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AFOEHL REPORT 89-112EQ0998KEF



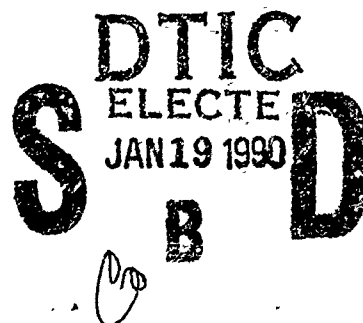
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**Compliance Testing of the Clear AFS
Power Plant, Coal-Fired Boiler 1
Clear AFS AK**

PAUL T. SCOTT, Capt, USAF

October 1989

Final Report



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AF Occupational and Environmental Health Laboratory (AFSC)
Human Systems Division
Brooks Air Force Base, Texas 78235-5501

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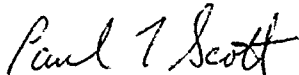
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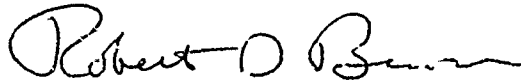
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19. ABSTRACT (Continue on reverse if necessary and identify by block number) The 13 MWS/DE through HQ AFSPACECOM/SG requested AFOEHL Air Quality Function conduct source emission testing of the Clear AFS Power Plant to determine compliance with applicable Alaska Air Quality Control Codes. The Alaska Department of Environmental Conservation required testing of one representative boiler for permit compliance and to determine operating limitations for each boiler. At 80,000 lbs steam/hour particulate emissions were within emission limits allowed by the State of Alaska. <i>key words:</i> Waste oil burning; Combustion products;					
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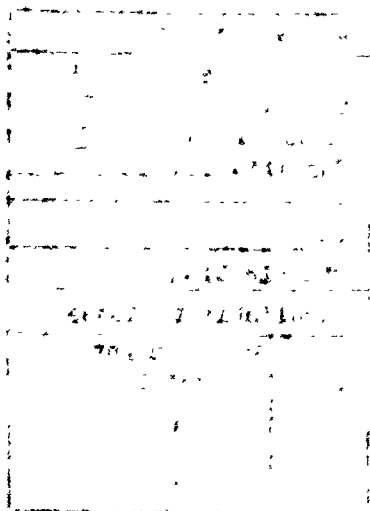
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I. INTRODUCTION

On 19-22 Jun 1989, stationary compliance testing for particulates and visible emissions was accomplished on boiler 1 of the Clear AFS Power Plant by personnel of the Air Quality Function, Environmental Quality Division, Air Force Occupational and Environmental Health Laboratory (AFOEHL). This survey was requested by 13 MWS/DE via HQ AFSPACECOM/SG to satisfy renewal requirements of Alaska Department of Environmental Conservation (DEC) Air Quality Control Permit to Operate No. 8731-AA004. Personnel involved with on-site testing are listed in Appendix A.

II. DISCUSSION

A. Background

On 3 February 1987 Clear AFS requested a permit modification to allow limited burning of waste oil for their power plant shown in Figure 1. The Alaska DEC rescinded Permit to Operate No. 8331-AA003 and issued Permit No. 8731-AA004 (Appendix B) allowing the burning of waste oil. As a condition of this new permit and the Alaska DEC, source testing was required to determine particulate and visible emissions of one representative boiler in conformance with Title 40, Code of Federal Regulations, Chapter 60.8 (40 CFR 60.8) and 40 CFR 60, Appendix A, to certify compliance with Title 18, Alaska Administrative Code, Chapter 50 - Air Quality Control (18 AAC 50). The source testing was required before the expiration of permit No. 8731-AA004 on 30 January 1990. In addition, the permit limits the operation of the boilers to the maximum steam load at which the associated visible and particulate emissions meet the applicable standards.

The Clear AFS Power Plant and 13 MWS/DE through AFSPACECOM/SG requested the services of AFOEHL to concurrently determine particulate emissions and visible emissions from a representative boiler in accordance with 40 CFR 60, Appendix A, Reference Methods 1-5 and Reference Method 9, respectively.

B. Site Description

The Clear AFS Power Plant operates three spreader-stoker coal-fired boilers. The three identical boilers, installed and built by Erie City Iron Works, became operational in June 1961 and were originally rated at 100,000 pounds of steam per hour (lbs steam/hr). The boilers primarily supply steam to three General Electric (GE) steam turbine generators. Each GE turbine produces 7.5 Megawatts of electrical power, and at least two turbines are always on line.

Air pollution controls for each boiler consist of a number of multiclone mechanical dust collectors (Figure 2) manufactured by Cycl-Trel and located in the boiler exhaust duct upstream of the induced draft fan. The exhaust effluent from each boiler is ducted to a separate exhaust stack extending through the roof of the power plant. Figure 3 shows the exhaust stack of boiler 1.

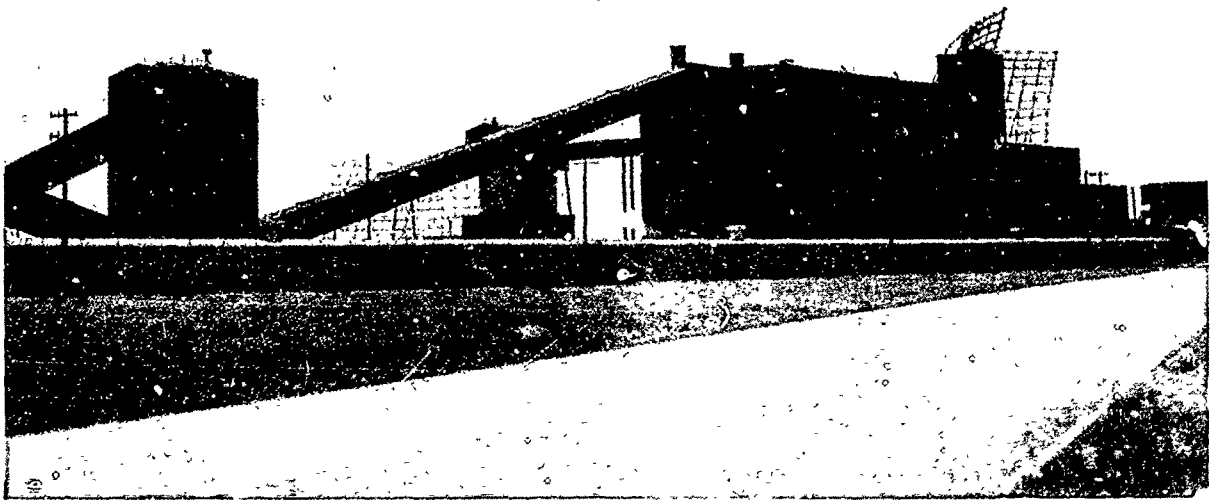


Figure 1. Clear AFS Power Plant

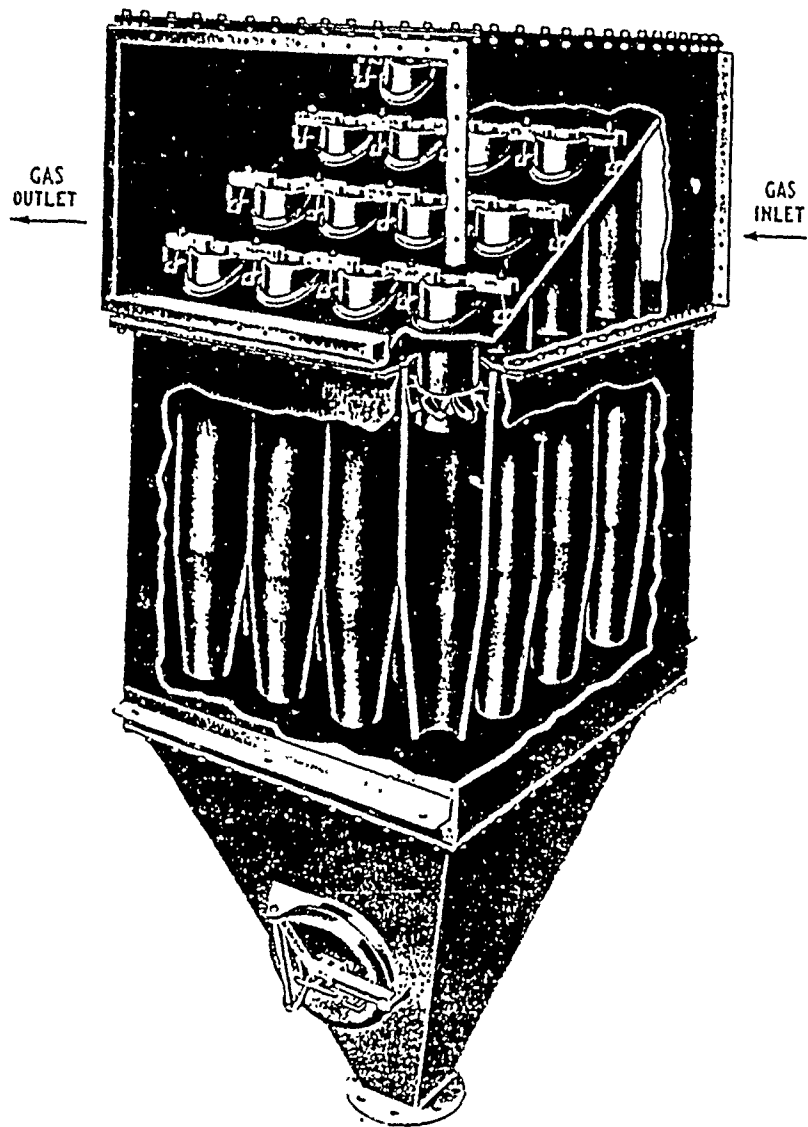


Figure 2. Schematic of Cyclone Separator

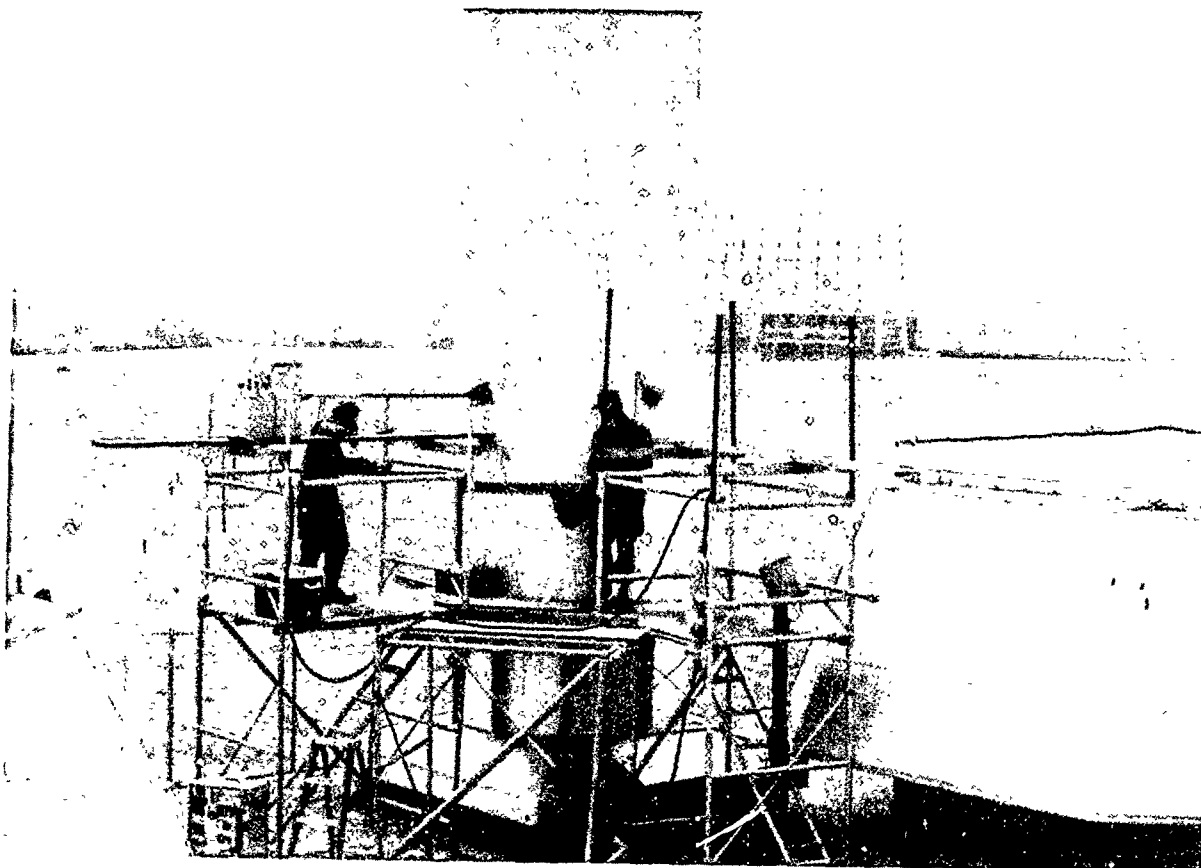


Figure 3. Exhaust Stack of Boiler 1

C. Applicable Standards

The source testing regulations are defined under 18 AAC 50.050(a), 50.050(b), and 50.500. These regulations are found in Appendix C and reiterated below.

1. Visible Emissions (18 AAC 50.050(a))

Visible emissions, excluding condensed water vapor from an industrial process or fuel burning equipment, may not reduce visibility through the exhaust effluent by greater than 20% for a total of more than three minutes in any one hour.

2. Particulate Emissions (18 AAC 50.050(b))

Particulate emissions may not exceed, per cubic foot of exhaust gas corrected to standard conditions, 0.1 grains per dry standard cubic foot (gdscf) for steam generating plants burning as fuel: (1) coal, and in operation before July 1, 1972 or (2) coal, and rated less than 250 million Btu per hour heat input.

D. Sampling Methods and Procedures

Particulate emissions testing was conducted in accordance with EPA method 5, found in 40 CFR 60, Appendix A as dictated by 18 AAC 500 and Permit No. 8731-AA004. Testing requires three 1-hour (minimum) sample runs; the results of which are averaged for a final emission rate. Boiler 1 was tested as a representative boiler.

