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FACILITIES AND ENVIRONMENTAL EFFECTS
SURFACE PREPARATION AND COATINGS
DESIGN/PRODUCTION INTEGRATION
HUMAN RESOURCE INNOVATION
MARINE INDUSTRY STANDARDS
WELDING
INDUSTRIAL ENGINEERING
EDUCATION AND TRAINING**

**June 1996
NSRP 0474**

THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

Shipyard MACT Implementation Plan and Compliance Tools

**U.S. DEPARTMENT OF THE NAVY
CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER**

**in cooperation with
National Steel and Shipbuilding Company
San Diego, California**

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June 1996
NSRP 0474

**Shipyard MACT Implementation Plan
and Compliance Tools**

U.S. DEPARTMENT OF THE NAVY
CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER

in cooperation with
National Steel and Shipbuilding Company
San Diego, California

FINAL REPORT

**SHIPYARD MACT IMPLEMENTATION PLAN
AND
COMPLIANCE TOOLS**

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In Behalf Of
SNAME SPC PANEL SP-1
on
FACILITIES AND ENVIRONMENTAL EFFECTS

Under the
NATIONAL SHIPBUILDING RESEARCH PROGRAM

June 1996

Task N1-92-2, Subtask 12

TABLE OF CONTENTS:

SECTION ONE:	PLAIN ENGLISH INTERPRETATION OF THE SHIPYARD MAXIMUM ACHIEVABLE CONTROL TECHNOLOGY
SECTION TWO:	MODEL SHIPYARD IMPLEMENTATION PLAN
SECTION THREE:	THINNING RATION CALCULATION SHEETS FOR OPTIONS 2 & 3 AND OPTION 4
SECTION FOUR:	NOTIFICATION FORMS
SECTION FIVE:	“LOW-USAGE EXEMPTION” FORM AND “UNAFFECTED MAJOR SOURCE” FORM

ONE:
PLAIN ENGLISH INTERPRETATION OF THE
SHIPYARD MAXIMUM ACHIEVABLE
CONTROL TECHNOLOGY

**EPA's Maximum Achievable Control Technology
Rule for Shipyards:
A Plain English Interpretation**

Prepared for

**National Shipbuilding Research Program
Facilities and Environmental Effects Panel**

Prepared by

Austin Environmental, Inc.

February 12,1996

**Revised
June 8,1996**

EPA's Maximum Achievable Control Technology Rule for Shipyards: A Plain English Interpretation

Summary

The MACT standard for shipyards¹ controls which coatings may be applied to a ship during construction or repairs. It does this by requiring the shipyard to use only coatings that meet, or are lower than, the coating VOC limits for marine coatings established in the MACT. These VOC limits apply to all marine coating operations in the shipyard, no matter who conducts the work: shipyard personnel, subcontractor or ship's force. The VOC limits apply to all marine coatings, whatever their origin: shipyard supplied, customer supplied or government furnished. If a coating does not meet the MACT standard, it is illegal for the shipyard to allow it to be applied to a ship while the ship is in the shipyard. Any time a marine coating operation is conducted within the physical boundaries of the shipyard it is subject to the MACT standards, and the shipyard is responsible for ensuring compliance.

A shipyard that is subject to the MACT standard also needs a Title V operating permit.

Details

Standards

The MACT establishes two standards, a material standard and a performance standard. The material standard establishes VOC limits for general use marine coatings and for twenty-two speciality categories of marine coatings.² (An additional set of VOC limits, which allows for the application of higher VOC content coatings, is established for coatings applied during temperatures of 40 F° or less.) Coatings may only be thinned up to their applicable VOC limit. If a coating exactly meets its VOC limit, VOC-containing thinners may not be added under any circumstances. If the coating contains less VOC than the established limit it may be thinned up to, but not exceeding the limit.

The performance standard requires all handling and transferring operations involving VOC-containing coatings, thinners and solvents to be conducted in a way that minimizes spills and releases of VOC. Additionally, containers of VOC-containing coatings, thinner and solvents must remain closed, except to add or remove material from them. The shipyard must establish procedures to ensure the performance standard is met, and must describe these procedures in a written Implementation Plan.

Compliance Options for the Material Standard

The MACT allows two basic, and two additional, alternatives to meet the VOC content Material Standard.

The basic options are:

- a) Determine and certify that each "batch" of coating is compliant as-supplied and apply the coatings without thinning.
- b) Determine and certify that each "batch" of coating is compliant after thinning with a

¹"National Emission Standard for Hazardous Air Pollutants for Shipbuilding and Ship Repair (Surface Coating)", 40 CFR §63,780-.787, (60 Federal Register 64330, December 15, 1995).

²See Appendix One for a list of marine coating categories and their VOC limits.

designated thinner,³ up to the limit of the MACT VOC standards.

A “batch” of coating means a manufacturer’s batch from a single production run. Each new type and batch of coating must be separately certified under this rule. Shipyards can rely on manufacturer certifications, or do their own testing. If the shipyard relies on the manufacturer’s certification and later testing determines a coating batch was noncompliant, the EPA will consider the shipyard to be the responsible party.

The record keeping and reporting requirements for both basic options are similar. The volumes and types of coating used must be recorded, along with certifications and any test results. When thinning is allowed, data on the type and volume of thinner used with any batch of coating must also be recorded and used in calculations to determine compliance.

The shipyard is required to determine compliance monthly. Twice a year, the shipyard must demonstrate compliance via a report to EPA based on its testing and record keeping.

A third compliance option is conceptually more complex, but may allow for simplified record keeping at some shipyards. Under this “group” option the shipyard would set thinning ratios for several coatings that are thinned with a common thinner, and label the coating containers accordingly. It would then track the use of all coatings in that group, and the use of the common thinner, to determine compliance. This option does not allow coatings in a group to be above the MACT VOC standard so long as things average out at the end of the month: each coating as applied must still meet VOC limits for its coating category.

The fourth compliance option is to use VOC control equipment to prevent the release of HAPs to the air. This option requires EPA approval of a specific plan detailing the process and equipment the shipyard would use to destroy or capture the coating VOCs.

The Performance Standard

Container integrity and material handling procedures must be specified in the shipyard’s Implementation Plan,⁴ which the shipyard must prepare. This Plan will describe the procedures necessary to ensure conformance with the MACT containers and procedures performance standard. The shipyard must certify that containers of VOC containing paints, thinners and solvents are in good condition and do not leak. The shipyard is required to determine compliance on a container by container basis. Twice a year, the shipyard must provide a report to EPA based on its Implementation Plan records.

Record Keeping

To both determine and demonstrate compliance with the MACT, shipyards must keep records on all their usage of marine coatings, thinners and solvents. These usage records have to be compiled monthly, for the shipyard to determine compliance. Daily records of the paint and thinner usage of each shipyard and subcontractor crew will provide the best data record although daily record keeping is not required by the

³Only a single designated thinner can be used with each batch of coating each month.

⁴Note that the specific performance elements of an approved MACT Implementation Plan could become federally enforceable permit requirements in the shipyard’s Title V operating permit, in the same manner that Best Management Practices are enforceable permit requirements of a NPDES permit.

MACT.⁵ Only the monthly compliance determination records need be retained in the shipyard's records. Daily coating and thinner logs may be discarded after the monthly compliance determination has been made. Records necessary to demonstrate compliance, (test results, VOC content certifications, calculations of allowable thinning solvent usage and actual paint and thinner solvent usage by month) must be retained by the shipyard for at least five years.

Related Requirements

Some states (including California and Louisiana) and the U.S. Navy have marine coating rules or specifications that are similar to the specifications in this EPA rule. The EPA rule does not replace or change these other requirements, or effect when they apply to a shipyard all applicable limits must be met.

State rules that apply to coatings used in a shipyard that are not "marine coatings" are also still applicable.

Executions

This rule exempts sealed aerosol cans, and marine coatings used in very low volumes. Noncompliant coatings may be used if annual use of each such coating is less than 200 liters (53 gallons) per coating, and the combined annual use of all exempted low volume coatings is less than 1,000 liters (264 gallons).

Deadlines⁶ and Due Date

The MACT standard became effective on 12/15/95. Each shipyard that it is subject to the MACT standard must submit a notification to the EPA with the shipyard's proposed implementation plan, within 180 days of the effective date (6/13/96). This deadline was later extended six months⁷, thus delaying the deadline for notification to 12/14/96. The shipyard was to have been in full compliance with the standard no later than 12/15/96, however this deadline was also extended by the EPA to 12/15/97 (two years from the effective date). The shipyard must submit its first compliance report to the EPA by 6/15/97 and every six months after the date of its first compliance report.

⁵ If a violation is discovered when the shipyard makes its monthly compliance determination, unless the shipyard has records that limit the duration of the violation the EPA will consider the violation to have lasted the entire month.

⁶ See attached MACT milestone chart.

⁷ The extension of the notification and compliance deadlines had been approved by the EPA, but not yet published in the Federal Register at the date this document was revised.

