibility Classification: Not listed 33 Chemical Formula: $Zr(SO_4)_4 \cdot 4H_2O$ 34 IMCO/United Nations Numerical Designation: Not listed		4 OBSERVABLE CHARACTERISTICS 41 Physical State (as shipped): Solid 42 Color: White 43 Odor: None
5 HEALTH HAZARDS 51 Personal Protective Equipment: Dust mask, goggles or face shield, protective gloves. 52 Symptoms Following Exposure: May have a mild pharmacologic action. Inhalation of dust may irritate nose and throat. Contact with eyes or skin causes irritation. 53 Treatment for Exposure: INHALATION: move to fresh air. INGESTION: give large amount of water. EYES or SKIN: flush with water. 54 Toxicity by Inhalation (Threshold Limit Value): 5 mg/m (as zirconium) 55 Short-Term Inhalation Limits: Data not available 56 Toxicity by Ingestion: (Grade 2) oral LD ₅₀ = 5.5 g/kg (rat) 57 Late Toxicity: Data not available 58 Vapor (Gas) Irritant Characteristics: Data not available 59 Liquid or Solid Irritant Characteristics: Data not available 510 Odor Threshold: Data not available		

6 FIRE HAZARDS 61 Flash Point: Not flammable 62 Flammable Limits in Air: Not flammable 63 Fire Extinguishing Agents: Not pertinent 64 Fire Extinguishing Agents Not to be Used: Not pertinent 65 Special Hazards of Combustion Products: Not pertinent 66 Behavior in Fire: Not pertinent 67 Ignition Temperature: Not pertinent 68 Electrical Hazard: Not pertinent 69 Burning Rate: Not pertinent	8 WATER POLLUTION 81 Aquatic Toxicity: 14 ppm av/96 hr fathead minnow: 11 soft water 145 ppm/96 hr fathead minnow: 11 hard water 82 Waterfowl Toxicity: Data not available 83 Biological Oxygen Demand (BOD): Not available 84 Food Chain Concentration Potential: Data not available
7 CHEMICAL REACTIVITY 71 Reactivity with Water: No reaction 72 Reactivity with Common Materials: Not pertinent 73 Stability During Transport: Stable 74 Neutralizing Agents for Acids and Caustics: Not pertinent 75 Polymerization: Not pertinent 76 Inhibitor of Polymerization: Not pertinent	9 SELECTED MANUFACTURERS 1 Varlacoid Chemical Co 666 South Front Street Elizabeth, N. J. 07202 2 Gallard Schlesinger Chemical Mfg. Co 584 Mincola Ave Carle Place, N. Y. 11514 3 Pfaltz and Bauer, Inc. 375 Fairfield Ave Stamford, Conn. 06902
	10 SHIPPING INFORMATION 101 Grades or Purity: Technical 102 Storage Temperature: Ambient 103 Inert Atmosphere: No requirement 104 Venting: Open
11. HAZARD ASSESSMENT CODE See HAZARD Assessment Handbook, CG 446-3) NS	13 PHYSICAL AND CHEMICAL PROPERTIES 131 Physical State at 15°C and 1 atm: Solid 132 Molecular Weight: 354.4 133 Boiling Point at 1 atm: Not pertinent (decomposes) 134 Freezing Point: Not pertinent 135 Critical Temperature: Not pertinent 136 Critical Pressure: Not pertinent 137 Specific Gravity: (approx.) 3.0 at 20°C (solid) 138 Liquid Surface Tension: Not pertinent 139 Liquid-Water Interfacial Tension: Not pertinent 1310 Vapor (Gas) Specific Gravity: Not pertinent 1311 Ratio of Specific Heats of Vapor (Gas): Not pertinent 1312 Latent Heat of Vaporization: Not pertinent 1313 Heat of Combustion: Not pertinent 1314 Heat of Decomposition: Not pertinent 1315 Heat of Solution: Not pertinent 1316 Heat of Polymerization: Not pertinent
12. HAZARD CLASSIFICATIONS 121 Code of Federal Regulations: Not listed 122 NAS Hazard Rating for Bulk Water Transportation: Not listed 123 NFPA Hazard Classifications: Not listed	
NOTES	

COMMANDANT INSTRUCTION M 16465.12

LIST OF EFFECTIVE PAGES

<u>SUBJECT MATTER</u>	<u>PAGE NUMBERS</u>	<u>CHANGE IN EFFECT</u>
Title Page	i (reverse blank)	original (Oct 78)
COMDTINST M 16465.12	iii (reverse blank)	original
Record of changes	v (reverse blank)	original
Table of Contents	vii to viii	original
1. Introduction	1-1 (reverse blank)	original
2. Components of CHRIS	2-1 to 2-2	original
3. Explanation of terms	3-1 to 3-19 (reverse blank)	original
4. Other Information systems	4-1 to 4-5 (reverse blank)	original
5. Conversion Factors	5-1 to 5-4	original
6. Selected Properties	6-1 to 6-4	original
7. Guide to Compatibility	7-1 to 7-17 (reverse blank)	original
8. Index of Synonyms	8-1 to 8-54	original
9. Index of Codes	9-1 to 9-14	original
10. Data sources	10-1 to 10-6	original
11. Chemical specific Information	11-1 (reverse blank) 11-3 to 11-903	original original