Sampling ports existed in the stack 10.0 feet downstream and 15.5 feet upstream from any flow disturbance. With an inside diameter of 6.9 feet, sampling sites were greater than one-half duct diameter downstream and two duct diameters upstream from any flow disturbance. Based on this information and the type of sample (particulate), 24 traverse points (12 per diameter) were used to collect a representative particulate sample.

Prior to the sample run on the stack, cyclonic flow was determined by using the type S pitot tube and measuring the stack gas rotational angle at each traverse point. Flow conditions are considered acceptable when the arithmetic mean average of the rotational angles is 20 degrees or less. These conditions were not met and a straightening vane was installed in the stack to correct the flow. Cyclonic flow determination was reaccomplished and was within acceptable limits. A preliminary velocity pressure traverse was also accomplished before each sample run.

A grab sample for ORSAT analysis (measures oxygen (O_2) and CO_2 for stack gas molecular weight determination) was taken during each sample run. ORSAT sampling and analysis equipment are shown in Figures 4 and 5. Flue gas moisture content, needed for determination of flue gas molecular weight, was obtained during particulate sampling.

Particulate samples were collected using the sampling train shown in Figure 6. The train consisted of a button-hook probe nozzle, heated stainless steel-lined probe, heated glass filter, impingers and a pumping and metering device. The probe nozzle was sized prior to the sample run so that the gas stream could be sampled isokinetically, (i.e., the velocity at the nozzle tip was the same as the stack gas velocity at each point sampled). Flue gas velocity pressure was measured at the nozzle tip using a Type S pitot tube connected to a 10-inch inclined-vertical manometer. Type K thermocouples were used to measure flue gas as well as sampling train temperatures. The probe liner was heated to minimize moisture condensation. The heated filter was used to collect particulates. The impinger train (first, third, and fourth impingers: modified Greenburg-Smith type, second impinger: standard Greenburg-Smith design) was used as a condenser to collect stack gas moisture. The pumping and metering system was used to control and monitor the sample gas flow rate.

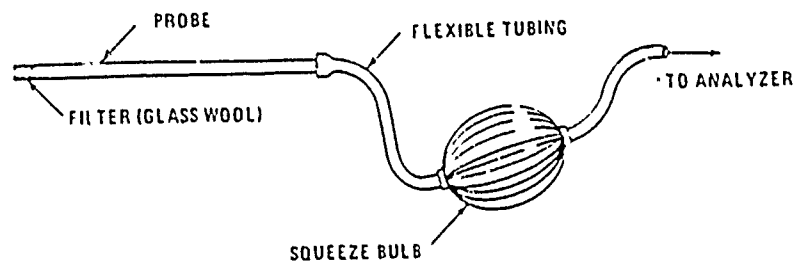


Figure 4. ORSAT Sampling Train

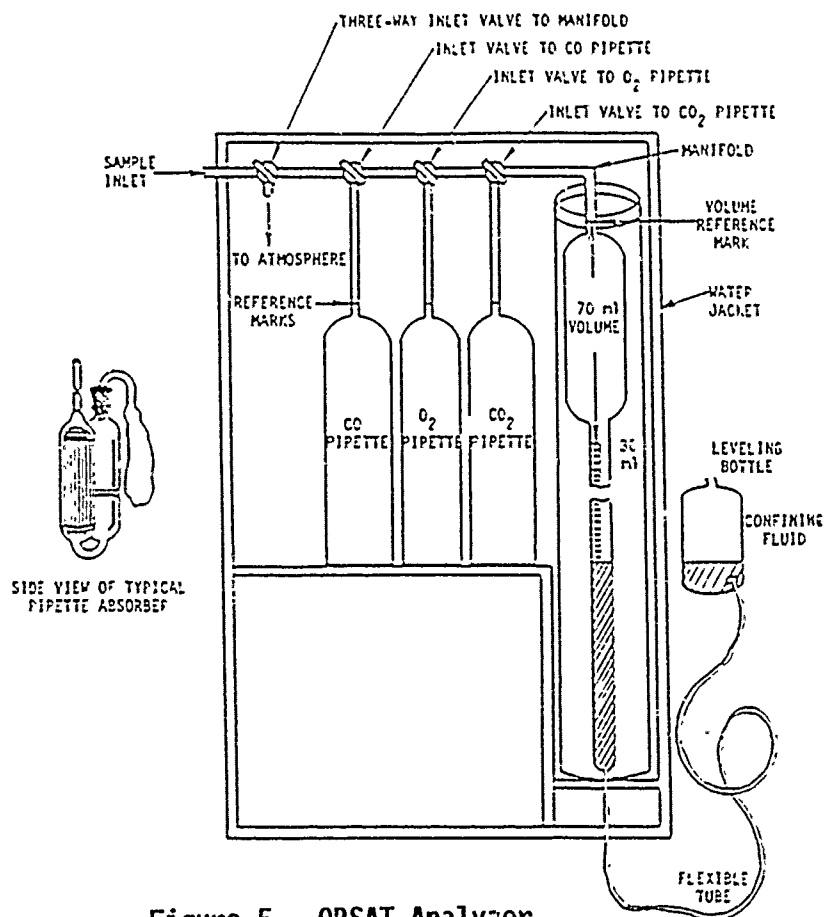


Figure 5. ORSAT Analyzer

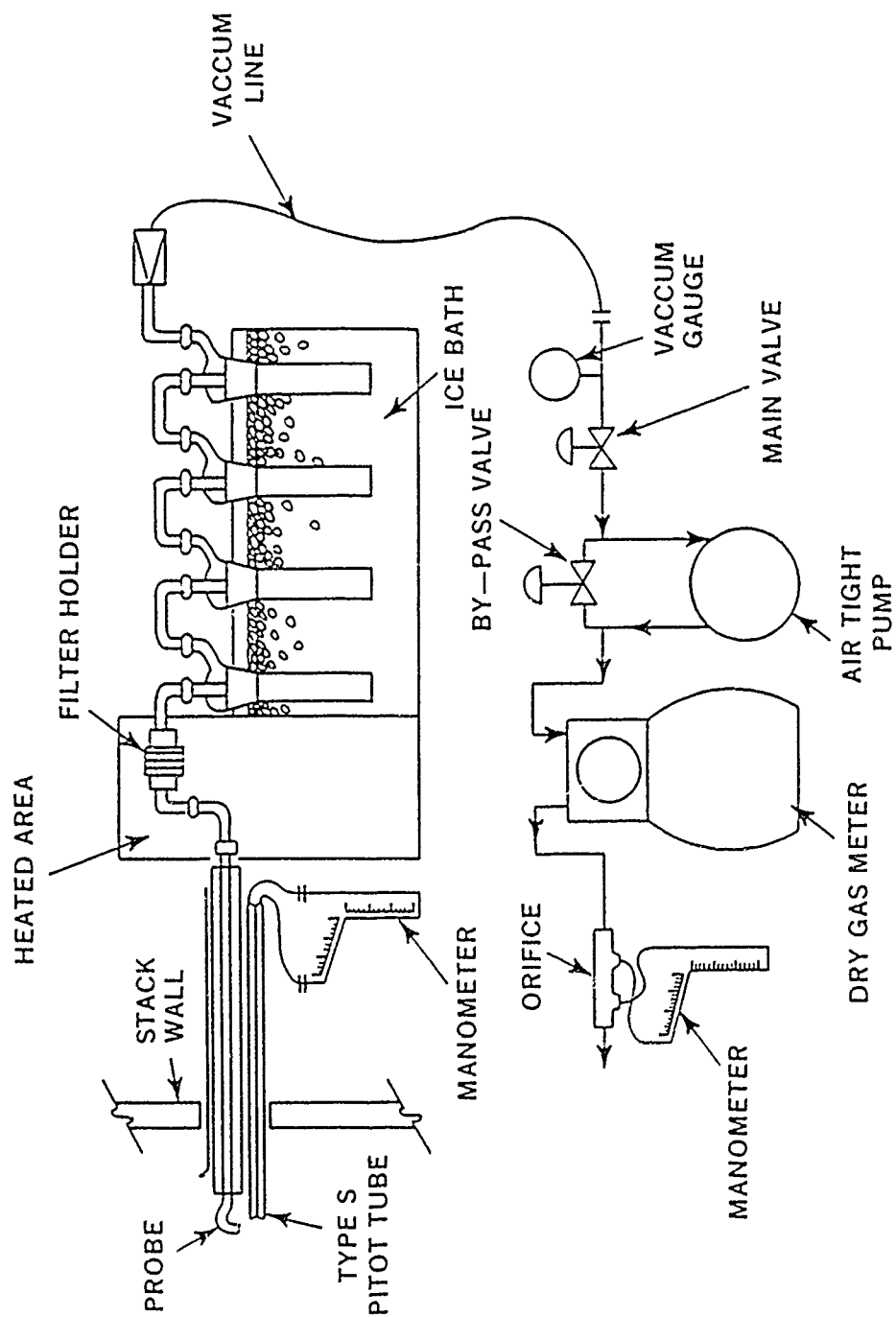


Figure 6. Particulate Sampling Train

Testing was accomplished on Boiler 1 at steam output capacities of 90,000 lbs/hr (20 and 21 Jun 89) and 80,000 lbs/hr (22 Jun 89). Power plant operating logs for 20, 21, 22 June are included in Appendix D. Complete EPA Method 5 and Method 9 (visible emissions) evaluations were conducted at each rated output. Field data, including visible emissions, for each test are presented in Appendixes E, F, and G, respectively. Method 9 determinations for opacity during this project were accomplished by a certified team member. EPA Method 9 certification documentation is provided in Appendix H.

Particulate samples were analyzed according to the procedures specified in Method 5. Emission calculations were accomplished using the "Source Test Calculation and Check Programs for Hewlett-Packard 41 Calculators" (EPA-340/1-85-018) developed by the EPA Office of Air Quality Planning and Standards, Research Triangle Park NC. Resulting emission calculations are presented in Appendix I. Equipment calibration data are presented in Appendix J.

III. CONCLUSIONS

The Table provides operating parameters and emission test results for Boiler 1 of the Clear AFS Power Plant. Boiler 1 did not meet state standards for particulate emissions while operating at 90,000 lbs steam/hr on either 20 or 21 June. The boiler met state standards for visible emissions for all runs on both days.

Stack Emission Test Results

Date	Boiler Operating Capacity (lbs steam/hr)	Run No.	Soot Blow	Particulate Emissions (gr/dscf)*
20 Jun	90,000	1	XX	0.1643
		2		0.1580
		3		0.1953
		AVG = $\overline{0.1725}$		
21 Jun	90,000	1	XX	0.0792
		2		0.1339
		3		0.1909
		AVG = $\overline{0.1347}$		
22 Jun	80,000	1	XX	0.1081
		2		0.0982
		3		0.0869
		AVG = $\overline{0.0977}$		

* gr/dscf = grains per dry standard cubic foot

Subsequently, the operating capacity was lowered to 80,000 lbs steam/hr and tested again on 22 June. Boiler 1 had particulate emissions of 0.109, 0.098, and 0.085 gr/dscf, for an average of 0.100 gr/dscf. Percent isokinetics for the three runs were 99.88, 100.58, and 101.94, respectively. Results indicate that the Clear AFS Power Plant is in compliance with applicable Alaska DEC visible and particulate emissions regulations. Accordingly, Alaska DEC Permit to Operate No. 8731-AA004 will limit the operation of each boiler at or below an output capacity of 80,000 lbs steam/hr.

IV. RECOMMENDATION

AFOEHL will remain active in providing Clear AFS with consultative and field support with regards to their Power Plant.

References

1. Code of Federal Regulations. Vol 40, Parts 53-60, The Office of the Federal Register National Archives and Records Service, General Services Administration, Washington DC, July 1987.
2. Quality Assurance Handbook for Air Pollution Measurement Systems - Volume III, Stationary Source Specific Methods, U.S. Environmental Protection Agency, EPA-600/4-77-027-b, Research Triangle Park, North Carolina, December 1984.
3. Source Test Calculation and Check Programs for Hewlett-Packard 41 Calculators, U.S. Environmental Protection Agency, EPA-340/1-85-018, Research Triangle Park, North Carolina, May 1987.

APPENDIX A
Personnel

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1. AFOEHL Test Team

Maj James A. Garrison, Chief, Air Quality Function
Capt Paul T. Scott, Consultant, Air Quality Meteorologist
Capt Ronald Vaughn, Consultant, Air Quality Engineer
1Lt Charles Attebery, Consultant, Environmental Engineer
Sgt Robert P. Davis, Environmental Quality Technician

AFOEHL/EQE
Brooks AFB TX 78235-5501
AV 240-2891
COM (512)536-2891

2. Clear AFS Power Plant Personnel

Wendell Shoemaker	13 MWS/DEMU
Larry Wegener	13 MWS/DEMU
	AV 317-585-6237

3. Eielson AFB Support Personnel

SSgt John Willey	343 Medical Group/SGPB
	AV 317-377-5225
	COM (907)377-5225

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APPENDIX B

Permit to Operate No. 8731-AA004

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DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AIR QUALITY CONTROL
PERMIT TO OPERATE

Permit No. 8731-AA004

Date of Issue: APRIL 3, 1987

The Department of Environmental Conservation, under the authority of AS 46.03 and 18 AAC 50.400, issues an Air Quality Control Permit to Operate to:

U.S. Air Force
13th Missile Warning Squadron
APO Seattle, Washington 98704

for the operation of the Clear Air Force Station power and heating plant, consisting of three 177 MM BTU/hr coal-fired boilers and 14 diesel-fired boilers, as described in the OMB Form 158-R75, dated April 26, 1977, submitted by HQ ADCOM/DEMUS, Peterson AFB, Colorado, and Air Quality Control Permit application dated March 24, 1978, renewal request dated February 9, 1983, and modification request dated February 3, 1987.

Located at the Clear Missile Early Warning Station, Clear, Alaska.