APPENDIX I. VOLATILE ORGANIC HAP (VOHAP) LIMITS
FOR MARINE COATINGS

Coating Category	VOHAP limits ^{abc}		
	grams/liter coating (minus water and compounds)	grams/liter solids ^d	
		t ≥ 2 4.5°C	t <4.5°C ^e
General use	340	571	728
Specialty	--	-	--
Air flask	340	571	728
Antenna	530	1,439	--
Antifoulant	400	765	971
Heat resistant	420	841	1,069
High-gloss	420	841	1,069
High-temperature	500	1,237	1,597
Inorganic zinc high-build	340	571	728
Military exterior	340	571	728
Mist	610	2,235	--
Navigational aids	550	1,597	-
Nonskid	340	571	728
Nuclear	420	841	1,069
Organic zinc	360	630	802
Pretreatment wash primer	780	11,095	--
Repair and maint. of thermoplastics	550	1,597	--
Rubber camouflage	340	571	728
Sealant for thermal spray aluminum	610	2,235	--
Special marking	490	1,178	--
Specialty interior	340	571	728
Tack coat	610	2,235	--
Undersea weapons systems	340	571	728
Weld-through precon. primer	650	2,885	--

^aThe limits are expressed in two sets of equivalent units. Either set of limits may be used for the compliance procedure described in §63.785(c)(1), but only the limits expressed in units of g/L solids (nonvolatile) shall be used for the compliance procedures described §63.785(c)(2)-(4).

^bVOC (including exempt compounds listed as HAP) shall be used as a surrogate for VOHAP for those compliance procedures described §63.785 (c)(1)-(3).

^cTo convert from g/L to lb/gal, multiply by (3.785 L/gal) (1/453.6 lb/g) or 1/120. For compliance purposes, metric units define the standards.

^dVOHAP limits expressed in units of mass of VOHAP per volume of solids were derived from the VOHAP limits expressed in units of mass of VOHAP per volume of coating assuming the coatings contain no water or exempt compounds and that the volumes of all components within a coating are additive.

^eThese limits apply during cold-weather time periods, as defined in §63.782. Cold-weather allowances are not given to coatings in categories that permit over a 40 percent VOHAP content by volume. Such coatings are subject to the same limits regardless of weather conditions.

Plain English Interpretation of EPA's Maximum Achievable Control Technology Rule for Shipyards: Major Compliance Milestones

[illegible]

SHIPYARD MAXIMUM ACHIEVABLE CONTROL TECHNOLOGY

Questions and Answers

Why is the EPA regulating surface coating operations in shipyards?

The EPA is required to establish Maximum 'Achievable Control Technologies ("MACT") for many types of industries that have the potential to emit hazardous air pollutants ("HAP") in amounts equal to or greater than 10 tons per year of any single HAP, or 25 tons per year of combined HAPs. Marine coatings contain a variety of HAPs as solvents, which are released to the air during outdoor paint operations.

How do I know if the MACT standards are applicable to my shipyard?

The 10/25 tons per year thresholds of HAP emission is based on all sources of HAP within the shipyard, not just coating operations. However, marine coating operations will typically account for 90 to 95% of HAP emissions in any shipyard. (The only exception should be in shipyards building Fiberglass or composite material ships. In this case Fiberglass or composite lay up operations would comprise a significant, or majority share of the HAP emissions.) As a rule of thumb, if the shipyard has an actual, or potential marine coating usage of 20,000⁸ gallons per year, the shipyard is a "major source" and is subject to the MACT standard.

The rule specifically exempts shipyards using less than 1,000 liters (264 gallons) of marine coatings annually, regardless of other HAP emissions.

What if the shipyard's actual or "Potential" HAP emissions drop below the MACT threshold sometime in the future?

The MACT rule requires that if a shipyard is subject to the MACT on the effective date of this standard or thereafter, it will always be subject to the MACT (once in, always in).

My shipyard is not subject to the MACT now, but we may expand operations in the future. What must we do when we expand?

When the shipyard's potential to emit based on its maximum operational capacity, exceeds the 10/25 tons per year of HAPs threshold, the shipyard must notify the EPA that it has become subject to the MACT and implement the MACT standards.. An application for a "Title V" operating permit, or for a modification to an existing permit, would also be required.

What operations in the shipyard does the MACT control?

The MACT standard controls what marine coatings can be applied to a ship, while the ship is located within the physical boundaries of the shipyard. Only coatings that meet the MACT VOC limits for the coating usage category can be applied. Additionally, thinning of coatings is only allowed up to the VOC limits of the MACT. The shipyard must take measures to prevent spills and leaks of VOC containing

⁸Assuming an average of 3.3 pounds VOC /gallon marine coating, 20,000 gallons of marine coating would contain 33 tons VOC.

materials, such as paints, thinners and solvents, and reduce VOC emissions from leaking or unclosed containers, pots or pipes.

Does the MACT apply to marine coatings used in spray booths equipped with VOC controls?

Yes, unless a proposal for VOC controls has been approved by the EPA as a MACT substitute. However, the rule would not apply to coating use at the shipyard that was not part of “building repair, repainting, converting or alteration” of a ship.

What does the shipyard have to do to comply with the MACT?

As described above, the shipyard must provide an initial notification develop an Implementation Plan, certify batches of coating and thinners, keep records, and make reports. The rule does not impose additional “how to” requirements, e.g., for training staff.

Does the MACT apply to subcontractors or ship's force engaged in surface coating operations while the ship is in the shipyard?

Yes. The MACT standard applies to all marine coating operations occurring within the physical boundaries of the shipyards, no matter who is conducting them.

What if a coating is customer or government furnished?

The MACT standard applies to all marine coating operations conducted in the shipyard, no matter who supplies the coating. If the coating cannot be certified as in compliance as-supplied or as-applied, it cannot legally be used within the shipyard.

Does the MACT apply to our shipyard painters if they are working on a ship outside the yard?

No. The MACT only regulates marine coating operations within shipyards that are subject to the standard.

Could our customers go to a competitor shipyard that is not subject to the MACT standard and have “noncompliant” coatings applied to their ships?

Yes. The MACT standard does not regulate shipyards that have actual or potential HAP emissions below the 10/25 tons per year thresholds. If your competitor shipyard does not exceed the thresholds it may apply any coating available, subject to any state or local VOC regulations.

Does the MACT apply to both private and public shipyards?

Yes. The MACT makes no distinction between government owned or privately owned shipyards.

What do our painters have to know and do for the shipyard to stay in compliance with the MACT?

In most cases, painters will need to know whether a coating can be used at all or for a specific purpose (if it is a specialty coating), whether each coating can be thinned the thinner designated for use with each

coating (for that month), and how much of the designated thinner can be added to each coating at temperatures above and below 40 degrees Fahrenheit.

Painters must also know how to keep necessary records, and may need to know how and when to inspect coating containers and transfer systems under the written Implementation Plan.

If a shipyard chooses to take advantage of the exemptions that are available for low volume use of noncompliant coatings, there is likely be an additional burden on painters to identify these coatings, to keep additional records, and to verify that usage limits have not already been exceeded before a job using such coatings begins.

What can happen if the shipyard knows it is subject to the MACT standard but doesn't notify the EPA or implement the MACT requirements?

A shipyard that is subject to the MACT cannot legally operate after the effective date of the standard unless it is in compliance with the standard. Moreover, a shipyard subject to the MACT that does not file a timely and complete Title V permit application could be shut down until a Title V permit is actually obtained. Facility closure is a drastic penalty, but it is a real risk for a shipyard that was aware of but ignored these programs.

The Clean Air Act also provides for very substantial monetary penalties for noncompliance. Civil penalties can be as large \$25,000 per violation per day. Criminal fines and imprisonment are also possible where violations of a MACT are knowing.

What does the shipyard have to do if it discovers it has violated the MACT standard during coating operations?

Any detected violations should be promptly corrected, and must be reported. However, the MACT standard does not require that detected violations be reported until the next semiannual report by the facility is due. Title V permits implementing the MACT at specific sites may impose additional reporting requirements.

The shipyard should consider whether to report detected violations more promptly, on a voluntary basis. In some cases this may result in lower penalties than might otherwise be assessed.

If there is any indication that violations were knowing or willful, or that they endangered human health and safety or the environment, legal counsel should be consulted.

What should the shipyard do if it discovers a subcontractor or ship's force has violated the MACT standard while conducting coating operations?

These violations should be promptly corrected and any steps necessary to prevent future violations should be taken. The shipyard will be responsible for such violations, and will need to report them as for violations caused by shipyard personnel. Consideration should be given to accelerated voluntary reporting.

Legal counsel should be consulted whenever there is a possible conflict, in an enforcement context, between the interests of the shipyard and the interests of ship's force or subcontractor personnel responsible for a violation.

Mu paint formulations are already controlled by a state regulation, or in my state permit. Does this matter?

Federally enforceable limits on paint formulations can legally be taken into account in determining whether a facility's potential to emit triggers the MACT. A temporary EPA policy also allows state limits that are not federally enforceable to be taken into account by EPA in the same way. Therefore, limits in state regulations and permits will affect EPA's views on whether the MACT and Title V apply at a facility.

Where the MACT does apply, its standards (Plus any more stringent state standards or permit limits) must be met.