Under the conditions:

1. Permittee shall comply with the State Ambient Air Quality Standards established in 18 AAC 50.020 and the applicable emissions standards specified in Air Control Regulations 18 AAC 50.050.
2. An Air Contaminant Emission Report, as described in Exhibit A, shall be submitted to the Northern Regional Office, Department of Environmental Conservation, P. O. Box 1601, Fairbanks, Alaska 99707, (907) 452-1714, semiannually by January 30 and July 30 of each year.
3. Permittee shall maintain and operate all fuel burning equipment, emission control devices, processes and monitoring equipment to provide optimum air quality control during all operating periods.
4. Permittee shall maintain test results, monitoring instrument recorder charts and other applicable data in an active file for one year and have them available on request for not less than three years.
5. The department's representatives shall be allowed access to permittee's facilities to conduct scheduled or unscheduled inspections or tests to determine compliance with this permit, state environmental laws and regulations.

- This permit expires on January 30, 1990, and may be revoked or suspended in accordance with 18 AAC 50.310.

Larry Dietrick

1000

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1730
known to a non pt source
methods: source testing
cubing load
Drinking water Testing
(continuous sampling)

EXHIBIT A

AIR QUALITY CONTROL PERMIT TO OPERATE No. 8731-AA004

AIR CONTAMINANT EMISSION REPORT

An Air Contaminant Emission Report shall be submitted to the Northern Regional Office, P. O. Box 1601, Fairbanks, Alaska 99707, semiannually by January 30 and July 30 of each year. The report shall include, but not be limited to, the following information:

NAME OF FIRM
 LOCATION OF FACILITIES
 PERIOD OF REPORT

<u>Quarterly Total</u>	
1. Days Operated	Number of hours or days per unit
BLR-1-177	
BLR-2-177	
BLR-3-177	
Diesel boilers (various)	Numbers of hours or days for all diesel boilers
	(It is not necessary to report individual diesel boilers)
2. Fuel Consumption	Tons coal per unit and gallons oil per unit (type of oil burned)
Coal burners	
Oil burners	

BLR = Coal or oil-fired boiler, BTUx10⁶ rating indicated.

3. Attach a detailed description of equipment or operating conditions which may adversely affect air contaminant emissions. A preliminary report of the incident shall be submitted to the department within five working days of the incident by calling or writing to the Northern Regional Office, P. O. Box 1601, Fairbanks, Alaska 99707, (907) 452-1714. Include such information as: date of incident; duration; nature of the occurrence; equipment failures; steps taken to minimize emissions; measures taken to avoid recurrence; and a general description of the weather. A separate report is required for each incident.

4. Attach a tabulation of estimated weekly average opacity (transmissivity) for each of the coal-fired boilers, based on data recorded by continuous monitors if installed.
5. Attach one yearly composite chemical analysis of the waste oil burned. The analysis shall list the concentration of: arsenic, lead, cadmium, chromium, PCB's, sulfur, and total halogens.
6. Attach a brief discussion of any change in monitoring equipment or failure which may affect reported results or yield incomplete data for any given day.
7. Signature of authorized agent preceded by the statement: "I am familiar with the information contained in this report and that, to the best of my knowledge and belief, such information is true, complete, and accurate."

Appendix C
State Regulations

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ALASKA AIR QUALITY CONTROL REGULATIONS

(Alaska Administrative Code, Title 18, Environmental Conservation, Chapter 50 —
Air Quality Control; Effective May 26, 1972; Amended November 9, 1972; May 8, 1974;
May 4, 1980; November 1, 1982; October 30, 1983; June 7, 1987)

ARTICLE 1. PROGRAM STANDARDS AND LIMITATIONS

50.010. APPLICABILITY OF LOCAL GOVERNMENT REGULATIONS. A local air quality control agency may establish the same or more stringent regulations, but not less stringent regulations, as the applicable regulations specified in this chapter.

50.020. AMBIENT AIR QUALITY STANDARDS. (a) The concentration of contaminants in the ambient air, corrected to standard conditions, may not exceed the following:

- (1) suspended particulate matter —
 - (A) annual geometric mean of 60 micrograms per cubic meter; or
 - (B) 24-hour average of 150 micrograms per cubic meter more than once each year;
- (2) sulfur oxides, measured as sulfur dioxide —
 - (A) annual arithmetic mean of 80 micrograms per cubic meter;
 - (B) 24-hour average of 365 micrograms per cubic meter more than once each year; or
 - (C) three-hour average of 1300 micrograms per cubic meter more than once each year;
- (3) carbon monoxide —
 - (A) eight-hour average of 10 milligrams per cubic meter more than once each year; or
 - (B) one-hour average of 40 milligrams per cubic meter more than once each year;
- (4) ozone — one-hour average of 235 micrograms per cubic meter expected more than once per year;

(5) nitrogen dioxide — annual arithmetic mean of 100 micrograms per cubic meter;

(6) reduced sulfur compounds, expressed as sulfur dioxide — 30-minute average of 50 micrograms per cubic meter more than once each year; and

(7) lead — quarterly arithmetic mean of 1.5 micrograms per cubic meter.

(b) In areas where concentrations of contaminants in the ambient air are less than the standards set out in (a) of this section, the concentrations must be kept below those standards, and no increase above the baseline concentration may exceed

- (1) for a Class I area
 - (A) suspended particulate matter —
 - (i) annual geometric mean of five micrograms per cubic meter; or
 - (ii) 24-hour average of 10 micrograms per cubic meter more than once each year; and
 - (B) sulfur dioxide —
 - (i) annual arithmetic mean of two micrograms per cubic meter;
 - (ii) 24-hour average of five micrograms per cubic meter more than once each year; or
 - (iii) three-hour maximum of 25 micrograms per cubic meter more than once each year;
- (2) for a Class II area
 - (A) particulate matter —
 - (i) annual geometric mean of 19 micrograms per cubic meter, or
 - (ii) 24-hour average of 37 micrograms per cubic meter more than once each year; and
 - (B) sulfur dioxide —
 - (i) annual arithmetic mean of 20 micro-

grams per cubic meter.

(ii) 24-hour average of 91 micrograms per cubic meter more than once each year; or

(iii) three-hour average of 512 micrograms per cubic meter more than once each year;

(3) for a Class III area

(A) particulate matter

(i) annual geometric mean of 37 micrograms per cubic meter; or

(ii) 24-hour average of 75 micrograms per cubic meter more than once each year, and

(B) sulfur dioxide

(i) annual arithmetic mean of 40 micrograms per cubic meter;

(ii) 24-hour average of 182 micrograms per cubic meter more than once each year; or

(iii) three-hour average of 700 micrograms per cubic meter more than once each year.

50.021. STATE AIR QUALITY CLASSIFICATIONS. (a) For purposes of classifying areas according to air quality, those areas in nonattainment with the ambient air quality standards of this chapter are

(1) Anchorage urban area for carbon monoxide; and

(2) Fairbanks and North Pole urban areas for carbon monoxide.

(b) For purposes of the ambient air quality standards specified in 18 AAC 50.020(b)

(1) Class I areas in the state are

(A) Denali (Mt. McKinley) National Park;

(B) that portion of Bering Sea National Wildlife Refuge designated as a National Wilderness Area;

(C) that portion of Simeonof National Wildlife Refuge designated as a National Wilderness Area; and

(D) that portion of Tuxedni National Wildlife Refuge designated as a National Wilderness Area;

(2) those areas of the state not classified in (a) of this section, or (1) or (3) of this subsection are classified as Class II; and

(3) no areas in the state have been classified as Class III.

(c) For purposes of preventing impairment of visibility, the designated areas are

(1) Mt. Deborah and the Alaska Range East, as viewed from approximately the Savage River Campground area;

(2) Mt. McKinley, Alaska Range, and the Interior Lowlands, as viewed from the vicinity of Wonder Lake; and

(3) the Class I areas listed in (b)(1) of this section.

(d) For purposes of maintaining the ambient air quality standards set out in 18 AAC 50.020(a), the Mendenhall Valley of Juneau is a wood smoke control area.

50.030. OPEN BURNING. (a) Open burning must achieve maximum combustion efficiency throughout the burning period, and is subject to the exception in (e) of this section, the limitations in (b), (c), (d), and (f) of this section, and 18 AAC 50.110.

(b) Open burning of asphalts, rubber products, plastics, tars, oils, oily wastes, contaminated oil cleanup materials, or other materials in a way that gives off black smoke is prohibited without written approval from the department. Approved open burning is subject to the following limitations:

(1) controlled fires for training fire fighters must be advertised through news media in the general area of the activity at least three days before the activity, informing the public of the time, place, and purpose of the fire, unless waived by the department.

(2) open burning of liquid hydrocarbons produced during oil or gas well flow tests will be approved only if there are no practical means available to recycle, reuse, or dispose of the fluids in a more environmentally acceptable way; and

(3) reasonable procedures and requirements must be established by the person doing the burning to minimize adverse environment effects and limit the amount of smoke generated.

(c) Open burning or incineration of pesticides, halogenated organic compounds, cyanic compounds, or polyurethane products in a way that gives off toxic or acidic gases or particulate matter is prohibited.

(d) Open burning of putrescible garbage, animal carcasses, or petroleum-based materials is prohibited if it causes odor or black smoke which has an adverse effect on nearby persons or residences.

(e) Controlled burning for the management of forest land, vegetative cover, fisheries, or wildlife habitat, other than burning to combat a natural wildfire, requires written approval from the department.

(f) Open burning is prohibited in an area if an air quality advisory by the department is broadcast on radio or television stating that burning is not permitted in that area for that day. This advisory will be based on a determination that there is or is likely to be inadequate air ventilation to maintain the standards set by 18 AAC 50.020.

(g) Open burning is prohibited in wood smoke control areas identified in 18 AAC 50.021(d) between November 1 and March 31.

50.040. INCINERATORS. (a) Visible emissions, excluding condensed water vapor, from an incinerator may not reduce visibility through the exhaust effluent by

(1) greater than 20 percent for a total of more than three minutes in any one hour, except as provided in (2) of this subsection; or

(2) 20 percent or greater for municipal wastewater treatment plant sludge incinerators.

(b) Emissions of particulate matter from incinerators may not exceed, per cubic foot of exhaust gas corrected to 12 percent CO₂ and standard conditions, and except as specified in (c) of this section

(1) 0.15 grains for incinerators less than 2,000 pounds, but greater than or equal to 1,000 pounds per hour rated capacity, or

(2) 0.08 grains from incinerators of 2,000 pounds per hour rated capacity or larger.

(c) Emissions of particulate matter from municipal wastewater treatment plant sludge incinerators which serve 10,000 or more persons and burn waste containing more than 10 percent wastewater treatment plant sludge by dry weight, may not exceed 0.65 grams per kilogram of dry sludge input.

50.050 INDUSTRIAL PROCESSES AND FUEL BURNING EQUIPMENT.

(a) Visible emissions, excluding condensed water vapor, from an industrial process or fuel burning equipment may not reduce visibility through the exhaust effluent by

(1) greater than 20 percent for a total of more than three minutes in any one hour, except as noted in (2) — (8) of this subsection;

(2) greater than 30 percent for more than three minutes in any one hour for fuel burning equipment in operation before November 1, 1982 and using more than 20 percent woodwaste as fuel;

(3) greater than 30 percent for urea prilling towers in operation before July 1, 1972, for a total of more than three minutes in any one hour;

(4) 20 percent or greater for asphalt plants installed or modified after November 1, 1982;

(5) 20 percent or greater for process emissions, other than from pneumatic cleaners, at coal preparation facilities installed or modified after November 1, 1982;

(6) 10 percent or greater for pneumatic cleaners at coal preparation facilities installed or modified after November 1, 1982;

(7) 10 percent or greater for process emissions, other than from kilns, at portland cement plants installed or modified after November 1, 1982; and

(8) 20 percent or greater for kilns at portland cement plants installed or modified after November 1, 1982.

(b) Particulate matter emitted from industrial processes or fuel burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions

(1) 0.05 grains except as provided in (2) — (4) of this subsection, (d) of this section, and 18 AAC 50.060;

(2) 0.1 grains for steam generating plants burning as fuel

(A) coal, and in operation before July 1, 1972;

(B) coal, and rated less than 250 million Btu per hour heat input; or

(C) municipal wastes;

(3) 0.1 grains for an industrial process in operation before July 1, 1972; or

(4) 0.15 grains from fuel burning equipment in operation before November 1, 1982, and using more than 20 percent woodwastes as fuel.

(c) Sulfur compound emissions, expressed as sulfur dioxide, from an industrial process or from fuel burning equipment may not exceed 500 ppm averaged over a period of three hours, except as provided in (d) of this section, and 18 AAC 50.060.

(d) Emissions from a source installed or modified after November 1, 1982 may not exceed

(1) at asphalt plants, 90 milligrams of particulate matter per cubic meter of exhaust gas at standard conditions;

(2) at petroleum refineries

(A) catalytic cracking unit catalyst regenerator

(i) 1.0 kilogram of particulate matter per 1,000 kilograms of coke burnoff,

(ii) 43.0 additional grams of particulate matter per million joules supplemental heat attributable to fuels burned in a catalyst regenerator waste heat boiler; and

(iii) 500 ppm carbon monoxide by volume of exhaust gas;

(B) sulfur recovery plant rated at more than 20 long tons per day

(i) 250 ppm sulfur dioxide at zero percent oxygen on a dry basis; or

(ii) 10 ppm hydrogen sulfide and a total of 300 ppm reduced sulfur compounds, expressed as sulfur dioxide, at zero percent oxygen on a dry basis, if the air contaminants are not oxidized before release to the atmosphere; and

(C) fuel burning equipment, sulfur dioxide averaged over three hours

(i) equal to the concentration of uncontrolled emissions which would result from burning fuel gas containing 230 milligrams hydrogen sulfide per dry standard cubic meter from equipment burning fuel gas;

(ii) a calculated concentration based on the allowable emissions in (i) and (iii) of this subparagraph and the proportion of

fuel gas and other fuels to the total fuel burned in fuel burning equipment; or

(iii) 500 ppm from all other fuel burning equipment;

(3) at coal preparation facilities

(A) thermal drying unit, 70 milligrams of particulate matter per cubic meter of exhaust gas at standard conditions; and

(B) pneumatic coal cleaning unit, 40 milligrams of particulate matter per cubic meter of exhaust gas at standard conditions; and

(4) at portland cement plants

(A) clinker cooler, 0.050 kilograms of particulate matter per 1000 kilograms of feed on a dry basis to the kiln; and

(B) kiln, 0.15 kilograms of particulate matter per 1000 kilograms of feed on a dry basis.