**TWO:
MODEL SHIPYARD
IMPLEMENTATION PLAN**

OK SHIPYARDS
The Best in the West

SHIPYARD MACT IMPLEMENTATION PLAN

April 1996

Prepared for:
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Table of Contents

1.	COATING COMPLIANCE PROCEDURES	1
1.0	COATING IDENTIFICATION AND CERTIFICATION	2
1.0.1	Coating Identification	2
1.0.2	VOC or VOHAP Content Above Limit	2
1.0.3	Unknown VOC Content	3
1.0.4	Container Inspection	3
1.1	OPTION 1 and OPTION 4	3
1.1.1	Certification	3
1.1.2	Notification	4
1.2	OPTION2, OPTION 3 and OPTION 4	4
1.2.1	Calculation of ThinningRatios..	4
1.2.2	Notification	7
1.2.3	Paint Crew Daily Records	7
1.2.4	Thimer GroupDesignation "ByUse"	7
1.2.5	Determination of Compliance.	8
2.	RECORD KEEPING PROCEDURES	8
3.	TRANSFER, HANDLING, AND STORAGE PROCEDHS	9
3.0	Work Practices	9
3.1	Self-Inspection	10
	APPENDIX A: FORMS	12
	COATING COMPLIANCE CERTIFICATION.....	13
	PAINT CREW USAGE FORM	14
	CONTAINER COMPLLANCE FORM	15
	METHOD 24 TEST RESULTS FOW	16
	PAINT AND THINNER USAGE LOG.....	17
	NO THINNING LABEL	18
	MAXIMUM ALLOWABLE THINNING LABELS	19

CALCULATION SHEET (SIDE 1) FOR OPTIONS 2AND3	20
CALCULATION SHEET (SIDE 1) FOR OPTION4	21
CALCULATION SHEET (SIDE 2).....	22
APPENDIX B: MARTNE COATING DATA SHEETS	23
VOC DATA SHEET	24
VOLATILE ORGANIC HAP (VOHAP) LIMIWTS FOR MARINE COATINGS	26
SHIPYARD MACT MARINE COATING EXPRESSIONS AND EQUATIONS	27
40 CFR51.100 (S)- EXEMPT COMPOUNDS	28
APPENDIX C: COATING DEFINITIONS.	29

1. COATING COMPLIANCE PROCEDURES

AOK Shipyards intends to implement the following option(s) in compliance with 40 CFR §63:

- ☒ Option 1- No thinning solvent added
- ☐ Option 2 - Thinning solvent added, Coating-by-coating compliance
- ☒ Option 3- Thinning solvent added, Thinner group compliance
- ☐ Option 4 - Alternative test method (i.e., other than Method 24)

Our approach to ensure MACT compliance is to integrate the additional requirements into existing work practices and to assign responsibilities to the appropriate organizational level in the company. Fig. 1-1 presents across reference matrix identifying organizational elements and their involvement in MACT implementation.

Fig. 1-1
Organizations Performing MACT Compliance Activities

MACT Compliance Activity		Initial Review	Receipt of Coatings	Certification	Dilution	Inspection	Mixing	Application	Reporting	Records	Testing
Option(s)		All	All	All	2, 3 & 4	All	2, 3 & 4	All	All	All	All
Organization	Purchasing	X								X	
	Receiving		X	X		X				X	X
	Environmental				X				X	X	X
	Paint Dept.			X						X	
	Paint Crew					X	X	X		X	

1.0 COATING IDENTIFICATION AND CERTIFICATION (ALL OPTIONS)

1.0.1 Coating Identification

Coating identification will be made in conjunction with the existing normal business activities required for the receipt of goods within the facility. Specifically, the warehouseman, receiving clerk, paint foreman, or other designated person will be responsible for determination of the coating category' and VOHAP limit of each batch of coating received into the facility. This will be accomplished using information gathered from the company purchase order, bills of lading, and/or coating container labels. This information will be recorded on **Form 1, Coating Compliance Certification.**²

[This activity meets the requirements of 40 CFR §63.785(a)(1) and -(2)]

1.0.2 VOC or VOHAP Content Above Limit

For its specific coating category, any batch of coating with an identified VOC or VOHAP content above the limit shown in the form will be rejected and returned to the supplier, customer, or government.

[This activity meets the requirements of 40 CFR §63.783(a)]

Identification codes for the categories prescribed in 40 CFR §63.783 are as follows:

G1	General use	S8	Military exterior	S15	Repair / maintenance of thermoplastics
S1	Air flask	S9	Mist	S16	Rubber camouflage
S2	Antenna	S10	Navigational aids	S17	Sealant for thermal spray aluminum
S3	Antifoulant	S11	Nonskid	S18	Special marking
S4	Heat resistant	S12	Nuclear	S19	Specialty interior
S5	High-gloss	S13	organic zinc	S20	Tack coat
S6	High-temperature	S14	Pretreatment wash primer	S21	Undersea weapons systems
S7	Inorganic zinc high-build			S22	Weld-through precoat primer

Forms are located in *Appendix A, Forms*.

1.0.3 Unknown VOC Content

The Purchasing Supervisor will be notified if the VOC content of any batch of coating cannot be identified. At his discretion, The Purchasing Supervisor may reject the batch and return it to the supplier, customer, or government; or, provisionally accept the batch pending further analysis using Method 24. If Method 24 tests are performed, the test results will be recorded on Frm 4, **Method 24 Test Results Log**.

[This activity meets the requirements of 40 CFR §63.783(a) and §63.788(b)(2)(vi)]

1.0.4 Container Inspection

We plan to use direct inspection of every equipment item (e.g., container, drum, vessel, vat, tank, pipe, etc.) involved in coating application to determine its integrity (see Section 3.2, Self Inspection). As applied to coating identification and certification, this involves at least receiving personnel, the Paint Shop Foreman, the Paint Crew Lead Men, and the Environmental personnel.

[This activity meets the requirements of 40 CFR §63.783(b)]

The warehouseman, receiving clerk, paint foreman, or other designated person will be responsible for inspecting the containers as received and completing Form 3 for the receiving activity. Leaking containers or equipment will be identified and handled according to company spill handling procedures. The paint shop personnel will reinspect containers delivered for each day's activities, and inspect paint mixing, handling, and application equipment items. Any discrepancies will be reported to the Paint Shop Foreman, who will alert the spill response teams and/or maintenance crews to take appropriate action.

We will document these findings on **Form 3, Container Compliance Form**, which will serve as a permanent record of ongoing inspections.

[This activity meets the requirements of 40 CFR §63.788(b)(2)(vi)]

1.1 OPTION 1 and OPTION 4

1.1.1 Certification

The Paint Department foreman, leadman, or supervisor will certify VOC (VOHAP) content “as-applied” prior to application of the work site using **Form 1, Coating Compliance Certification**. This form will be returned to the Paint Department clerk, foreman, or supervisor at the end of the work shift.

[This activity satisfies the requirements of 40 CFR §63.785(c)(1)(I)]

Additionally, the volume of coating applied during the shift will be recorded by the paint crew foreman at the end of the work shift using Form 2, Paint Crew Usage Form. Likewise, this form will be returned to the Paint Department clerk, foreman, or supervisor at the end of the work shift for recording in Form 5, **Paint and Thinner Usage Log**.

1.1.2 Notification

The Paint Department clerk, foreman, or company Environmental manager will maintain MACT compliance by notification of painters of the designated thinners by use of labels. **Form 6, “NO Thinning” Label**, will be used for this purpose. Alternatively, when use of labels is not practical or warranted, paint department gang box meetings, held prior to each work shift, will be used to notify painters that no thinning is allowed.

[This activity satisfies the requirements of 40 CFR §63.785(c)(1)(ii)]

1.2 OPTION 2, OPTION 3 and OPTION 4

1.2.1 Calculation of Thinning Ratios

The Paint Department clerk, foreman, or environmental manager will maintain MACT compliance by preparing required information on marine coatings to ensure compliance with MACT standards, including

- (I) VOC Data Sheets, and
- (ii) Thinning Ratio Calculations

The **VOC Data Sheet**, will be used to record the properties of marine coatings or thinners “As-Supplied.” Note that this form accounts for exempt compounds and cure volatiles omitted from the VOC Data Sheet when the MACT was published, but necessary to complete the calculations. The VOC Data Sheet and attachments are provided as Appendix B.

Thinning ratio calculations will be completed before the application of each batch, using the equation 1, as provided in the MACT:

FOR OPTION 2 and OPTION 3:

$$R = \frac{(V_s)(\text{VOHAP limit}) - m_{\text{voc}}}{D^{\text{th}}} \quad \text{Eqn (1)}$$

where:

R = Maximum allowable thinning ratio for a given batch
(L thinner/L coating as supplied);

V_s = Volume fraction of solids in the batch as supplied
(L solids/L coating as supplied);

VOHAP limit= Maximum allowable as-applied VOHAP content of the
coating (g VOHAP/L solids);

m_{voc} = VOC content of the batch as supplied. [g VOC
(including cure volatiles and exempt compounds on the
HAP list)/L coating (including water and exempt
compounds) as supplied];

D^{th} = Density of the thinner (g/L).

FOR OPTION 4:

$$R = \frac{(V_s)(VOHAP \text{ limit}) - m_{VOHAP}}{D_{th}} \quad \text{Eqn (1)}$$

where:

R = Maximum allowable thinning ratio for a given batch
(L thinner/L coating as supplied);

V_s = Volume fraction of solids in the batch as supplied
(L solids/L coating as supplied);

VOHAP limit = Maximum allowable as-applied VOHAP content of
the coating (g VOHAP / L solids);

m_{VOHAP} = VOHAP content of the batch as supplied. [g VOHAP
(including cure volatiles and exempt compounds on
the HAP list) /L coating (including water and exempt
compounds) as supplied];

$D_{th}(VOHAP)$ = Average density of the VOHAP thinner(S) (g/L).

Thinning Ratio Calculation Sheets for both Options 2 and 3, and Option 4 are provided in Appendix B.

Note: If V_s is not supplied directly by the coating manufacturer, V_s both Option 2 and Option 3, and Option 4 calculations will be determined using equation 2 as given by the MACT:

$$V_s = 1 - \frac{m_{volatiles}}{D_{avg}} \quad \text{Eqn.}$$

where:

$m_{volatiles}$ = Total volatiles in the batch, including VOC, water, and exempt
compounds (g/L coating), and

D_{avg} = Average density of volatiles in the batch (g/L).