(e) Release of materials other than process emissions, products of combustion, or materials introduced to control pollutant emissions from a stack at a source built or modified after November 1, 1982 is prohibited unless approved in writing by the department.

(f) No person may cause or permit bulk materials to be handled, transported, or stored, or engage in an industrial activity or construction project without taking reasonable precautions to prevent particulate matter from becoming airborne.

50.060. PULP MILLS. Average emissions per ton of pulp produced from a sulfite pulp mill may not exceed in any 24-hour period

(1) 20 pounds of sulfur oxides (expressed as sulfur dioxide) from blow pits, washer vents, storage tanks, digester relief systems, and recovery systems; and

(2) two pounds of particulate matter from blow pits, washer vents, storage tanks, digester relief systems, and recovery systems.

50.070. MOTOR VEHICLE EMISSIONS. (a) Emissions from gasoline-powered motor vehicles, excluding condensed water vapor, may not be visible for more than any five consecutive seconds.

(b) Visible emissions from diesel-powered motor vehicles, excluding condensed water vapor, may not result in a reduction of visibility of greater than 40 percent through the exhaust effluent for more than any five consecutive seconds.

50.080. [Repealed]

50.085. WOOD-FIRED HEATING DEVICES. For wood-fired heating devices,

(1) when an air quality alert is issued under 18 AAC 50.610(a)(1)(B) for particulate matter within a specific area, except areas set out in (3) of this section, visible emissions at the point of release to the atmosphere may not reduce visibility through the exhaust effluent by 50 percent or greater for more than 15 minutes in any one hour;

(2) burning in a way that creates black smoke is prohibited; and

(3) for wood smoke control areas identified in 18 AAC 50.021(d)

(A) visible emissions at the point of release to the atmosphere may not reduce visibility through the exhaust effluent by 50 percent or greater for more than 15 minutes in any one hour; and

(B) when an air emergency has been issued under 18 AAC 50.610 (a)(3)(D), no person may operate, permit, or allow the operation of a wood-fired heating device which results in the emission of smoke.

50.090. ICE FOG LIMITATIONS. The department will, in its discretion, require any person proposing to build or operate an industrial process, fuel burning equipment or incinerator in areas of potential ice fog, to obtain a permit to operate and to reduce water emissions.

50.100. MARINE VESSELS. Within three miles of the coastline of Alaska, visible emissions from any marine vessel, excluding condensed water vapor, may not result in a reduction of visibility through the exhaust effluent of greater than

(1) 40 percent for a period or periods aggregating more than three minutes in any one hour, except as provided in (2) of this section; and

(2) 40 percent for a period or periods aggregating more than six minutes in any one hour during initial startup of diesel-driven vessels.

50.110. AIR POLLUTION PROHIBITED. No person may permit any emission which is injurious to human health or welfare, animal or plant life, or property, or which would unreasonably interfere with the enjoyment of life or property.

50.120 — 50.190. [Repealed]

ARTICLE 2. PERMIT REQUIREMENTS

50.300. PERMIT TO OPERATE. (a) No person may construct, modify, reconstruct, operate, or cause the operation of the following without a permit from the department:

(1) a facility containing a source which requires an air contaminant emission control unit or system to comply with emission standards set by 18 AAC 50.040—18 AAC 50.060, and which is

(A) an industrial process with a total design rate, capacity, or throughput greater than five tons per hour and which physically or chemically treats the material; or

(B) fuel-burning equipment with a rating of 50 million Btu per hour or greater;

(2) fuel-burning equipment with a rating of 100 million Btu per hour or more;

(3) an incinerator with a rated capacity of 1,000 pounds per hour or more;

(4) a facility subject to the standards set by 18 AAC 50.040(c), 18 AAC 50.050(a)(5), 18 AAC 50.050(a)(7), or 18 AAC 50.050(d);

(5) a facility

(A) which has allowable emissions of 100 tons per year or more of an air contaminant regulated under the Clean Air Act (P.L. 91-604) as amended August 7, 1977 (P.L. 95-95), is installed after November 1, 1982, and is a

(i) fossil fuel fired steam electric plant of more than 250 million Btu's per hour heat input;

(ii) coal cleaning plant (with thermal dryers);

(iii) kraft pulp mill;

(iv) portland cement plant;

(v) primary zinc smelter;

(vi) iron and steel mill plant;

(vii) primary aluminum ore reduction plant;

(viii) primary copper smelter;

(ix) municipal incinerator capable of charging more than 250 tons of refuse per day;

(x) hydrofluoric, sulfuric, or nitric acid plant;

(xi) petroleum refinery;

(xii) lime plant;

(xiii) phosphate rock processing plant;

(xiv) coke oven battery;

(xv) sulfur recovery plant;

(xvi) carbon black plant (furnace process);

(xvii) primary lead smelter;

(xviii) fuel conversion plant;

(xix) sintering plant;

(xx) secondary metal production plant;

(xxi) chemical process plant;

(xxii) fossil fuel boiler or a combination of boilers totaling more than 250 million Btu's per hour heat input;

(xxiii) petroleum storage and transfer unit with a total storage capacity exceeding 300,000 barrels;

(xxiv) taconite ore processing plant;

(xxv) glass fiber processing plant; or

(xxvi) charcoal production plant;

(B) which is listed in (A) of this paragraph with allowable emissions of less than 100 tons per year of a regulated air contaminant and is modified after August 7, 1977, causing an increase in allowable emissions of 100 tons per year or more; or

(C) which is listed in (A) of this paragraph with allowable emissions of greater than 100 tons per year of a regulated air contaminant and is modified after August 7, 1980, or after the date of the most recent permit issued for the affected area under 18 AAC 50.400(c)(3), causing an increase in actual emissions equal to or exceeding the emissions listed in (6)(C)(i) — (xvii) of this subsection;

(6) a facility not listed in (5) of this subsection

(A) which has allowable emissions of 250 tons per year or more of an air contaminant regulated under the Clean Air Act (P.L. 91-604) as amended August 7, 1977 (P.L. 95-95), and is installed after November 1, 1982;

(B) which has allowable emissions of less than 250 tons per year of a regulated air contaminant and is modified after August 7, 1977, causing an increase in allowable emissions of 250 tons per year or more; or

(C) which has allowable emissions of more than 250 tons per year of a regulated air contaminant and is modified after August 7, 1980, or after the date of the most recent permit issued for the affected area under 18 AAC 50.400(c)(3), causing an increase in actual emissions equal to exceeding any of the following:

(i) carbon monoxide — 100 tpy;

(ii) nitrogen oxides — 40 tpy;

(iii) sulfur dioxide — 40 tpy;

(iv) particulate matter — 25 tpy;

(v) ozone — 40 tpy of volatile organic compounds as an ozone indicator;

(vi) lead — 0.6 tpy;

(vii) asbestos — 0.007 tpy;

(viii) beryllium — 0.0004 tpy;

(ix) mercury — 0.1 tpy;

(x) vinyl chloride — 1 tpy;

(xi) fluorides — 3 tpy;

(xii) sulfuric acid mist — 7 tpy;

(xiii) hydrogen sulfide (H₂S) — 10 tpy;

(xiv) total reduced sulfur including H₂S — 10 tpy;

(xv) reduced sulfur compounds including H₂S — 10 tpy;

(xvi) increased emissions of a pollutant regulated by the Clean Air Act (PL 91-604) as amended August 7, 1977 (PL 95-95) and not listed in (6)(C)(i)-(xv) of this subsection; or

(xvii) notwithstanding (i) through (xvi), if located within 10 kilometers of an area listed in 18 AAC 50.021(b)(1) with increased emissions that impact the area by 1 ug/m³ or more for a 24-hour average;

(7) a source or facility installed, reconstructed, or modified after July 1, 1979 or after the date of the most recent permit issued since November 1, 1982, under 18 AAC 50.400(c)(4), located within an area identified in 18 AAC 50.021(a), and causing an increase in actual or allowable carbon monoxide emissions, whichever is greater, from the source or facility of 100 tons per year or more; or

(8) a facility or modification to a facility for which the owner or operator has requested that the department approve limitations of emission rates or operations to reduce emissions to levels below those specified in this chapter.

(b) An application for a permit required by (a) of this section must include

(1) one set of plans and specifications clearly showing the layout of the proposed facility, location of individual equipment and points of discharge, building dimensions, and stack heights;

(2) a map or aerial photograph, on a scale at least one-inch to one-mile indicating the location of the proposed facility, homes, buildings, roads, and other adjacent facilities, and the general topography within 15 kilometers of the facility;

(3) an engineering report outlining the proposed methods of operation, the

amount of material to be processed, the proposed use and distribution of the processed material, and a process flow diagram with description showing points of emission and estimated amounts and types of air contaminants to be emitted;

(4) a description of air quality control devices, including efficiency and other design criteria, and assurances that this equipment is capable of complying with applicable emission requirements specified in this chapter;

(5) if requested by the department, an evaluation of the effect of the facility's expected maximum emissions on the ambient air, including ambient air quality and meteorological data;

(6) if requested by the department, plans for emission reduction procedures to be used during an air episode; and

(7) a detailed schedule for construction or modification of the facility.

(c) A permit application for a facility subject to (a)(5) or (a)(6) of this section must include the following information in addition to that required under (b) of this section:

(1) ambient air and meteorological data to fully describe the air quality in the vicinity of the proposed facility and any changes in air quality due to general growth which has occurred after the establishment of the baseline date in the area the facility or modification would affect; department approval of the air monitoring network is required before starting data collection;

(2) a detailed demonstration that the expected maximum emissions from the construction and operation of the facility, including emissions from associated growth, will not cause a violation, or contribute to an existing violation, of the ambient air quality standards in 18 AAC 50.020(a) or allowable increments in 18 AAC 50.020(b);

(3) an adequate demonstration that the proposed emission control system represents the best available control technology for each air contaminant and for each new or modified source; and

(4) an analysis of the impact of expected maximum emissions from the facility,

including emissions from associated growth, on visibility, vegetation, and soils.

(d) A permit application for a facility subject to (a)(7) of this section must include the following information in addition to that required under (b) of this section:

(1) proof that emissions of a pollutant for which the area is declared in nonattainment will not exceed the applicable emission allowance, and will be controlled to a rate which represents the lowest achievable emission rate; and

(2) proof that other sources owned or operated by the applicant within the state are in compliance with the requirements of this chapter and the Clean Air Act (P.L. 91-604) as amended August 7, 1977 (P.L. 95-95).

(e) A permit application submitted under (a)(8) of this section need not include the information required under (b) and (c) of this section, but must specify the limitations on emission rates or operations necessary to exempt the facility from 18 AAC 50.300(a)(5) — (7) or any other requirement of this chapter.

(f) If a permit application is deficient, the department will notify the applicant by certified mail within 30 days after receipt of the application, identifying the deficiencies and the information to be submitted. When the deficiencies are corrected, the department will continue processing the application.

50.310. REVOCATION OR SUSPENSION OF PERMIT. A permit to operate will, in the department's discretion, be revoked or suspended if the conditions of the permit or applicable laws or regulations are violated.

ARTICLE 3. PERMIT REVIEW CRITERIA

50.400. APPLICATION REVIEW AND ISSUANCE OF PERMIT TO OPERATE. (a) Before review under (b) of this section for a facility described in 18 AAC 50.300(a)(5), (6), or (7); for a facility with a stack described in 18 AAC 50.900(23)(C); or for any other facility for which the department finds that additional public review and comment is desirable, an opportunity for public comment and

hearing will be provided using the following procedures:

(1) at least 30 days before beginning review under (b) of this section a summary of the department's preliminary review and analysis of the application will be published in a newspaper of general circulation within the area where the new or modified facility is to be located. The analysis will be sent to the Environmental Protection Agency, and any federal land manager, Indian governing body on a reservation, or unit of local government which may be affected by emissions from the proposed activity; materials submitted by the applicant and a copy of the proposed permit will be available in at least one location within the area of the new or modified facility;

(2) the department, upon its own motion, or upon request, will hold a public hearing on the application following the procedures set out in 18 AAC 15.060(d) — (g); 60 days notice of a hearing will be sent to any affected federal land manager under 18 AAC 50.021(c); and

(3) public comments and testimony received on the application will be evaluated as part of the information needed to complete evaluation of the permit application, and will be made available to the public.

(b) The department will review a permit application and will, in its discretion, issue the permit within 30 days after receipt of all information needed to complete evaluation of the application, including testimony at a public hearing held under (a) of this section. For applications subject to (a) of this section, a copy of the final determination will be published and distributed as described in (a)(1) of this section.

(c) The department will issue a permit only if the applicant shows that:

(1) allowable emissions from the facility and from associated growth will not prevent or interfere with the attainment or maintenance of ambient air quality standards set by 18 AAC 50.020(a);

(2) air contaminant emissions from a source in the facility will not exceed the requirements of 18 AAC 50.040 — 18 AAC 50.060 and 18 AAC 50.110 and are approvable by the Environmental Protec-

tion Agency under the federal new source performance standards or emission standards for hazardous air pollutants;

(3) for a facility subject to 18 AAC 50.300(a)(5) or (6).

(A) the best available control technology for controlling emissions of each pollutant will be installed and used for each new or modified source;

(B) in an area designated in 18 AAC 50.021(b) as in attainment with ambient air quality standards set by 18 AAC 50.020(a), allowable emissions from the facility and from associated growth will not

(i) cause or contribute to an increase in air contaminants greater than specified in 18 AAC 50.020(b); or

(ii) cause an increase of carbon monoxide more than 500 ug/m³ eight-hour average or 2000 ug/m³ one-hour average within any area specified in 18 AAC 50.021(a); and

(C) allowable emissions from the facility and from associated growth will not adversely affect air quality related values, including noise, odor, visibility, vegetation, and soils of any area within the state; and

(4) for a facility subject to 18 AAC 50.300(a)(7).

(A) emissions will not exceed the emission allowance in the applicable nonattainment area;

(B) the lowest achievable emission rate will be achieved for each new or modified source; and

(C) other sources owned or operated by the applicant within the state are in compliance with requirements of this chapter and the Clean Air Act (P.L. 91-604) as amended August 7, 1977 (P.L. 95-95).