1.2.2 Notification

The Paint Department clerk, foreman, or company Environmental manager will maintain MACT compliance by notification of painters of the designated thinners by use of labels. **Form 7, “Maximum Allowable Thinning Ratio” Label**, will be used for this purpose. Alternatively, when use of labels is not practical or warranted, paint department gang box meetings, held before each work shift, will be used to notify painters that no thinning is allowed.

[This activity satisfies the requirements of 40 CFR §63.785(c)(2)(ii) and -(3)(ii)]

1.2.3 Paint Crew Daily Records

The paint crew foreman, leadman, or supervisor will be responsible for recording the ambient temperature, the actual volumes used for each coating, the total allowable thinner volume, and the actual volume of thinner used. This form will be returned to the Paint Department clerk, foreman, or supervisor at the end of the work shift for recording in **Form 5, Paint and Thinner Usage Log**.

[This activity meets the requirements of 40 CFR §63.785(c)(2)(iii), and -(3)(iii)]

1.2.4 Thinner Group Designation “By Use”

The coatings grouped with a particular thinner will be determined “by use,” i.e., if a thinner is used with a particular coating during the monthly reporting period, then that coating has been “designated” to that thinner group.

[This activity meets the requirements of 40 CFR §63.785(c)(3)(I)]

1.2.5 Determination of Compliance

At the end of each calendar month, the Paint Department clerk will provide the master coating and thinner usage log to the designated responsible person, who will determine compliance for that period. MACT compliance determination under Options 2 and 3 will be completed for the previous month by the 15th day of each month. The data will be evaluated using Equation 3 of the Rule, as follows:

$$V_{th} = \sum_{i=1}^n (R \times V_b)_i + \sum_{i=1}^n (R_{cold} \times V_{b-cold})_i \quad \text{Eqn.}$$

where

V_{th} = Total allowable volume of thinner for the previous month (L thinner);

V_b = Volume of each batch as supplied and before being thinned, used during non-cold-weather days of the previous month (L coating as supplied);

R_{cold} = Maximum allowable thinning ratio for each batch used during cold-weather days (L thinner/L coating as supplied);

V_{b-cold} = Volume of each batch as supplied and before being thinned, used during cold-weather days of the previous month (L coating as supplied);

I = Each batch of coating; and

n = Total number of batches of the coating.

[This activity meets the requirements of 40 CFR §63.785(c)(2)(iii), -(2)(iv), -(2)(v), -(2)(vi), (3)(iv), -(3)(v), -(3)(vi), and -(3)(vii).]

2. RECORD KEEPING PROCEDURES

The Paint Department clerk, foreman, and environmental manager will maintain all MACT compliance RECORD KEEPING information, including the information listed below, as required for each Option used during the reporting period. Records will be maintained for five years. Reporting will be provided before the 60th day following completion of each 6-month period after the compliance date. (Note: Some RECORD KEEPING items are not reported.)

BASIC CHECKLIST

- ☐ Initial Notification Documentation *
- ☐ Approved Implementation Plan *
- ☐ Volume of Low-Usage -Exempt Coatings by Month
- ☐ Identification of coatings used, EPA categories, and VOHAP limits
- ☐ Certification of As-Supplied VOC Content for each Batch of Coating *
- ☐ Determination whether containers meet standard §63.783(b)(2)
- ☐ Results of Method 24 or other approved measurements on individual containers

OPTIONS

	1 & 4	2 & 4	3 & 4
☐ Certification of As-Applied VOC content by Batch *	x		
☐ Volume of each coating applied	x		
☐ Thinner Density and Vol Fraction Solids for each Batch *		x	x
☐ Maximum Allowable Thinner Ratio for each Batch		x	x
☐ Volume Used of each Batch, (As-Supplied)		x	x
☐ Cold weather dates and times		x	x
☐ Total Allowable Volume of thinner		x	x
☐ Actual Volume of thinner		x	x
☐ ID of coating groups/thinner			x

* Maintained on site but not reported.

[This activity satisfies the requirements of 40 CFR §63.788]

3. **TRANSFER, HANDLING, AND STORAGE PROCEDURES**

Our company management policy takes a proactive role in the development of measures to minimize the likelihood for air pollution. We therefore develop procedures, practices, and equipment on an ongoing basis. The sections below discuss our policy with respect to work practices, and to self-inspection, respectively.

3.0 **Work Practices**

Regarding the transfer and handling of VOHAP-containing materials in a way that minimizes spills, the following elements of our policy are of particular relevance:

- (1) Maintain a neat and orderly work environment including storing hazardous materials and wastes in a way that minimizes the potential for accidental releases.

- (2) Keep lids on liquid volatile material containers when not directly in use.
- (3) Practice clean up procedures to ensure that accidentally spilled solvents and paints are cleaned-up immediately.
- (4) Store solvent contaminated rags, cloths, and materials in a covered container.
- (5) Keep drums closed when not in use and equip drums with tight-fitting lids.
- (6) Use funnels when filling and replace the cap covering the hole once filling is completed (or replace the funnel's lid, if used).
- (7) Dispose of solvent-wipe rags immediately in a covered container.
- (8) Apply the volatile solvents directly to the rag and avoid spraying solvent directly on the surface.
- (9) Avoid the use of VOCs for surface preparation whenever possible (i.e., substitute aqueous cleaners where possible).
- (10) Maintain paint guns and pots to minimize the potential for leaks and improper spraying. (See also section 3.2, *Self-inspection*, below.)
- (11) Clean lines or paint guns in a closed system to capture solvents.
- (12) Provide containment for VOC-containing material storage areas.
- (13) Perform mixing and transfer operations only in designated areas with containment.

[This activity meets the requirements of 40 CFR §63.783(b)(1)]

3.1 Self-Inspection

Our facility policy already prescribes reactions to malfunctions and/or leaks both by maintenance crews and by spill response teams. There are existing notification protocols to alert the appropriate response organization. Effectively, we use self-inspection of every equipment item (e.g., container, drum, vessel, vat, tank pipe, etc.) involved in coating application to determine its integrity. This strategy is executed for every activity and every organizational level associated with coating materials and thinning solvents, from initial receipt within the facility to final application.

[These policies and procedures meet the requirements of 40 CFR §63.783(b)(2).]

For compliance with MACT RECORD KEEPING requirements, we plan to document container self-inspection findings on ***Form 3, Container Compliance Form***. This form will serve as a permanent record, and will be maintained for a minimum of 5 years.

[This activity assures compliance with 40 CFR §63.788(b)(2)(vi).]

APPENDIX A: FORMS

A-OK SHIPYARDS COATING COMPLIANCE CERTIFICATION

☐ AS SUPPLIED

☐ AS APPLIED

ID	Rem	Description	Data																																																																								
A.	Coating	Name/ Identification																																																																									
B.	Coating Manufacturer	Name	I																																																																								
C.	Batch Identification	Count/Volume																																																																									
D.	Supplied By	Source (check one)	☐ Customer ☐ Manufacturer ☐ Government																																																																								
E.	VOC Content	Concentration g/L																																																																									
		Source (check one)	☐ MSDS ☐ M-24 ☐ Technical Data Sheet																																																																								
F.	Coating Category (check one below)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Code</th> <th style="width: 50%;">Description</th> <th style="width: 40%;">VOC Limit, grams/Liter coating</th> </tr> </thead> <tbody> <tr> <td>☐ G1</td> <td>General use</td> <td>340</td> </tr> <tr> <td>☐ S1</td> <td>Air flask</td> <td>340</td> </tr> <tr> <td>☐ S2</td> <td>Antenna</td> <td>530</td> </tr> <tr> <td>☐ S3</td> <td>Antifoulant</td> <td>400</td> </tr> <tr> <td>☐ S4</td> <td>Heat resistant</td> <td>420</td> </tr> <tr> <td>☐ S5</td> <td>High-gloss</td> <td>420</td> </tr> <tr> <td>☐ S6</td> <td>High-temperature</td> <td>500</td> </tr> <tr> <td>☐ S7</td> <td>Inorganic zinc high-build</td> <td>340</td> </tr> <tr> <td>☐ S8</td> <td>Military exterior</td> <td>340</td> </tr> <tr> <td>☐ S9</td> <td>Mist</td> <td>610</td> </tr> <tr> <td>☐ S10</td> <td>Navigational aids</td> <td>550</td> </tr> <tr> <td>☐ S11</td> <td>Nonskid</td> <td>340</td> </tr> <tr> <td>☐ S12</td> <td>Nuclear</td> <td>420</td> </tr> <tr> <td>☐ S13</td> <td>Organic zinc</td> <td>360</td> </tr> <tr> <td>☐ S14</td> <td>Pretreatment wash primer</td> <td>780</td> </tr> <tr> <td>☐ S15</td> <td>Repair/ maintenance of thermoplastics</td> <td>550</td> </tr> <tr> <td>☐ S16</td> <td>Rubber camouflage</td> <td>340</td> </tr> <tr> <td>☐ S17</td> <td>Sealant for thermal spray aluminum</td> <td>610</td> </tr> <tr> <td>☐ S18</td> <td>Special marking</td> <td>490</td> </tr> <tr> <td>☐ S19</td> <td>Specialty interior</td> <td>340</td> </tr> <tr> <td>☐ S20</td> <td>Tack coat</td> <td>610</td> </tr> <tr> <td>☐ S21</td> <td>Undersea weapons systems</td> <td>340</td> </tr> <tr> <td>☐ S22</td> <td>Weld-through precon. primer</td> <td>650</td> </tr> </tbody> </table>	Code	Description	VOC Limit, grams/Liter coating	☐ G1	General use	340	☐ S1	Air flask	340	☐ S2	Antenna	530	☐ S3	Antifoulant	400	☐ S4	Heat resistant	420	☐ S5	High-gloss	420	☐ S6	High-temperature	500	☐ S7	Inorganic zinc high-build	340	☐ S8	Military exterior	340	☐ S9	Mist	610	☐ S10	Navigational aids	550	☐ S11	Nonskid	340	☐ S12	Nuclear	420	☐ S13	Organic zinc	360	☐ S14	Pretreatment wash primer	780	☐ S15	Repair/ maintenance of thermoplastics	550	☐ S16	Rubber camouflage	340	☐ S17	Sealant for thermal spray aluminum	610	☐ S18	Special marking	490	☐ S19	Specialty interior	340	☐ S20	Tack coat	610	☐ S21	Undersea weapons systems	340	☐ S22	Weld-through precon. primer	650	I
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G.	I certify that the VOC content of this product is less than or equal to the allowable federal VOC content for its applicable coating category. Signed _____ Date _____																																																																										