(d) A permit to operate

(1) will be granted for no more than five years, after which the permit must be renewed for continued operation of the facility;

(2) will include a compliance schedule if the facility is emitting air contaminants in excess of applicable limitations contained in this chapter, based on the minimum time necessary to install the required control equipment, a permit which includes a compliance schedule must be renewed every year of its duration;

(3) will, in the department's discretion, require the permittee to install, use, and

maintain monitoring equipment, to sample emissions according to methods prescribed by the department, at locations and intervals and by procedures specified by the department; to provide source test reports; to provide monitoring data, emission data, and information from analyses of any test samples; and to make periodic reports on process operations and emissions;

(4) will, for an application submitted under 18 AAC 50.300(a)(8), include specific limitations on emissions or operations as necessary to exempt the facility from 18 AAC 50.300(a)(5) — (7) or any other requirement of this chapter;

(5) will, in the department's discretion, require that specific emission reduction procedures be taken during an air episode; and

(6) may not be transferred without the written consent of the regional supervisor.

(e) If an application for a permit is denied, the department will notify the applicant by certified mail, stating the reasons for denial. The notification will include a statement that a person aggrieved by the department's decision may request in adjudicatory hearing within 30 days after service of the denial under 18 AAC 15.200 — 18 AAC 15.310. For applications subject to (a) of this section, a copy of the final determination will be published and distributed as described in (a)(1) of this section.

50.410. [Repealed]

ARTICLE 4. REGULATION COMPLIANCE CRITERIA

50.500. SOURCE TESTING. (a) Except as provided in (d) of this section, the department will, in its discretion, conduct or have conducted air contaminant emission tests to determine compliance with this chapter.

(b) Testing to determine compliance with this chapter must be by methods approved by the department and done at a point or points which characterize the actual discharge into the ambient air.

(c) Except as provided in (d) of this section, air contaminant emission tests must be done at maximum rate burning or operating capacity of the unit, or other

rate determined by the department to characterize the actual discharge into the ambient air.

(d) Demonstration by source testing of compliance with the requirements of 18 AAC 50.040(a)(2) and (b)(2) for incinerators greater than 4,100 pounds per hour, 18 AAC 50.050(a)(1) for catalyst cracking unit catalyst regenerators, 18 AAC 50.040(c), 18 AAC 50.050(a)(4) — (8) and (d) must be done at maximum operating or production rates within 180 days after startup of a new or modified source. Source test methods specified in 40 CFR 60, Appendix A, as amended through November 1, 1982 or their equivalent are to be used as follows:

(1) for emissions of particulate matter, procedures specified in reference methods 1, 2, 3, 4, and 5;

(2) for emission of carbon monoxide, procedures specified in reference method 10;

(3) for emissions of sulfur dioxide, procedures specified in reference methods 1, 2, and 6;

(4) for emissions of reduced sulfur compounds, procedures specified in reference method 15;

(5) for hydrogen sulfide content of process fuel gas streams, procedures specified in reference method 11; and

(6) for visible emissions, procedures specified in reference method 9.

(e) If the provisions in (d) of this section do not apply, then compliance with emission standards must be measured by the following:

(1) for emissions of particulate matter, procedures specified in reference methods 1, 2, 3, 4, and 5 of Appendix A to 40 C.F.R. sec. 60 as amended through November 1, 1983;

(2) for emissions of sulfur dioxide, procedures specified in reference methods 1, 2, and 6 of Appendix A to 40 C.F.R. sec. 60 as amended through November 1, 1983; and

(3) to determine the reduction of visibility and opacity of exhaust gases, the procedures specified in the department document entitled "Alaska Air Quality Visible Emissions Evaluation Procedures" (dated August 1983).

(f) To determine compliance with this chapter, standard exhaust gas volumes

must include only the gases formed from theoretical combustion of the fuel, plus the excess gas volume normal for the specific source type, corrected to standard conditions.

50.510. AMBIENT ANALYSIS METHODS. (a) Air quality data and analyses submitted in support of a permit application under 18 AAC 50.300(a)(5) or (6) must comply with procedures set out in the department document entitled "ADEC Ambient Analysis Procedures" (dated July 1982).

(b) Continuous ambient air monitoring is required in support of a permit application submitted under 18 AAC 50.300(a)(5) or (6) for each pollutant which exceeds the limitations described in 18 AAC 50.300(a)(6)(C)(i) — (xvii) unless the existing concentrations or the predicted ambient air quality impacts are less than

- (1) carbon monoxide — 575 ug/m³, 8-hour average;
- (2) nitrogen dioxide — 14 ug/m³, annual average;
- (3) total suspended particulates — 10 ug/m³, 24-hour average;
- (4) sulfur dioxide — 13 ug/m³, 24-hour average;
- (5) ozone — any increase in allowable or actual volatile organic compounds emissions of 100 tons per year or more;
- (6) lead — 0.1 ug/m³, quarterly average;
- (7) mercury — 0.25 ug/m³, 24-hour average;
- (8) beryllium — 0.001 ug/m³, 24-hour average;
- (9) fluorides — 0.25 ug/m³, 24-hour average;
- (10) vinyl chloride — 15 ug/m³, 24-hour average; and
- (11) hydrogen sulfide — 0.2 ug/m³, 1-hour average.

50.520. EMISSION AND AMBIENT MONITORING. (a) Operators of facilities requiring a permit under 18 AAC 50.300 shall install, maintain, and operate continuous ambient air quality, meteorological, process, or emission monitoring and recording devices specified by the department and in accordance with 40 CFR sec. 58, Appendix B, as amended through November 1, 1983.

(b) Operators of facilities subject to 18

AAC 50.040(b)(2), 18 AAC 50.040(c), or 18 AAC 50.050(d) shall install, maintain, and operate continuous emission and process monitoring devices, keep records, and report excess emissions in accordance with procedures established in 40 CFR sec. 60 as amended through November 1, 1983.

(c) The department will, in its discretion, require the owner or operator of an air contaminant source to keep records and periodically report on the nature and amount of emissions as necessary to determine compliance with this chapter.

50.530. CIRCUMVENTION. (a) Use of air for dilution of emission contaminants without causing a total decrease in the contaminants is not permitted as a method of compliance with this chapter, except that dilution air may be used at sulfur recovery plants with a maximum production rate of 20 long tons per day or less to achieve compliance with the 500 ppm sulfur dioxide requirement in 18 AAC 50.050(c).

(b) A person owning or operating a facility emitting air contaminants subject to the limitations and provisions of this chapter shall ensure that the facility is in compliance with this chapter and any other applicable local, state, or federal law.

(c) Stack heights which exceed good engineering practice, or dispersion techniques, may not be used to affect the degree of emission limitation required for control of air contaminants.

(d) No person may construct, operate, or modify an air contaminant emission source which will result in a violation of the applicable emission standards or will interfere with the attainment or maintenance of the ambient air standards of this chapter.

ARTICLE 5. PROCEDURAL AND ADMINISTRATIVE

50.600. RECLASSIFICATION PROCEDURES AND CRITERIA. (a) The department will, in its discretion, periodically review and revise the air quality classifications within the state after notice and public hearing, except that

(1) the areas identified in 18 AAC

50.021(b)(1) of this chapter will not be reclassified; and

(2) the following areas may be reclassified only to Class I or II;

(A) an area which exceeds 10,000 acres in size and is a national monument, national primitive area, national preserve, national recreation area, national wild and scenic river, national wildlife refuge or range, or national lakeshore or seashore; and

(B) a national park or national wilderness area established after August 7, 1977 which exceeds 10,000 acres; and

(3) land within the exterior boundaries of reservations of federally recognized Indian tribes may be redesignated only by the appropriate Indian governing body.

(b) Reclassification will be initiated by the department on its own motion, or upon receipt of a petition for reclassification containing

(1) detailed reasons why reclassification is requested and is in the best interests of the public;

(2) an accurate description of the proposed boundaries of the area and the air quality within it;

(3) a detailed evaluation of emission and ambient air quality effects of any proposed new or modified facility;

(4) an evaluation of the effects of any proposed new or modified facility on air quality within other areas classified under 18 AAC 50.021;

(5) a detailed analysis of the health, environmental, economic, social, and energy effects of the proposed reclassification; and

(6) if an area proposed for reclassification includes or is part of a local government jurisdiction

(A) a resolution recommending reclassification and adopted by each affected unit of local government; and

(B) evidence that the resolution required under (A) of this paragraph was adopted after public hearing with at least 15 days' prior notice published in a newspaper of general circulation.

(c) The department will review the petition for reclassification within 30 days after receipt and will accept it for consideration if it satisfactorily describes the circumstances behind the proposed reclassification and meets the requirements of

(b) of this section Within 10 days after acceptance under this subsection, the department will send to any affected federal land managers a draft notice of public hearings to be held on the proposed reclassification and allow 30 days for comments. Within 10 days after the comment period, the department will publish in one or more newspapers of general circulation in the area for which reclassification is sought, notice of public hearings on the proposed reclassification to be held in areas likely to be affected. The notice will include a summary of the petition, the federal land manager's comments, and the department's analysis, and will state where copies of the petition and the analysis may be obtained. The notice will be published at least 30 days before the first hearing. Copies of the notice will be sent for review and comment to state department commissioners, members of the state legislature and the Environmental Advisory Board, affected federal land managers, and to units of local government within the affected area.

(d) Public hearings on proposed reclassification will be conducted as follows:

(1) the deputy commissioner or a designee will serve as hearing officer;

(2) the hearings will be electronically recorded, and witnesses will testify under oath;

(3) the hearing officer may question a witness and will permit any reasonable, pertinent testimony to be presented; and

(4) written testimony may be introduced into the record of the hearing within 15 days following the hearing.

(e) The hearing officer will summarize the hearing record and submit a recommendation, with the basis for approval or disapproval of the reclassification, to the commissioner. The recommendation will be sent to those officials and agencies identified in (c) of this section, and to persons who submitted testimony into the public hearing record, requesting their comments within 20 days after they receive the recommendation.

(f) Within 15 days after the close of the comment period under (e) of this section, the commissioner will approve the proposed reclassification if

(1) the health, environmental, economic, social, and energy effects of the proposed reclassification are in the public interest; and

(2) reclassification will not cause or contribute to air pollutant concentrations which exceed the standards in 18 AAC 50.020.

(g) The department will annually review the air quality classifications to determine if any areas should be proposed for reclassification. The department will annually publish a summary of the classifications, any petitions for reclassification received, and air quality conditions in the state. Copies will be sent to the officials and agencies identified in (c) of this section and, upon request, to other interested persons.

(h) If an area of the state is proposed for reclassification

(1) by the department, the data specified in (b) of this section will be made available to the public at the time of public notice; the requirements of (c), (d), (e), and (f) of this section will be followed in acting on all reclassifications; or

(2) by a private individual or organization without the resources to submit a complete petition under (b) of this section, the department will provide technical and coordinative assistance to ensure reasonable opportunity for full evaluation of the proposed reclassification.

50.610. AIR EPISODES. (a) An air episode will be declared when, in the opinion of the commissioner, the concentration of air contaminants in the ambient air has reached or is predicted to reach any of the following:

(1) for an air alert

(A) sulfur dioxide — 800 micrograms per cubic meter (24-hour average);

(B) particulate matter — 375 micrograms per cubic meter (24-hour average); and

(C) carbon monoxide — 17 milligrams per cubic meter (eight-hour average); and

(D) particulate matter generated from wood-burning activities within wood smoke control areas — 150 micrograms per cubic meter (24-hour average);

(2) for an air warning

(A) sulfur dioxide — 1,600 micrograms per cubic meter (24-hour average);

(B) particulate matter — 625 micrograms per cubic meter (24-hour average); and

(C) carbon monoxide — 34 milligrams

per cubic meter (eight-hour average), and (3) for an air emergency

(A) sulfur dioxide — 2,100 micrograms per cubic meter (24-hour average);

(B) particulate matter — 875 micrograms per cubic meter (24-hour average);

(C) carbon monoxide — 46 milligrams per cubic meter (eight-hour average).

(D) particulate matter generated from wood-burning activities within wood smoke control areas — 260 micrograms per cubic meter (24-hour average).

(b) The commissioner will prescribe and publicize curtailment actions when a level of air contaminants in (a) of this section is about to be reached.

50.620. AIR QUALITY CONTROL PLAN. The documents and procedures referred to in 18 AAC 50.021, 18 AAC 50.500 and 18 AAC 50.510 are included in vols. II and III of the Air Quality Control Plan. Those volumes of the plan, as amended through November 1, 1983, for implementing and enforcing this chapter, may be reviewed at the central office of the department and are incorporated by reference as part of this chapter.