A-OK SHIPYARDS PAINT CREW USAGE FORM

MONTH OF _____

JOB ID _____ CREW ID _____ DATE _____

Requirement	Activity	Item	Description	Value
MACT	COATING (Complete Before Work)	(1)	Mfg. Name	
		(2)	ID	
		(3)	Batch	
		(4)	EPA Category (Note 1);	
		(5)	VOC Limit	
	THINNER (Complete Before Work)	(6)	Manufacturer's Name	
		(7)	ID	
		(8)	Mix Ratio, Normal	
		(9)	Mix Ratio, Cold	
		(10)	Actual Coating Volume	
	MIXING	(11)	Allowable Thinner Vol, Normal	
		(12)	Allowable Thinner Vol, Cold	
		(13)	Actual Thinner Volume	
		(14)	Temperature <40°F (Y/N)	
		(15)	Actual Temp (°F)	
		(16)	Final Volume (Note 2)	
(17)		Volume Applied		
CERTIFICATION	(21)	Date		
	(22)	By		

Note 1: EPA Coating Categories are identified below:

- | | | |
|--|---|--|
| General
G1 General Use
Specialty
S1 Air flask
S2 Antenna
S3 Antifoulant
S4 Heat resistant
S5 High-gloss
S6 High-temperature | S7 Inorganic zinc high-build
S8 Military exterior
S9 Mist
S10 Navigational aids
S11 Nonskid
S12 Nuclear
S13 Organic zinc
S14 Pretreatment wash primer | S15 Remir/ maintenance of thermoplastics
S16 Rubber camouflage
S17 Sealant for thermal spray aluminum
S18 Special marking
S19 Specialty interior
S20 Tack coat
S21 Undersea weapons systems
S22 Weld-through precon. primer |
|--|---|--|

Note 2: (16) = (10) + (12)

From Paint and Thinner Usage Log

A-OK SHIPYARDS CONTAINER COMPLIANCE FORM

MONTH OF _____

[illegible]

A-OK SHIPYARDS METHOD 24 TEST RESULTS FORM ⁽¹⁾

MONTH OF _____

[illegible]

Note (2) R = Received
M = Mixed

Note (8) Select EPA Category from list below

Note (9) Use "*" for cold application (<40°F)

Note (11) L1 = ABC Labs
 L2 = DEF Labs

G1 General use

S1 Air flask

S2 Antenna

S3 Antifoulant

S4 Heat resistant

S5 High-gloss

S6 High-temperature

S8 Military exterior

S9 Mist

S10 Navigational aids

S11 Nonskid

S12 Nuclear

S13 Organic zinc

S14 Pretreatment wash primer

S15 Repair and maintenance of thermoplastics

S16 Rubber camouflage

S17 Sealant for thermal spray aluminum

S18 Special marking

S19 Specialty interior

S20 Tack coat

S21 Undersea weapons systems

S22 Weld-through precon. primer

(1) In compliance with 40 CFR Part 63.788(b)(2).

☐ OPTION 2: Coating Group _____ ☐ OPTION 3: Thinner Group _____Page 17

NO THINNING LABEL

**NO
THINNING**

**In compliance with 40 CFR Part 63.785.
Contact Paint Foreman or _____.**

Maximum Allowable Thinning Label

Maximum Allowable Thinning Ratio	
Ratio	Normal (≥ 40 °F) _____ Cold (< 40 °F) _____
Thinner	<i>USE NO SUBSTITUTES</i> ⁽¹⁾ Mfg. Name _____ Product ID _____ Use no more than _____ gal thinner per gallon paint.
⁽¹⁾ In compliance with 40 CFR Part 63.785. Contact Paint Foreman or _____	

MARINE COATING ALLOWABLE THINNING RATIO CALCULATION SHEET (SIDE 1) FOR OPTIONS 2 AND 3

A	Coating	Batch Number
		Manufacturer
		ID
		Category
B	Thinner	Manufacturer
		ID

Step	Instructions (Use VOC data collection sheet for this batch of coating)	Calculations
1	Enter Vs the volume fraction solids in the batch as supplied, (liter solid/ liter coating) on lines 1a and 1 b.	1a _____ % 1b _____ %
2	Enter VOHAP LIMIT, for normal and for cold operation, based on the coating category (see side 2)	$t \geq 4.5^{\circ}\text{C}$ $t \leq 4.5^{\circ}\text{C}$ 2a _____ 2b _____
3	Multiply line 1a times line 2a and enter the results on line 3a. Multiply line 1b times line 2b and enter the results on line 3b.	3a _____ 3b _____
4	Calculate M_{voc} the VOC Content of the Batch	
	Enter Method 24 M_v , mass fraction Total Volatiles.	4.1 _____ %
	Enter M_w the mass fraction Water.	4.2 _____ %
	Subtract line 4.2 from line 4.1, enter difference.	4.3 _____ %
	Enter Dc the Coating Density, grams/liter.	4.4 _____
I	Multiply line 4.3 times line 4.4, enter result on lines 4a and 4b.	4a _____ 4b _____
5	Subtract line 4a from 3a and enter results on line 5a Subtract line 4b from 3b and enter result on line 5b. STOP if negative. See Supervisor.	5a _____ 5b _____
6	Enter D_t the Thinner Density, grams/liter, on lines 6a and 6b.	6a _____ 6b _____
7	Divide line 5a by line 6a and enter result on line 7a. Divide line 5b by line 6b and enter result on line 7b.	R_N R_c 7a _____ 7b _____
8	Enter line 7a: Use no more than _____ gallons thinner per gallon coating for normal temperatures. Enter line 7b: Use no more than _____ gallons thinner per gallon coating for cold temperatures.	

MARINE COATING ALLOWABLE THINNING RATIO CALCULATION SHEET (SIDE 1) FOR OPTION 4

A	Coating	Batch Number Manufacturer ID Category
B	Thinner	Manufacturer ID

Step	Instructions (Use VOC data collection sheet for this batch of coating)	Calculations
1	Enter V_s the volume fraction solids in the batch as supplied, (liter solid/ liter coating) on lines 1a and 1b.	1a _____ % 1b _____ %
2	Enter VOHAP LIMIT, for normal and for cold operation, based on the coating category (see side 2)	$t \geq 4.5^\circ\text{C}$ $t < 4.5^\circ\text{C}$ 2a _____ 2b _____
3	Multiply line 1a times line 2a and enter the results on line 3a Multiply line 1b times line 2b and enter the results on line 3b.	3a _____ 3b _____
4	Enter the VOHAP content, grams/liter, of the batch on lines 4a and 4b. <i>Note: VOHAP content was determined using EPA approved test method:</i>	4a _____ 4b _____
5	Enter $D_{thvohap}$ the average Density of the VOHAP Thinners, grams/liter, on lines 5a and 5b.	5a _____ 5b _____
6	Divide line 4a by line 5a and enter result on line 6a. Divide line 4b by line 5b and enter result on line 6b.	RX R c 6 a _____ 6 b _____
7 Enter line 6a: Use no more than _____ gallons thinner per gallon coating for normal temperatures. Enter line 6b: Use no more than _____ gallons thinner per gallon coating for cold temperatures.		

MARINE COATING ALLOWABLE THINNING RATIO CALCULATION SHEET (SIDE 2)

Coating Category:		VOHAP limits grams/liter solids	
		$t \geq 4.5^{\circ}\text{C}$	$t \leq 4.5^{\circ}\text{C}$
General	G1 General use	5 7 1	728
Specialty	S1 Air flask	5 7 1	728
	S2 Antenna	1,439	—
	S3 Antifoulant	7 6 5	971
	S4 Heat resistant	8 4 1	1,069
	S5 High-gloss	8 4 1	1,069
	S6 High-temperature	1,237	1,597
	S7 Inorganic zinc high-build	571	728
	S8 Military exterior	5 7 1	728
	S9 Mist	2,235	—
	S10 Navigational aids	1,597	—
	S11 Nonskid	5 7 1	728
	S12 Nuclear	8 4 1	1,069
	S13 Organic zinc	6 3 0	802
	S14 Pretreatment wash primer	11,095	--
	S15 Repair and maintenance of thermoplastics	1,597	--
	S16 Rubber camouflage	571	728
	S17 Sealant for thermal spray aluminum	2,235	--
	S18 Special marking	1,178	--
	S19 Specialty interior	571	728
	S20 Tack coat	2,235	--
	S21 Undersea weapons systems	571	728
	S22 Weld-through, precon. primer	2,235	—

Note: To convert from g/L to lb/gal, multiply by (3.785 L/gal) (1/453.6 lb/g) or 1/120. For compliance purposes, metric units define the standards.