ARTICLE 6. GENERAL PROVISIONS

50.900. DEFINITIONS. In this chapter

(1) "actual emissions" means the average rate, in tons per year, that the facility actually emitted during the most recent two years of normal operation; facility-specific allowable emissions may be considered actual emissions;

(2) "air contaminant" means dust, fumes, mist, smoke, fly ash and other particulate matter, vapor, gas, odorous substances, or a combination of these things;

(3) "air curtain incinerator" means a incinerator in which large amounts of combustible materials are burned in a rectangular container equipped with an over-fire air system;

(4) "allowable emissions" means the calculated emission rate of a source or facility using the maximum rated capacity and enforceable limitations and conditions on emissions or operations;

(5) "ambient air" means that portion of

the atmosphere, external to buildings, to which the public has access;

(6) "asphalt plant" means a facility which manufactures asphalt concrete by heating and drying aggregate and mixing asphalt cements; the term includes any combination of dryers, systems for screening, handling, storing, and weighing dried aggregate, systems for loading, transferring, and storing mineral filler; systems for mixing, transferring, and storing asphalt concrete; and emission control systems within the facility;

(7) "baseline concentration" means the ambient concentration level for a pollutant which exists on the applicable baseline date, plus the contribution from allowable emissions of a facility described in 18 AAC 50.300(a)(5) and (6), for which construction began before January 6, 1975, but which was not in operation by the baseline date, minus the contribution from actual emissions from a facility described in 18 AAC 50.300(a)(5) and (6) constructed or modified on or after January 6, 1975;

(8) "baseline date" means, for each air contaminant and for any air quality control region in which a facility would locate or have an air quality annual impact equal to or greater than one microgram per cubic meter, the earliest date after August 7, 1977 and before November 1, 1982 on which the first permit application was found to be complete by the Environmental Protection Agency, or the date after November 1, 1982 on which information required under 18 AAC 50.300(c) for a facility subject to 18 AAC 50.300(a)(5) and (6) is submitted;

(9) "best available control technology" means the emission limitation which represents the maximum reduction achievable for each regulated air pollutant, taking into account energy, environmental and economic impacts, and other costs; the resulting emissions must comply with applicable federal emission standards; best available control technology may include, for example, design features, equipment specifications, work practices, operational standards, or combinations of these factors;

(10) "Btu" means British thermal unit;

(11) "coal preparation facility" means a facility which prepares coal by breaking, crushing, screening, wet or dry cleaning, or thermal drying, and which processes

more than 200 tons per day of coal; the term includes any combination of thermal dryers, pneumatic coal cleaning equipment, coal processing and conveying equipment, breakers and crushers, coal storage systems, and coal transfer systems within the facility;

(12) "commissioner" means the commissioner of environmental conservation;

(13) "construct" means to make any physical change to a facility change in method of operation which would result in a change in actual emissions;

(14) "department" means the Department of Environmental Conservation;

(15) [Repealed]

(16) "dispersion technique" means a technique that attempts to reduce the concentration of an air contaminant in the ambient air by

(A) using that portion of a stack which exceeds good engineering practice stack height;

(B) varying the emission rate of an air contaminant according to atmospheric conditions or ambient concentrations of that air contaminant; or

(C) increasing exhaust gas plume rise by manipulating a source process parameter, exhaust gas parameter, or stack parameter, combining exhaust gases from several existing stacks into one stack, or by other selective handling of exhaust gas streams; this does not include

(i) reheating a gas stream, following use of an emission control system, to its original discharge temperature;

(ii) combining the exhaust gases from several stacks into one stack if the facility was originally designed and constructed with combined exhaust streams;

(iii) combining the exhaust gases from several stacks into one stack, if done concurrently with the installation of an emission control system accompanied by a net reduction in the allowable emissions of the controlled air contaminant; or

(iv) any technique that increases the exhaust gas plume rise if the allowable emissions of sulfur dioxide from the facility are less than 5,000 tons per year.

(17) [Repealed]

(18) "emission" means release of air contaminants into the environment;

(19) "emission allowance" means, for each nonattainment pollutant, the amount of air contaminant emissions allowed from new or modified facilities, as defined in

each applicable local air quality control plan, which will not interfere with attainment of the ambient air quality standards;

(20) "excessive concentration" means, in determining good engineering practice stack height.

(A) a maximum ground-level concentration caused by emissions from the stack which is at least 40 percent in excess of the maximum concentration experienced in the absence of downwash, wakes, or eddy effects produced by any nearby structure or nearby terrain feature;

(B) for a source seeking to establish good engineering practice stack height under (23)(C) of this section, a maximum ground-level concentration as described in (A) of this paragraph caused by emissions from the individual stack which, in addition,

(i) contributes to a total concentration due to emissions from all sources which is greater than an ambient air quality standard in 18 AAC 50.020(a); or

(ii) for a source described in 18 AAC 50.300(a)(5) or (6), contributes to a total concentration due to emissions from all sources which is greater than an allowable increment in 18 AAC 50.020(b);

(C) for an existing source seeking to establish good engineering practice stack height under (23)(C) of this section, a maximum ground-level concentration as described in (B) of this paragraph if the allowable emission rate used in a modeling demonstration for determining the creditable stack height does not exceed

(i) that required by the most recent federal new source performance standard applicable to the source category; or

(ii) an alternative emission rate established by the department in consultation with the source owner or operator, after the owner or operator demonstrates to the satisfaction of the department, or the authority administering the state implementation plan, that the most recent federal new source performance standard applicable to the source category is infeasible; or

(D) for a source seeking credit for an increase in existing stack height up to the height determined under (23)(B) of this section,

(i) a maximum ground-level concentration as described in (B) of this paragraph, if the allowable emission rate used in a modeling demonstration is the emission rate specified by the State Air Quality

Control Plan, or other applicable state implementation plan, or, in the absence of such a limit, the actual emission rate, or

(ii) the actual presence of a local nuisance caused by emissions from the existing stack as determined by the department or other authority administering the state implementation plan;

(21) "facility" means pollutant-emitting sources or activities which are located on one or more contiguous or adjacent properties and which are owned or operated by the same person or by persons under common control;

(22) "fuel burning equipment" means a combustion device capable of emission, including flares but excluding mobile internal combustion engines, incinerators, marine vessels, backyard barbecues, and wood-fired heating devices;

(23) "good engineering practice" means, for stack height, the greater of

(A) 65 meters, measured from the ground level elevation at the base of the stack, or, for a source located offshore, measured from mean lower, low water;

(B) the height, measured from the ground-level elevation at the base of the stack, or for a source located offshore measured from mean lower, low water, of any nearby structure plus one and one-half times the lesser dimension (height or projected width) of the nearby structure; unless a field study or fluid model required by the department or other authority administering the state implementation plan verifies that the emissions from the stack at this height would not result in an excessive concentration of a regulated air contaminant as a result of atmospheric downwash, wakes, or eddy effects created by the source itself, any nearby structure, or any nearby terrain feature; or

(C) the height demonstrated by a fluid model or a field study approved by the department or other authority administering the state implementation plan which ensures that the emissions from a stack do not result in an excessive concentration of a regulated air contaminant as a result of atmospheric downwash, wakes, or eddy effects created by the source itself, any nearby structure, or any nearby terrain feature;

(24) "impairment of visibility" means a humanly perceptible change in visibility such as visual range, contrast, or color-

ation, from that which would exist under natural conditions;

(25) "incinerator" means a device used for the thermal reduction of garbage or other wastes, other than an indoor stove or fireplace, but including air curtain incinerators;

(26) "lowest achievable emission rate" means that rate of emission which reflects the most stringent emission limitation imposed in any state, or any emission control which has been achieved in practice by comparable sources;

(27) "maximum combustion efficiency" means, for open burning, that the following are attempted: material should be kept as dry as possible through cover or dry storage; noncombustibles are separated before burn; natural or artificially induced draft is included; combustibles are separated from grass or peat layer; and combustibles are not allowed to smolder,

(28) "modify" means to make a change or a series of changes in operation, or any physical changes or additions to a source which increase the actual emissions of an air pollutant;

(29) "nearby," as used in the definition of "good engineering practice" in this section, means,

(A) for any structure in applying the formula in (23)(B) of this section, that distance up to five times the lesser of the height or the width dimension of a structure but not greater than 0.8 kilometers; the height of the structure is measured from the ground-level elevation at the base of the stack, or for sources located offshore, measured from mean lower, low water;

(B) for any structure or terrain feature in determining good engineering practice stack height with a fluid model or field study as prescribed in (23)(C) of this section, not greater than 0.8 kilometers, except that portion of a terrain feature may be considered to be nearby if it falls within a distance of up to 10 times the maximum height of the terrain feature, but not greater than 3.2 kilometers, provided that within 0.8 kilometers from the stack, the terrain feature achieves a height that is at least 40 percent of the good engineering practice stack height determined by the formula in (23)(B) of this section or 26 meters, whichever is greater, as measured from the ground-level eleva-

tion at the base of the stack or, for a source located offshore, measured from mean lower, low water; the height of the structure of terrain feature is measured from the ground-level elevation at the base of the stack, or, for a source located offshore, measured from mean lower, low water.

(30) "opacity" means the characteristic of a substance which renders it partially or wholly impervious to transmittance of light;

(31) "open burning" means the burning of a material which results in the products of combustion being emitted directly into the ambient air without passing through a stack or flare;

(32) "particulate matter" means a material except water which is, or has been, airborne and exists as a liquid or a solid at standard conditions;

(33) "petroleum refinery" means a facility engaged in the distillation of petroleum or redistillation, cracking, or reforming of unfinished petroleum derivatives;

(34) "ppm" means parts per million;

(35) "practical means available" means, when approving the open burning of liquid hydrocarbons produced during oil or gas well testing, that all alternative disposal methods will have been analyzed, and when an environmentally acceptable procedure exists, it will be required;

(36) "putrescible garbage" means a material capable of being decomposed with sufficient rapidity to cause nuisance or obnoxious odors;

(37) "reconstruct" means to make equipment or process changes for which the capital cost exceeds 50 percent of the fixed capital cost of a comparable new source or facility;

(38) "reduction of visibility" means the obscuring of an observer's vision;

(39) "regulated air pollutant" means an air pollutant regulated under Clean Air Act (P.L. 91-604) as amended August 7, 1977 (P.L. 95-95);

(40) "smolder" means to burn and smoke without flame;

(41) "source" means a structure, building, installation, or other part of a facility which emits or may emit a regulated air pollutant;

(42) "stack" means a chimney or con-

duit installed after air-pollution control equipment through which air or air contaminants are emitted into the environment;

(43) "standard conditions" means a dry gas at a temperature of 70 degrees Fahrenheit and a reference pressure of 14.7 pounds per square inch;

(44) "tpy" means tons per year; and

(45) "ug/m" means micrograms per cubic meter of ambient air.

(46) "regional supervisor" means the supervisor of the department's regional office located at Juneau, Anchorage, or Fairbanks;

(47) "wood-fired heating device" means a device designed for wood combustion so that usable heat is derived for the interior of a building, and includes wood-fired stoves, fireplaces, wood-fired cooking stoves, and combination fuel furnaces or

boilers which burn wood; and

(48) "wood smoke control area" means a geographic location within the state where wood-burning activities have resulted in a minimum of two individual 24-hour periods when ambient exposures of total suspended particulate matter solely from this activity have reached or exceeded 150 micrograms per cubic meter of air.

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Appendix D
Power Plant Operating Logs

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POWER PLANT													
STEAM GENERATION LOG													
BOILER NO: 1													
DATE: 6-25-89													
TIME	STEAM PRESSURE	STEAM TEMPERATURE	WATER COOLING TEMPERATURE	WATER COOLING FLOW	WATER COOLING PRESSURE	WATER COOLING TEMPERATURE	WATER COOLING FLOW	WATER COOLING PRESSURE	WATER COOLING TEMPERATURE	WATER COOLING FLOW	WATER COOLING PRESSURE	WATER COOLING TEMPERATURE	WATER COOLING FLOW
0000	610	880	88	130	22	650	113	303	2.5	18	27	1.4	1
0100	610	880	88	130	22	650	109	306	2.5	18	27	1.3	1
0200	615	880	88	130	22	650	106	300	2.9	18	27	1.3	1
0300	610	880	88	130	22	650	103	300	2.2	18	27	1.3	1
0400	615	880	88	130	22	650	106	300	2.5	18	27	1.3	1
0500	610	880	88	130	22	650	103	300	2.5	18	27	1.3	1
0600	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
0700	615	880	88	130	22	650	106	300	2.5	18	27	1.3	1
0800	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
0900	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
1000	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
1100	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
1200	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
1300	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
1400	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
1500	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
1600	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
1700	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
1800	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
1900	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
2000	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
2100	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
2200	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
2300	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
2400	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
2500	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
2600	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
2700	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
2800	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
2900	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1
3000	610	880	88	130	22	650	106	300	2.5	18	27	1.3	1

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Appendix E
Field Data, 20 Jun 89

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PARTICULATE SAMPLING DATA SHEET													
RUN NUMBER		1		DATE		20 JUNE 89		PLANT		POWER PLANT			
BASE		CLEAN		SAMPLE BOX NUMBER		2		METER BOX NUMBER		2			
Qw/Qm				Co				EQUATIONS		$OR = OF + 460$ $H = \left[\frac{5130 \cdot F \cdot C \cdot A}{Co} \right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$ $P_{tot} \text{ check - } 4H = 191$ $P_{tot} \text{ test leak check } @ 16" Hg - \text{good}$ $P_{out} \text{ test leak check } @ 7" Hg - \text{good}$ $Scot \text{ BL-OW}$			
SCHEMATIC OF STACK CROSS SECTION				$Moisture = 7$ $40,000 \text{ lb steam/hr}$		$OR = OF + 460$ $H = \left[\frac{5130 \cdot F \cdot C \cdot A}{Co} \right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$ $P_{tot} \text{ check - } 4H = 191$ $P_{tot} \text{ test leak check } @ 16" Hg - \text{good}$ $P_{out} \text{ test leak check } @ 7" Hg - \text{good}$ $Scot \text{ BL-OW}$		$OR = OF + 460$ $H = \left[\frac{5130 \cdot F \cdot C \cdot A}{Co} \right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$ $P_{tot} \text{ check - } 4H = 191$ $P_{tot} \text{ test leak check } @ 16" Hg - \text{good}$ $P_{out} \text{ test leak check } @ 7" Hg - \text{good}$ $Scot \text{ BL-OW}$		$OR = OF + 460$ $H = \left[\frac{5130 \cdot F \cdot C \cdot A}{Co} \right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$ $P_{tot} \text{ check - } 4H = 191$ $P_{tot} \text{ test leak check } @ 16" Hg - \text{good}$ $P_{out} \text{ test leak check } @ 7" Hg - \text{good}$ $Scot \text{ BL-OW}$		$OR = OF + 460$ $H = \left[\frac{5130 \cdot F \cdot C \cdot A}{Co} \right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$ $P_{tot} \text{ check - } 4H = 191$ $P_{tot} \text{ test leak check } @ 16" Hg - \text{good}$ $P_{out} \text{ test leak check } @ 7" Hg - \text{good}$ $Scot \text{ BL-OW}$	
TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H2O)	A (OF)	Ts (OF)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (in)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP	7 CUT (OF)	SAMPLE BOX TEMP (OF)	IMPINGER OUTLET TEMP (OF)		
1	0	2	275		23	3.34	354.277	80	76	237	54		
2	25		275		24	3.50		84	77	256	54		
3	5		274		16	2.35		88	78	256	54		
4	75		274		16	2.35		88	78	256	54		
5	10	3	274		13	1.91		92	79	266	67		
6	12.5	3	276		12	1.77		93	80	264	65		
7	15		275		13	0.44		94	80	265	69		
8	17.5	1	274		10.1	0.15		95	82	269	71		
9	20		272		10.2	0.30		94	83	267	71		
10	22.5	1	272		10.3	0.45		93	84	262	70		
11	25	15	271		10.5	0.74		94	84	262	69		
12	27.5	2	271		10.5	0.75		95	85	257	68		
	30 (step)						372.788						

AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE CLEAR AFS		DATE ²⁰ 19 JUNE 89		RUN NUMBER 1	
BUILDING NUMBER POWER PLANT			SOURCE NUMBER BOILER #21		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	0.5178	0.2933 ~~0.2891~~	0.2245		
ACETONE WASHINGS (Probe, Front Half Filter)	98.7856	98.6688	0.1168		
BACK HALF (If needed)					
			Total Weight of Particulates Collected		0.3413 gm
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (20)	223	200	23		
IMPINGER 2 (H2O)	258	200	58		
IMPINGER 3 (Dry)	3	0	3		
IMPINGER 4 (Silica Gel)	218.4	200	18.4		
			Total Weight of Water Collected		102.0 gm
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	9.0	9.0	9.0		9.0
VOL % O ₂	10.0	10.0	10.0		10.0
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

VISIBLE EMISSION OBSERVATION FORM

No. 1

COMPANY NAME <i>USAP</i>		
STREET ADDRESS <i>CHP HP</i>		
CITY <i>Clear AFS</i>	STATE <i>AK</i>	ZIP
PHONE (KEY CONTACT) <i>Wanda Shoemaker</i>	SOURCE ID NUMBER <i>Boiler #1</i>	

PROCESS EQUIPMENT <i>Coal fired boiler</i>	OPERATING MODE <i>9000 lbs steam/hr</i>
CONTROL EQUIPMENT <i>Oxygen separators</i>	OPERATING MODE <i>normal</i>

DESCRIBE EMISSION POINT <i>steel stack</i>	
HEIGHT ABOVE GROUND LEVEL <i>100</i>	HEIGHT RELATIVE TO OBSERVER Start <i>100</i> End ☒
DISTANCE FROM OBSERVER Start <i>300</i> End ☒	DIRECTION FROM OBSERVER Start <i>S</i> End ☒

DESCRIBE EMISSIONS	
Start <i>lofting</i>	End
EMISSION COLOR Start <i>White/gray</i>	IF WATER DROPLET PLUME Attached ☒ <i>NA</i> Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start <i>0-5 ft</i> End	

DESCRIBE PLUME BACKGROUND	
Start <i>sky</i>	End ☒
BACKGROUND COLOR Start <i>Blue</i> End	SKY CONDITIONS Start <i>Clear</i> End
WIND SPEED Start <i>< 5 mph</i> End	WIND DIRECTION Start <i>SE</i> End
AMBIENT TEMP Start <i>78</i> End	WET BULB TEMP Start <i>< 5</i> End

Stack with Plume Sun Wind	SOURCE LAYOUT SKETCH Draw North Arrow Emission Point Observer's Position 140° Sun Location Line
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ADDITIONAL INFORMATION	46
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OBSERVATION DATE <i>20 JUN 89</i>				START TIME <i>1042</i>	END TIME <i>1101</i>
SEC MIN	0	15	30	45	COMMENTS
1	10	10	10	10	
2	15	10	20	15	
3	15	10	10	5	
4	10	10	10	10	
5	10	5	5	10	
6	15	10	10	10	
7	5	5	15	15	
8	10	10	5	10	
9	10	10	25	20	
10	15	15	15	10	
11	10	10	25	25	
12	15	25	40	25	
13	25	20	20	20	<i>Start Hawk</i>
14	25	20	20	10	
15	10	15	15	15	
16	15	10	10	10	
17	10	5	5	5	
18	5	5	5	5	
19	5	5	5	5	
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

OBSERVER'S NAME (PRINT) <i>Charles W. Atteberg</i>	DATE <i>20 JUN 89</i>
OBSERVER'S SIGNATURE <i>Charles W. Atteberg</i>	
ORGANIZATION <i>AFB EHL/ECR</i>	
CERTIFIED BY <i>Texas Air Control Board</i>	DATE <i>17 MAR 89</i>

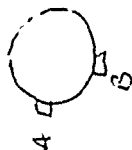
PARTICULATE SAMPLING DATA SHEET

RUN NUMBER 2 1/2
 DATE 19 JUNE 89
 PLANT POWER PLANT
 BASE CLERAFS
 SAMPLE BOX NUMBER 1
 METER BOX NUMBER 2
 Qm/Qm
 Co

SCHEMATIC OF STACK CROSS SECTION



meter box



EQUATIONS
 $OR = OF + 460$
 $H = \left[\frac{5130 \cdot Pd \cdot Cp \cdot A}{Co} \right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$

1st check - good
 pre leak check @ 15" H₂ - good
 post leak check @ 14" H₂ - good

AMBIENT TEMP
 STATION PRESS 29.20 in Hg
 HEATER BOX TEMP
 PROBE HEATER SETTING
 PROBE LENGTH 96 in
 NOZZLE AREA (A) 0.377 in² sq ft
 Cp
 DRY GAS FRACTION (Fd)

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H ₂ O)	STACK TEMP (°F)	STACK TEMP (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (in)	GAS SAMPLE VOLUME (cu ft)	GAS IN (°F)	AVG (Tm) (°R)	7 OUT (°F)	3 SAMPLE BOX TEMP (°F)	IMPIINGER OUTLET TEMP (°F)
1	0	2	275		.14	2.10	389.132	97		96	241	67
2	25	2	275		.16	2.41		97		96	258	58
3	5	3.5	286		.16	2.44		99		96	260	56
4	75	3.5	295		.13	1.96		101		96	269	55
5	10	3	297		.11	1.66		102		96	269	56
6	125	2	297		.09	1.36		103		96	271	58
7	15	2	297		.08	1.21		103		97	277	61
8	175	2	296		.06	0.91		103		97	282	62
9	20	1.5	294		.05	0.76		103		97	273	63
10	225	1	293		.05	0.76		101		97	268	64
11	25	1	293		.06	0.91		100		96	256	65
12	275	1.5	293		.05	0.76		100		96	256	65
1250	30 (stop)						408.005					

RUN NUMBER 2	SCHEMATIC OF STACK CROSS SECTION	EQUATIONS $\text{OR} = ^\circ\text{F} + 460$ $H = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m}{T_s} \cdot V_p$	AMBIENT TEMP OF
DATE 20 JUNE 89			STATION PRESS 27.20 in Hg
PLANT POWER PLANT			HEATER BOX TEMP OF
BASE CLEAR AFS			PROBE HEATER SETTING
SAMPLE BOX NUMBER -			PROBE LENGTH 96 in
METER BOX NUMBER 2			NOZZLE AREA (A) 1.4 0.377 $\frac{1}{4}$ sq ft
Q_w/Q_m			Cp 1.84
Co	DRY GAS FRACTION (F _d)		

[illegible]

AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE CLEAR AFS		DATE 20 19 JUNE 89		RUN NUMBER 2	
BUILDING NUMBER POWER PLANT			SOURCE NUMBER BOILER # 1		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	0.6038	0.2944	0.3094		
ACETONE WASHINGS (Probe, Front Half Filter)	102.8355	102.7366	0.0989		
BACK HALF (If needed)					
		Total Weight of Particulates Collected		0.4083 gm	
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H ₂ O)	247	200	47		
IMPINGER 2 (H ₂ O)	222.5	200	22.5		
IMPINGER 3 (Dry)	6.5	0	6.5		
IMPINGER 4 (Silica Gel)	216.4	200	16.4		
		Total Weight of Water Collected		92.0 gm	
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	8.7	8.8	8.8		8.8
VOL % O ₂	10.2	10.1	10.2		10.2
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

VISIBLE EMISSION OBSERVATION FORM

No. 2

COMPANY NAME USAF		
STREET ADDRESS CH & HP		
CITY Clear AFS	STATE AK	ZIP
PHONE (KEY CONTACT) Wendel S. ...	SOURCE ID NUMBER Boiler #1	

PROCESS EQUIPMENT Coal fired Boiler	OPERATING MODE 90 kwh/hr
CONTROL EQUIPMENT Cyclone separators	OPERATING MODE normal

DESCRIBE EMISSION POINT steel stack	
HEIGHT ABOVE GROUND LEVEL 100	HEIGHT RELATIVE TO OBSERVER Start 100 End
DISTANCE FROM OBSERVER Start 200 End	DIRECTION FROM OBSERVER Start E W End

DESCRIBE EMISSIONS Start lifting End	
EMISSION COLOR Start white End	IF WATER DROPLET PLUME Attached ☒ N/A Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 6-5' End	

DESCRIBE PLUME BACKGROUND Start broken clouds End	
BACKGROUND COLOR Start blue white End	SKY CONDITIONS Start Partly End
WIND SPEED Start <5 mph End	WIND DIRECTION Start End
AMBIENT TEMP Start 75 End	WET BULB TEMP Start End
RH, percent Start 100 End	

Stack with Plume Sun Wind	SOURCE LAYOUT SKETCH
---------------------------------	--------------------------

OBSERVATION DATE				START TIME	END TIME
20 JUN 89.				177.5	1239
SEC MIN	0	15	30	45	COMMENTS
1	5	5	5	5	
2	5	5	10	5	
3	5	5	5	5	
4	5	5	5	5	
5	5	5	5	5	
6	5	5	5	5	
7	5	5	5	10	
8	5	10	5	10	
9	10	10	5	5	
10	5	5	5	5	
11	5	5	5	5	
12	5	5	5	5	
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

OBSERVER'S NAME (PRINT) CHARLES W. McHenry		DATE 20 JUN 89
OBSERVER'S SIGNATURE Charles W. McHenry		
ORGANIZATION Toxic Air Control Board		WAF
CERTIFIED BY y	DATE 12 MAR 89	

ADDITIONAL INFORMATION

PARTICULATE SAMPLING DATA SHEET

[illegible]

PARTICULATE SAMPLING DATA SHEET

SCHEMATIC OF STACK CROSS SECTION				EQUATIONS				AMBIENT TEMP			
TRaverse POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H ₂ O)	STACK TEMP (°F)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (in)	GAS SAMPLE VOLUME (cu ft)	GAS IN (°F)	AVG (T _m) (°F)	OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	0	10	295	.16	2.37	455.609	94	93	93	256	67
2	25	11	295	.17	2.51		96	93	93	256	67
3	50	12	290	.17	2.60		98	93	93	255	63
4	75	13	295	.15	2.35		97	93	93	255	67
5	10	13	300	.12	1.79		100	93	93	257	67
6	125	11	300	.10	1.49		101	93	93	262	69
7	15	10	299	.08	1.20		101	94	94	260	70
8	175	9	298	.08	1.20		100	94	94	261	70
9	20	9	297	.07	1.05		100	94	94	259	70
10	225	9	297	.08	1.20		101	94	94	264	70
11	25	9	296	.07	1.05		100	94	94	264	70
12	275	9	296	.07	1.05		100	94	94	265	69
				176.110				$T_m = 96$			
				$Alt = 1.93$							
				$1875 = 9.5940$							
				$Vol = 43.670$							

RUN NUMBER **3**
 DATE **2/2**
 PLANT **19 JUNE 89**
 BASE **POWER PLANT**
 CLEAR AFS
 SAMPLE BOX NUMBER **—**
 METER BOX NUMBER **2**
 Qw/Qm
 Co

AMBIENT TEMP
 STATION PRESS **29.20** in Hg
 HEATER BOX TEMP
 PROBE HEATER SETTING
 PROBE LENGTH **96** in
 NOZZLE AREA (A_N) **0.377** sq-in
 Cp **0.84**
 DRY GAS FRACTION (F_d)

$OR = 9°F + 460$
 $H = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m}{T_s} \cdot V_p$

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE

CLEAR AFS

DATE

20
19 JUNE 89

RUN NUMBER

3

BUILDING NUMBER

POWER PLANT

SOURCE NUMBER

BOILER # 21

I.

PARTICULATES

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	0.6864	0.2902	0.3962
ACETONE WASHINGS (Probe, Front Half Filter)	93.7517	93.6322	0.1195
BACK HALF (If needed)			
Total Weight of Particulates Collected			0.5157 gm

II.

WATER

ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H2O)	~~27~~ 301	250 ~~200~~	51
IMPINGER 2 (H2O)	268	250 ~~200~~	18
IMPINGER 3 (Dry)	2	0	2
IMPINGER 4 (Silica Gel)	217.3	200	17.3 ~~2~~
Total Weight of Water Collected			88.0 ~~73.0~~ gm

III.