Note: Cold-weather allowances are not given to coatings in categories that permit over a 40 percent VOHAP content by volume. Such coatings are subject to the same limits regardless of weather conditions.

APPENDIX B: MARINE COATING DATA SHEETS

VOC DATA SHEET

PROPERTIES OF THE MARINE COATING OR THINNER "AS SUPPLIED" BY THE MANUFACTURER

Manufacture: _____ Product Identification: _____

Is this product a coating or thinner? COATING THINNER _____

If product is a coating or paint please provide the information in the box below and provide all information for Items A through J below:

MACT Coating Category: General Use or Specialty Coating _____
If Coating is a Speciality Coating Please list the specific Category type(s) below. (Use attached list of marine coating speciality categories):

If the product is thinner or reducer, please provide the information requested in Items D through J below:

Properties of the coating or thinner as supplied to the customer

- A. Coating Density (D_c) _____ g/L or _____ lbs/gal [] ASTM D1475-90 [] Other
- B. Total Volatiles: Mass Percent [] ASTM D2369-93 [] Other
- C. Cure Volatiles Content (C_{cv}) _____ g/L or _____ lbs/gal [] Calculated [] Other
- D. Organic Volatiles: (M_o) _____ Mass Percent [] Calculated [] Other
- E. Water Content
1. (M_w) _____ Mass Percent [] ASTM D3792-91 [] ASTM D4017-90 [] Other
2. (V_w) _____ Volume Percent [] Calculated [] Other
- F. Exempt Compounds Content (C_{ex}) _____ g/L or _____ lbs/gal [] Calculated [] Other
- G. Nonvolatile: (V_s) _____ Volume Percent [] Calculated [] Other
- H. VOC Content (VOC):
1. _____ g/L or _____ lbs/gal solids (nonvolatiles)
2. _____ g/L or _____ lbs/gal coating (less water and exempt compounds)
- I. Thinner Density: (D_{th}) _____ g/L or _____ lbs/gal ASTM _____ [] Other

- J. Coating Speciation: Provide the percentage of each chemical component of this coating or thinner. (If only a percentage range can be supplied, the range mean will be used to calculate VOC and HAP emissions.) This information is not required for compliance with the shipyard MACT, however other federal and/or state environmental regulations require this data. By providing this information now it will avoid the possibility that the shipyard will make redundant requests for the data in the future.

COATING OR THINNER COMPONENT

MASS PERCENTAGE

Nonvolatile Components, Water and Exempt Compounds

1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____
8. _____	_____
9. _____	_____
_____	_____

Organic Volatile Components:

1. _____	_____
2. _____	_____
3. _____	_____
4. _____	_____
5. _____	_____
6. _____	_____
7. _____	_____
8. _____	_____
9. _____	_____
10. _____	_____

Signed: _____

Dated _____

VOLATILE ORGANIC HAP (VOHAP) LIMITS FOR MARINE COATINGS

Coating Category	VOHAP limits ^{a,b-c}		
	grams/liter coating (minus water and exempt compounds)	grams/liter solids ^d	
		t ≥ 4.5°C	t ≤ 4.5°C ^e
General use	340	571	728
Specialty	-	--	—
Air flask	340	571	728
Antenna	530	1,439	—
Antifoulant	400	765	971
Heat resistant	420	841	1,069
High-gloss	420	841	1,069
High-temperature	500	1,237	1,597
Inorganic zinc high-build	340	571	728
Military exterior	340	571	728
Mist	610	2,235	—
Navigational aids	550	1,597	—
Nonskid	340	571	728
Nuclear	420	841	1,069
Organic zinc	360	630	802
Pretreatment wash primer	780	11,095	--
Repair and maint. of thermoplastics	550	1,597	--
Rubber camouflage	340	571	728
Sealant for thermal spray aluminum	610	2,235	--
Special marking	490	1,178	—
Specialty interior	340	571	728
Tack coat	610	2,235	—
Undersea weapons systems	340	571	728
Weld-through precon. primer	650	2,885	--

^aThe limits are expressed in two sets of equivalent units. Either set of limits may be used for the compliance procedure described in §63.785(c)(1), but only the limits expressed in units of g/L solids (nonvolatiles) shall be used for the compliance procedures described in §63.785(c)(2)-(4).

^bVOHAP (including exempt compounds listed as HAPs) shall be used as a surrogate for VOHAP for those compliance procedures described in §63.785(c)(1)-(3).

^cTo convert from g/L to lb/gal, multiply by (3.785 L/gal)(4.536 lb/g) or 1/120. For compliance purposes, metric units define the standards.

^dVOHAP limits expressed in units of mass of VOHAP per volume of solids were derived from the VOHAP limits expressed in units of mass of VOHAP per volume of coating assuming the coatings contain no water or exempt compounds and that the volumes of all components within a coating are additive.

^eThese limits apply during cold-weather time periods, as defined in §63.782. Cold-weather allowances are not given to coatings in categories that permit over a 40 percent VOHAP content by volume. Such coatings are subject to the same limits regardless of weather conditions.

Shipyard MACT Marine Coating Expressions and Equations

Fraction	Constituents	Volume Expression	Mass Expression
Organic	Organic-Volatiles	V_v	NI_v
	Exempt-Volatiles	V_E	M_E
Aqueous	Water	V_w	M_w
Solid	Non-Volatiles	V_s	M_s
“Cure-Volatiles”	Reaction Volatiles		M_c

Coating Property			Expression	units
A	D_s	Coating Density	$\sum M_i / \sum V_i$	grams/liter
B	M_v	Total Volatiles (mass percent)	$(M_v + M_E + M_w + M_c) / \sum M_i$	%
C	C_{cm}	Cure Volatiles Content	$M_c / \sum V_i$	grams/liter
D	M_v	Organic Volatiles (mass percent)	$(M_v + M_E) / \sum M_i$	%
E ₁	M_w	Water Content (mass percent)	$M_w / \sum M_i$	%
E ₂	V_w	Water Content (volume percent)	$V_w / \sum V_i$	%
F	C_{ex}	Exempt Compounds Content****	$M_E / \sum V_i$	grams/liter
G	v_s	Nonvolatiles (volume percent)	$V_s / \sum V_i$	%
H ₁		VOC Content (nonvolatiles)	$(M_v) / v_s$	grama/liter
H ₂		VOC Content (less water & exempt compounds)****	$(M_v) / (v_s + v_v)$	grams/liter
I	D_m	Thinner Density	$\sum M_i / \sum V_i$	grams/liter

Acetone was recently identified to have a low photochemical reactivity, as a result it was added to the list of “exempt” compounds. When Method 24 in 40 CFR Part 60 was published, acetone was considered a VOC. Therefore, the method that will be used to determine the acetone content in a coating should be specified. This is also applicable to any new addition to the list of exempt compounds, unless an EPA approved test method already exists.

In calculating the mass of VOCs in a coating the “exempt” compounds which are on the HAP list should not be subtracted from the mass of total volatiles.

40 CFR 51.100 (s) - Exempt Compounds

(s) Volatile organic compounds (VOC) means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions.

(1) This includes any such organic compound other than the following, which have been determined to have negligible photochemical reactivity

acetone;
methane;
ethane;
methylene chloride (dichloromethane);
1,1,1-trichloroethane (methyl chloroform);
1,1,1-trichloro-2,2,2-trifluoroethane (CFC-113);
trichlorofluoromethane (CFC-11);
dichlorodifluoromethane (CFC-12);
chlorodifluoromethane (CFC-22);
trifluoromethane (FC-23);
1,2-dichloro 1,1,2-tetrafluoroethane (CFC-114);
chloropentafluoroethane (CFC-115);
1,1,1-trifluoro 2,2-dichloroethane (HCFC-123);
1,1,1,2-tetrafluoroethane (HFC-134a);
1,1-dichloro 1-fluoroethane (HCFC-141b);
1-chloro 1,1-difluoroethane (HCFC-142b);
2-chloro-1,1, 1,2- tetrafluoroethane (HCFC-124);
pentafluoroethane (HFC-125);
1,1,2,2- tetrafluoroethane (HFC-134);
1,1, 1-trifluoroethane (HFC-143a);
1,1 -difluoroethane (HFC-152a);

and perfluorocarbon compounds which fall into these classes:

- (i) Cyclic, branched or linear, completely fluorinated alkanes;
- (ii) Cyclic, branched or linear, completely fluorinated ethers with no unsaturations;
- (iii) Cyclic, branched or linear, completely fluorinated tertiary amines with no unsaturations; and
- (iv) Sulfur containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

(2) For purposes of determining compliance with emissions limits, VOC will be measured by the test methods in the approved State implementation plan (SIP) or 40 CFR part 60, appendix A as applicable. Where such a method also measures compounds with negligible photochemical reactivity, these negligibly-reactive compounds may be excluded as VOC if the amount of such compounds is accurately quantified and such exclusion is approved by the enforcement authority.

APPENDIX C: COATING DEFINITIONS

General use coating

GI General use coating means any coating that is not a specialty coating.

Specialty coating

means any coating that is manufactured and used for one of the specialized applications described within this list of definitions.

S1	Air flask specialty coating	means any special composition coating applied to interior surfaces of high pressure breathing air flasks to provide corrosion resistance and that is certified safe for use with breathing air supplies.
S2	Antenna specialty coating	means any coating applied to equipment through which electromagnetic signals must pass for reception or transmission.
S3	Antifoulant specialty coating	means any coating that is applied to the underwater portion of a vessel to prevent or reduce the attachment of biological organisms and that is registered with the EPA as a pesticide under the Federal Insecticide, Fungicide, and Rodenticide Act.
S4	Heat resistant specialty coating	means any coating that during normal use must withstand a temperature of at least 204°C (400°F).
S5	High-gloss specialty coating	means any coating that achieves at least 85 percent reflectance on a 60 degree meter when tested by ASTM Method D523 (incorporation by reference-see \$63.14).
S6	High-temperature specialty coating	means any coating that during normal use must withstand a temperature of at least 426°C (800°F).
S7	Inorganic zinc (high-build) specialty coating	means a coating that contains 960 grams per liter (8 pounds per gallon) or more elemental zinc incorporated into an inorganic silicate binder that is applied to steel to provide galvanic corrosion resistance. (These coatings are typically applied at more than 2 mil dry film thickness.)
S8	Military exterior specialty coating	or Chemical Agent Resistant Coatings (“CARC”) means any exterior topcoat applied to military or U.S. Coast Guard vessels that are subject to specific chemical, biological, and radiological washdown requirements.
S9	Mist specialty coating	means any low viscosity, thin film epoxy coating applied to an inorganic zinc primer that penetrates the porous zinc primer and allows the occluded air to escape through the paint film prior to curing.
S10	Navigational aids specialty coating	means any coating applied to Coast Guard buoys or other Coast Guard waterway markers when they are recoated aboard ship at their usage site and immediately returned to the water.
S11	Nonskid specialty coating	means any coating applied to the horizontal surfaces of a marine vessel for the specific purpose of providing slip resistance for personnel, vehicles, or aircraft.

S12	Nuclear specialty coating	means any protective coating used to seal porous surfaces such as steel (or concrete) that otherwise would be subject to intrusion by radioactive materials. These coatings must be resistant to long-term (service life) cumulative radiation exposure (ASTM D4082-89 [incorporation by reference--see §63.14]), relatively easy to decontaminate (ASTM D4256-89 [reapproved 1994] [incorporation by reference--see §63.14]), and resistant to various chemicals to which the coatings are likely to be exposed (ASTM D3912-80 [incorporation by reference--see §63.14]). [Nuclear coatings should meet the general protective requirements outlined by the Department of Energy (formerly U.S. Atomic Energy Commission Regulatory Guide 1.54).]
S13	Organic zinc specialty coating	means any coating derived from zinc dust incorporated into an organic binder that contains more than 960 grams of elemental zinc per liter (8 pounds per gallon) of coating, as applied and that is used for the expressed purpose of corrosion protection.
S14	Pretreatment wash primer specialty coating	means any coating that contains a minimum of 0.5 percent acid by mass, and is applied only to bare metal to etch the surface and enhance adhesion of subsequent coatings.
S15	Repair and maintenance of thermoplastic coatingk/commercial vessels	means any vinyl, chlomated rubber, or bituminous resin coating that is applied over the same type of existing coating to perform the partial recoating of any in-use commercial vessel. (This deftition does not include coal tar epoxy coatings, which are considered "general use" coatings.)
S16	Rubber camouflage specialty coating	means any specially formulated epoxy coating used as a camouflage topcoat for exterior submarine hulls and sonar domes.
S17	Sealant for thermal spray aluminum	means any epoxy coating applied to thermal spray aluminum surfaces at a maximum thickness of 1 dry roil.
S18	Special marking specirdty coating	means any coating that is used for safety or identification applications, such as markings on flight decks and ships' numbers.
S19	Specialty interior coating	means any coating used on interior surfaces aboard U.S. militry vessels pursuant to a coating specification that requires the coating to meet specified fire retardant and low toxicity requirements, in addition to the other applicable military physical and performance requirements.
S20I	Tack specialty coating	means any thin film epoxy coating applied at a maximum thickness of 2 dry roils to prepare an epoxy coating that has dried beyond the time limit specified by the manufacturer for the application of the next coat.
S21	Undersea weapons systems specialty coating	means any coating applied to any component of a weapons system intended to be launched or fired from under the sea
S22	Weld-through preconstruction primer (specialty coating)	means a coating that provides corrosion protection for steel during inventory, is typically applied at less than 1 mil dry film thickness, does not require removal prior to welding, is temperature resistant (burn back from a weld is less than 1.25 centimeters [0.5 inches]), and does not normally require removal before applying film-building coatings, including inorganic zinc high-build coatings. When constructing new vessels, there may be a need to remove areas of weld-through preconstruction primer due to surface damage or contamination prior to application of film-building coatings.

THREE:
THINNING RATION CALCULATION SHEETS
FOR
OPTIONS 2 & 3
AND
OPTION 4

MARINE COATING ALLOWABLE THINNING RATIO CALCULATION SHEET (SIDE 1) FOR OPTIONS 2 AND 3

A	Coating	I	Batch Number _____ Manufacturer _____ ID _____ Category _____
B	Thinner		Manufacturer _____ ID _____

Step	Instructions (Use VOC data collection sheet for this batch of coating)	Calculations	Calculations
1	Enter Vs the volume fraction solids in the batch, as supplied (liter solid/ liter coating) on lines 1a and 1b.	1a _____ %	1b _____ %
2	Enter VOHAP LIMIT, for normal and for cold operation, based on the coating category (see side 2)	t ≥ 4.5°C 2a _____	t ≤ 4.5°C 2b _____
3	Multiply line 1a times line 2a and enter the results on line 3a. Multiply line 1b times line 2b and enter the results on line 3b.	3a _____	3b _____
4	Calculate Mvoc the VOC Content of the Batch Enter Method 24 Mv , mass fraction Total Volatiles. 4.1 _____ % Enter Mw , the mass fraction Water. 4.2 _____ % Subtract line 4.2 from line 4.1, enter difference. 4.3 _____ % Enter Dc the Coating Density, grams/liter. 4.4 _____ Multiply line 4.3 times line 4.4, enter result on lines 4a and 4b.	4a _____	4b _____
5	Subtract line 4a from 3a and enter results on line 5a Subtract line 4b from 3b and enter result on line 5b. STOP if negative. See Supervisor.	5a _____	5b _____
6	Enter Dt the Thinner Density, grams/liter, on lines 6a and 6b.	6a _____	6b _____
7	Divide line 5a by line 6a and enter result on line 7a. Divide line 5b by line 6b and enter result on line 7b.	RN 7a _____	Rc 7b _____
8 Enter line 7a: Use no more than _____ gallons thinner per gallon coating for normal temperatures. Enter line 7b: Use no more than _____ gallons thiunner per gallon coating for cold temperatures.			

MARINE COATING ALLOWABLE THINNING RATIO CALCULATION SHEET (SIDE 1) FOR OPTIONS 4

A	Coating	Batch Number _____ Manufacturer _____ ID _____ Category _____
B	Thinner	Manufacturer _____ ID _____

Step	Instructions (Use VOC data collection sheet for this batch of coating)	Calculations
1	Enter Vs the volume fraction solids in the batch, as supplied (liter solid/ liter coating) on lines 1a and 1b.	1a _____ % 1b _____ %
2	Enter VOHAP LIMIT , for normal and for cold operation, based on the coating category (see side 2)	$t \geq 4.5^{\circ}\text{C}$ $t \leq 4.5^{\circ}\text{C}$ 2a _____ 2b _____
3	Multiply line 1a times line 2a and enter the results on line 3a. Multiply line 1b times line 2b and enter the results on line 3b.	3a _____ 3b _____
4	Enter the VOHAP content, grams/liter, of the batch on lines 4a and 4b. <i>Note: VOHAP content was determined using EPA approved test method:</i>	4a _____ 4b _____
5	Enter <i>D_{thvohap}</i> the average Density of the VOHAP Thinners, grams/liter, on lines 5a and 5b.	5a _____ 5b _____
6	Divide line 4a by line 5a and enter result on line 6a. Divide line 4b by line 5b and enter result on line 6b.	R_N R_N 6a _____ 6b _____
7 Enter line 6a: Use no more than _____ gallons thinner per gallon coating for normal temperatures. Enter line 6b: Use no more than _____ gallons thinner per gallon coating for cold temperatures.		

MARINE COATING ALLOWABLE THINNING RATIO CALCULATION SHEET (SIDE 2)

Coating Category:		VOHAP limits grams/liter solids	
		t ≥ 4.5 °c	t ≤ 4.5 °c
General	G1 General use	5 7 1	728
Specialty	S1 Air flask	5 7 1	728
	S2 Antenna	1,439	--
	S3 Antifoulant	7 6 5	971
	S4 Heat resistant I	8 4 1	1,069
	S5 High-gloss	8 4 1	1,069
	S6 High-temperature I	1,237	1,597
	S7 Inorganic zinc hgh-build I	5 7 1	728
	S8 Military exterior I	5 7 1	728
	S9 Mist	2,235	--
	S10 Navigational aids I	1,597	
	S11 Nonskid I	5 7 1	728
	S12 Nuclear I	8 4 1	1,069
	S13 Organic zinc I	6 3 0	802
	S14 Pretreatment wash primer I	11,095	--
	S15 Repair and maintenance of thermoplastics	1,597	--
	S16 Rubber camouflage	571	728
	S17 Sealant for thermal spray aluminum	2,235	
	S18 Special marking	1,178	
	S19 Specialty interior	571	728
	S20 Tack coat I	2,235	–
	S21 Undersea weapons systems I	5 7 1	728
	S22 Weld-throu gh precon. mimer	2,885	

Note: To convert from g/L. to lb/gal, multiply by (3.785 L/gal) (1/453.6 lb/g) or 1/120. For compliance purposes, metric units define the standards.

Note: Cold-weather allowances are not given to coatings in categories that permit over a 40 percent VOHAP content by volume. Such coatings are subject to the same limits regardless of weather conditions.

MARINE COATING ALLOWABLE THINNING RATIO CALCULATION SHEET (SIDE 1)

A	Coating PR0369-4009	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">Batch Number</td> <td style="border-bottom: 1px solid black;">_1234_</td> </tr> <tr> <td>Manufacturer</td> <td style="border-bottom: 1px solid black;">_SIGMA_</td> </tr> <tr> <td>ID</td> <td style="border-bottom: 1px solid black;">_PR0369-4009_</td> </tr> <tr> <td>Category</td> <td style="border-bottom: 1px solid black;">_GENERAL USE_</td> </tr> </table>	Batch Number	_1234_	Manufacturer	_SIGMA_	ID	_PR0369-4009_	Category	_GENERAL USE_
Batch Number	_1234_									
Manufacturer	_SIGMA_									
ID	_PR0369-4009_									
Category	_GENERAL USE_									
B	Thinner 91-92	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">Manufacturer</td> <td style="border-bottom: 1px solid black;">_SIGMA_</td> </tr> <tr> <td>ID</td> <td style="border-bottom: 1px solid black;">_91-92_</td> </tr> </table>	Manufacturer	_SIGMA_	ID	_91-92_				
Manufacturer	_SIGMA_									
ID	_91-92_									

Step	Instructions (Use VOC data collection sheet for this batch of coating)	Calculations	
1	Enter Vs the volume fraction solids in the batch as supplied (liter solid/ liter coating) on lines 1a and 1b.	1a 61.28 %	1b 61.28 %.
2	Enter VOHAP LIMIT, for normal and for cold operation, based on the coating category (see side 2)	t ≥ 4.5°C 2a 571	t ≤ 4.5°C 2b 728
3	Multiply line 1a times line 2a and enter the results on line 3a. Multiply line 1b times line 2b and enter the results on line 3b.	3a 349.9	3b 446.1
4	Calculate Mvoc the VOC Content of the Batch Enter Method 24 Mv the mass fraction Total Volatiles. 4.1 25.12 %. Enter Mw the mass fraction Water. 4.2 0.0 % Subtract line 4.2 from line 4.1, enter difference. 4.3 25.12 % Enter <u>DC</u> the Coating Density, grams/liter. 4.4 1313.0 Multiply line 4.3 times line 4.4, enter result on lines 4a and 4b. 4a 329.8 4b 329.8		
5	Subtract line 4a from 3a and enter results on line 5a. Subtract line 4b from 3b and enter result on line 5b. STOP if negative. See Supervisor.	5a 20.1	5b 116.3
6	Enter <i>D_{th}</i> the Thinner Density, grams/liter, on lines 6a and 6b.	6a 848	6b 848
7	Divide line 5a by line 6a and enter result on line 7a. Divide line 5b by line 6b and enter result on line 7b.	R _N 7a 0.024	R _C 7b 0.137
8	Enter line 7a: Use no more than <u>0.024</u> gallons thinner per gallon coating for normal temperatures. Enter line 7b: Use no more than <u>0.137</u> gallons thinner per gallon coating for cold temperatures.		

FOUR:
NOTIFICATION FORMS

AOK SHIPYARDS
The Best in the West

13 June 1996

EPA Region V
Director, Air and Radiation Division
77 West Jackson Blvd.
Chicago, IL 60604-3507

RE: 40 CFR PART 63, SUBPART II
National Emission Standards for Shipbuilding and Ship Repair (Surface Coating)

Dear Sir:

AOK Shipyard is pleased to submit the enclosed Implementation Plan for your review and approval. Our Implementation Plan is fully compliant with all requirements of the subject Rule.

We have also enclosed the required Initial Notification form. Our facility is located in <STATD>, where

- ☐ The State has been delegated authority. You are provided herein a copy of the Initial Notification sent in its original to

- ☐ Your office is the delegated authority. This is the single original Initial Notification.

If you have any questions, please contact me personally at (618) 955-1234.

Sincerely yours,

Richard L. Jones
Environmental Manager

SHIPYARD MACT RULE
40 CFR PART 63, SUBPART II
NATIONAL EMISSION STANDARDS FOR SHIPBUILDING AND SHIP REPAIR (SURFACE COATING)

INITIAL NOTIFICATION

A APPLICANT'S NAME AND ADDRESS AOK SHIPYARDS 2245 Tower Drive Rolling Meadow, Illinois 60822-2543
B FACILITY'S NAME AND ADDRESS AOK SHIPYARDS 128 South Industrial Boulevard Pineville, Illinois 68234-2543
C. RELEVANT STANDARD 40 CFR PART 63, SUBPART II <i>Natwnal Emission Standards for Shipbuilding and Ship Repair (Surface Coating)</i>
D COMPLIANCE DATE The relevant standard became effective on 12/15/95. The compliance date for the relevant standard is <date>.
E INITIAL STARTUP DATE AOK SHIPYARDS began operations on <date> and was in operation when the relevant standard was enacted.

AOK SHIPYARDS
The Best in the West

13 June 1996

EPA Region V
Director, Air and Radiation Division
77 West Jackson Blvd.
Chicago, IL 60604-3507

RE: 40 CFR PART 63, SUBPART II
National Emission Standards for Shipbuilding and Ship Repair (Surface Coating)

Dear Sir

AOK Shipyard currently has a potential to emit hazardous air pollutants ("HAP") in amounts greater than 25 tons per year of all combined HAPs and/or 10 tons per year of an individual HAP. AOK Shipyard would therefore be classified as a "major" source of hazardous air pollutants and be subject to the requirements of the National Emission Standards for Shipbuilding and Ship Repair (Surface Coating) Maximum Achievable Control Technology ("MACT"). This letter is to inform you that AOK Shipyard is intending to accept a federally enforceable limit on its potential to emit hazardous air pollutants ("HAP"), on or before <compliance date>, to a level less than 25 tons per year of all combined HAPs and 10 tons per year of any individual HAP. This action will make AOK Shipyard an "area" source of hazardous air pollutants and therefore not subject to the requirements of the shipyard MACT.

We have also enclosed the required Initial Notification form. Our facility is located in <STATE>, where

- ☐ The State has been delegated authority. You are provided herein a copy of the Initial Notification sent in its original to:

- ☐ Your office is the delegated authority. This is the single original Initial Notification.

If you have any questions, please contact me personally at (618) 955-1234.

Sincerely yours,

Richard L. Jones
Environmental Manager

SHIPYARD MACT RULE
40 CFR PART 63, SUBPART II
NATIONAL EMISSION STANDARDS FOR SHIPBUILDING AND SHIP REPAIR (SURFACE COATING)

INITIAL NOTIFICATION

A. APPLICANT'S NAME AND ADDRESS

AOK SHIPYARDS
2245 Tower Drive
Rolling Meadow, Illinois 60522-2543

B. FACILITY'S NAME AND ADDRESS

AOK SHIPYARDS
128 South Industrial Boulevard
Pineville, Illinois 60234-2543

C. RELEVANT STANDARD

40 CFR PART 63, SUBPART II
National Emission Standards for Shipbuilding and Ship Repair (Surface- Coating)

D. COMPLIANCE DATE

The relevant standard became effective on 12/15/95. The compliance date for the relevant standard is <date>.

E. INITIAL STARTUP DATE

AOK SHIPYARDS began operations on <date> and was in operation when the relevant standard was enacted.

FIVE:
“LOW-USAGE EXEMPTION” FORM
AND
“UNAFFECTED MAJOR SOURCE” FORM

ABC INDUSTRIES

"LOW-USAGE EXEMPT" COATING USAGE LOG

YEAR _____[illegible]

Note 1: EPA Coating Categories are identified below:

General

G1 **General Use**

Specialty

S1 Air flask

S2 Antenna

S3 Antifoulant

S4 Heat resistant

S5 High-gloss

S6 High-temperature

S7 Inorganic zinc high-build

S8 Military exterior

S9 Mist

S10 Navigational aids

S11 Nonskid

S12 Nuclear

S13 Organic zinc

S14 Pretreatment wash primer

S15 Repair/ maint. of thermoplastics

S16 Rubber camouflage

S17 Sealant for thermal spray aluminum

S18 Special marking

S19 Specialty interior

S20 Tack coat

S21 Undersea weapons systems

S22 Weld-through precon. primer

Complies with 40 CFR Part 63.781(b). Individual coating limit is 200 liters (52.8 gal), total for all coatings is limited to 1,000 liters (264 gal).

ABC INDUSTRIES

YEAR

	(1)	(2)	(3)
	Coating ID & Description of Use	Date Applied	Volume Applied
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			
		Monthly Total	
		Annual Cumulative	

Use additional sheet if required to record monthly coating application. Records must be complied monthly and retained for five years. Annual total for all coatings is limited to 1,000 liters (264 gal).

Complies with 40 CFR Part 63.788(b).

Additional copies of this report can be obtained from the
National Shipbuilding Research and Documentation Center:

<http://www.nsnet.com/docctr/>

Documentation Center
The University of Michigan
Transportation Research Institute
Marine Systems Division
2901 Baxter Road
Ann Arbor, MI 48109-2150

Phone: 734-763-2465
Fax: 734-936-1081
E-mail: Doc.Center@umich.edu