GASES (Dry)

ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	8.0	8.1	8.0		8.0
VOL % O ₂	11.0	11.0	11.0		11.0
VOL % CO					
VOL % N ₂					

$$\text{Vol \% N}_2 = (100\% - \% \text{CO}_2 - \% \text{O}_2 - \% \text{CO})$$

VISIBLE EMISSION OBSERVATION FORM

No. THREE

COMPANY NAME <u>USAF</u>		
STREET ADDRESS <u>CH & HP</u>		
CITY <u>Clear AFS</u>	STATE <u>AK</u>	ZIP
PHONE (KEY CONTACT) <u>Wendell Spawden</u>		SOURCE ID NUMBER <u>Baker #1</u>

PROCESS EQUIPMENT <u>Coal fired Boiler</u>	OPERATING MODE <u>90 lbs/hr</u>
CONTROL EQUIPMENT <u>Cyclone separator</u>	OPERATING MODE <u>normal</u>

DESCRIBE EMISSION POINT <u>Steel Stack</u>	
HEIGHT ABOVE GROUND LEVEL <u>100</u>	HEIGHT RELATIVE TO OBSERVER Start <u>100</u> End
DISTANCE FROM OBSERVER Start <u>300</u> End	DIRECTION FROM OBSERVER Start <u>NW</u> End

DESCRIBE EMISSIONS Start <u>Continuous</u> End	
EMISSION COLOR Start <u>White/gray</u> End	IF WATER DROPLET PLUME Attached ☒ <u>N/A</u> Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start <u>0-5'</u> End	

DESCRIBE PLUME BACKGROUND Start <u>broken clouds</u> End	
BACKGROUND COLOR Start <u>White/gray</u> End	SKY CONDITIONS Start <u>partly cloudy</u> End
WIND SPEED Start <u>4-5 mph</u> End	WIND DIRECTION Start <u>N</u> End
AMBIENT TEMP Start <u>75</u> End	WET BULB TEMP <u>75</u> RH, percent <u>100</u>

Stack with Plume Sun Wind	SOURCE LAYOUT SKETCH Draw North Arrow
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ADDITIONAL INFORMATION

OBSERVATION DATE			START TIME		END TIME
20 JUN 89			1403		1430
SEC	0	15	30	45	COMMENTS
MIN					
1	20	20	20	15	
2	15	15	15	15	
3	15	10	15	20	
4	20	20	30	20	
5	15	15	25	15	
6	15	10	10	10	
7	10	10	15	15	
8	20	15	15	10	
9	15	10	20	15	
10	20	15	15	15	
11	20	20	20	25	
12	25	15	15	25	
13	20	15	15	15	
14	15	15	15	20	
15	20	15	20	15	
16	15	20	15	15	
17	20	15	20	20	
18	20	20	20	20	
19	15	15	20	20	
20	15	15	15	15	
21	15	15	15	20	
22	15	20	15	15	
23	15	15	20	20	
24	15	15	30	25	
25	25	25	20	15	
26	15	15	15	15	
27	15	15	20	20	
28					
29					
30					

OBSERVER'S NAME (PRINT) <u>CHARLES W. Arneberg</u>	
OBSERVER'S SIGNATURE <u>Charles W. Arneberg</u>	DATE <u>20 JUN 89</u>
ORGANIZATION <u>AFSC/ECG</u>	
CERTIFIED BY <u>Texas Air Control Group</u>	DATE <u>17 June 89</u>

PRELIMINARY SURVEY DATA SHEET NO. 2
(Velocity and Temperature Traverse)

BASE

CLEAR AFS

DATE _____

19 JUNE 89

BOILER NUMBER

#2

INSIDE STACK DIAMETER

83

Inches

STATION PRESSURE

29.15

In Hg

STACK STATIC PRESSURE

- 0.13

In H₂O

SAMPLING TEAM

17 FOEHL

TRAVERSE POINT NUMBER	VELOCITY HEAD, V_p IN H ₂ O	CYCLONIC α	STACK TEMPERATURE ($^{\circ}$ F)
1	.21	10 5 5	212
2	.26	10 0	258
3	.28	5 2	274 29.2
4	~~.25~~ .23	3 3	~~287~~ 295
5	.20	2 10	297
6	.17	5 7	298
7	.06	15 15	297
8	.04	10 5	296
9	.04	15 5	296
10	.03	20 0	295
11	.06	20 15	295
12	.08	20 20	294
		Avg = 9°	
	FPS = 23 ft/sec		
	T _c = 285	D _{in} = 0.393	
	$\Delta P = 0.14$	Actual = 277	
	AVERAGE		

PRELIMINARY SURVEY DATA SHEET NO. 1

*(Stack Geometry)

BASE CLEAR AFS	PLANT POWER PLANT
DATE ²⁰ 19 JUNE 89	SAMPLING TEAM AFOEHL
SOURCE TYPE AND MAKE COAL-FIRED BOILER	
SOURCE NUMBER # 2	INSIDE STACK DIAMETER 83 Inches
RELATED CAPACITY 100,000 LB STEAM/hr	TYPE FUEL COAL
DISTANCE FROM OUTSIDE OF NIPPLE TO INSIDE DIAMETER 0.25 Inches	
NUMBER OF TRAVERSES 2	NUMBER OF POINTS/TRAVERSE 12

LOCATION OF SAMPLING POINTS ALONG TRAVERSE

POINT	PERCENT OF DIAMETER	DISTANCE FROM INSIDE WALL (Inches)	TOTAL DISTANCE FROM OUTSIDE OF NIPPLE TO SAMPLING POINT (Inches)
1			2.0
2			5.8
3			10.1
4			15.0
5			21.0
6			29.8
7			53.7
8			62.5
9			68.5
10			73.4
11			77.7
12			81.5

Appendix F
Field Data, 21 Jun 89

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[illegible]

AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE <i>Eff. Clear ATS</i>		DATE <i>21 June 89</i>		RUN NUMBER <i>1</i>	
BUILDING NUMBER <i>CHPP</i>			SOURCE NUMBER <i>Boiler 1</i>		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	<i>0.3793</i>	<i>12883</i>	<i>.0910</i>		
ACETONE WASHINGS (Probe, Front Half Filter)	<i>105.3759</i>	<i>105.2623</i>	<i>.1136</i>		
BACK HALF (If needed)					
Total Weight of Particulates Collected			<i>.2046 gm</i>		
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	<i>250</i>	<i>200</i>	<i>50.0</i>		
IMPINGER 2 (H2O)	<i>220</i>	<i>200</i>	<i>28.0</i>		
IMPINGER 3 (Dry)	<i>4</i>	<i>0</i>	<i>4.0</i>		
IMPINGER 4 (Silica Gel)	<i>223.0</i>	<i>200</i>	<i>23.0</i>		
Total Weight of Water Collected			<i>105 gm</i>		
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	<i>7.0</i>	<i>6.9</i>	<i>6.9</i>		<i>6.9</i>
VOL % O ₂	<i>13.0</i>	<i>12.9</i>	<i>13.1</i>		<i>13.0</i>
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

VISIBLE EMISSION OBSERVATION FORM

No. 1

COMPANY NAME USAF	
STREET ADDRESS CH & WP	
CITY Chen AFB	STATE AK
PHONE (KEY CONTACT) Wendel Shoemaker	SOURCE ID NUMBER Boiler #1
PROCESS EQUIPMENT Coal fired boiler	OPERATING MODE 90 lbs/hr
CONTROL EQUIPMENT Cyclone Separator	OPERATING MODE nominal
DESCRIBE EMISSION POINT Steel Stack	
HEIGHT ABOVE GROUND LEVEL 100'	HEIGHT RELATIVE TO OBSERVER Start 16 End
DISTANCE FROM OBSERVER Start 50 End	DIRECTION FROM OBSERVER Start W End
DESCRIBE EMISSIONS	
Start <i>Optimizing</i> End	
EMISSION COLOR Start <i>black</i> End <i>brown/white</i>	IF WATER DROPLET PLUME Attached ☒ A1/A Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 0-5 End	
DESCRIBE PLUME BACKGROUND	
Start <i>Clouds</i> End	
BACKGROUND COLOR Start <i>White</i> End	SKY CONDITIONS Start <i>overcast</i> End
WIND SPEED Start <i>10-15 mph</i> End	WIND DIRECTION Start <i>NE</i> End
AMBIENT TEMP Start <i>65</i> End	WET BULB TEMP RH, percent 40
Stack with Plume Sun Wind SOURCE LAYOUT SKETCH Draw North Arrow	

OBSERVATION DATE		START TIME		END TIME	COMMENTS
21 JUN 89		1110		1125	
SEC	0	15	30	45	
MIN					
1	5	5	5	5	
2	10	10	5	5	
3	5	5	5	5	
4	5	5	5	5	
5	5	5	5	5	
6	5	5	5	10	
7	5	5	5	5	
8	5	5	5	5	
9	5	5	5	5	
10	5	5	10	5	
11	5	5	5	5	
12	20	25	20	30	
13	25	15	20	25	SOOT BLOW
14	20	15	15	10	
15	5	5	5	5	
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
OBSERVER'S NAME (PRINT) CHARLES W. AITENBERG					
OBSERVER'S SIGNATURE Charles W. Aitenberg					DATE 21 JUN 89
ORGANIZATION AFORHL/CA					
CERTIFIED BY Texas Air Control Board					DATE 17 MAR 89

ADDITIONAL INFORMATION

RUN NUMBER	2 1/2	SCHEMATIC OF STACK CROSS SECTION 	EQUATIONS $^{\circ}R = ^{\circ}F + 460$ $H = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m}{T_s} \cdot V_p$ <i>Pot check - good</i> <i>pre heat check @ 15" Hg - good</i> <i>pre heat check @ 15" Hg - good</i>	AMBIENT TEMP STATION PRESS HEATER BOX TEMP PROBE HEATER SETTING PROBE LENGTH NOZZLE AREA (AT P) Cp DRY GAS FRACTION (Fd)
DATE	21 JUN 89			
PLANT	POWER PLANT			
BASE	CLIFAR AT S			
SAMPLE BOX NUMBER				
METER BOX NUMBER	2			
Qw/Qm				
C _o				

[illegible]

PARTICULATE SAMPLING DATA SHEET

SCHEMATIC OF STACK CROSS SECTION				EQUATIONS				AMBIENT TEMP								
RUN NUMBER	DATE	PLANT	BASE	OR = °F + 460	IN	AVG (Tm) (°R)	OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)	STATION PRESS	HEATER BOX TEMP	PROBE HEATER SETTING	PROBE LENGTH	NOZZLE AREA (mm ²)	Cp	DRY GAS FRACTION (Fd)
2	21 JUNE 89	POWER PLANT	CLEAR AFS	$H = \left[\frac{5130 \cdot Fd \cdot Cp \cdot A}{Co} \right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$	96	91	91	257	68							
METER BOX NUMBER	2															
Qw/Qm																
Co																
TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H2O)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (H)	GAS SAMPLE VOLUME (cu ft)	IN (°F)	AVG (Tm) (°R)	OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)				
1	6	3	281		.13	1.91	539.10	94		91	257	68				
2	25	3	281		.15	2.31		98		91	257	67				
3	5	3	281		.16	2.36		99		91	257	63				
4	75	3	282		.13	1.91		103		93	261	63				
5	10	3	291		.10	1.45		103		93	262	64				
6	125	3	294		.10	1.46		103		93	258	65				
7	15	3	292		.07	1.02		102		93	251	65				
8	175	3	291		.06	1.02		102		93	257	66				
9	20	1	290		.05	0.73		101		93	253	67				
10	22.5	1	289		.05	0.73		99		93	253	67				
11	35	1	288		.05	0.73		96		93	254	66				
12	27.5	1	288		.05	0.73		77		93	255	66				
	3.14 hr						557.854									
$PSTS = 8.7799$ $TS = 288$ $ASH = 1.59$ $TM = 94$ $VOL = 38.412873$																

AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE Clear AFS		DATE 21 June 89		RUN NUMBER 2	
BUILDING NUMBER CHHP			SOURCE NUMBER Boiler #1		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	0.5124	.2873	.2251		
ACETONE WASHINGS (Probe, Front Half Filter)	105.4661	105.3810	.0851		
BACK HALF (If needed)					
Total Weight of Particulates Collected			.3102 gm		
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	260	200	60.4		
IMPINGER 2 (H2O)	222	200	22.4		
IMPINGER 3 (Dry)	5	0	5.4		
IMPINGER 4 (Silica Gel)	215.8	200	15.8		
Total Weight of Water Collected			103 gm		
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	10.4	10.4	10.4		10.4
VOL % O ₂	9.6	9.6	9.6		9.6
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

VISIBLE EMISSION OBSERVATION FORM

No. 2

COMPANY NAME <u>USAF</u>		
STREET ADDRESS <u>CH & HP</u>		
CITY <u>Clean Air</u>	STATE <u>AK</u>	ZIP
PHONE (KEY CONTACT) <u>Wendel Shumaker</u>	SOURCE ID NUMBER <u>Boiler #1</u>	
PROCESS EQUIPMENT <u>Coal-fired boiler</u>	OPERATING MODE <u>90 lbs/hr</u>	
CONTROL EQUIPMENT <u>On-line separator</u>	OPERATING MODE	

DESCRIBE EMISSION POINT <u>Steel Stack</u>	
HEIGHT ABOVE GROUND LEVEL <u>100</u>	HEIGHT RELATIVE TO OBSERVER Start <u>16</u> End
DISTANCE FROM OBSERVER Start <u>50</u> End	DIRECTION FROM OBSERVER Start <u>N</u> End

DESCRIBE EMISSIONS	
Start <u>10:15</u> End	IF WATER DROPLET PLUME Attached ☐ <u>N/A</u> Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start <u>0-5'</u> End	

DESCRIBE PLUME BACKGROUND	
Start <u>Skies</u> End	SKY CONDITIONS Start <u>Partly Cloudy</u> End
BACKGROUND COLOR Start <u>Blue/white</u> End	WIND DIRECTION Start <u>NE</u> End
WIND SPEED Start <u>5-10 mph</u> End	AMBIENT TEMP Start <u>75</u> End
WET BULB TEMP	RH, percent <u>40</u>

Stack with Plume Sun Wind	SOURCE LAYOUT SKETCH
---------------------------------	--------------------------

ADDITIONAL INFORMATION

OBSERVATION DATE <u>21 JUN 89</u>				START TIME <u>1214</u>	END TIME
SEC	0	15	30	45	COMMENTS
MIN					
1	5	10	10	10	
2	10	10	5	5	
3	5	5	5	5	
4	10	10	10	5	
5	5	5	5	5	
6	5	5	5	5	
7	5	5	5	5	
8	5	5	5	5	
9	5	5	5	5	
10	5	5	5	5	
11	5	5	5	5	
12	5	5	5	5	
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27					
28					
29					
30					

OBSERVER'S NAME (PRINT) <u>Charles W. Hebert</u>	DATE <u>21 JUN 89</u>
OBSERVER'S SIGNATURE <u>Charles W. Hebert</u>	
ORGANIZATION <u>AFCEH/ECR</u>	
CERTIFIED BY <u>Texas Air Control Board</u>	DATE <u>17 JUNE 89</u>

PARTICULATE SAMPLING DATA SHEET											
SCHEMATIC OF STACK CROSS SECTION				EQUATIONS							
RUN NUMBER 3	1/2			$^{\circ}R = ^{\circ}F + 460$ $H = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m}{T_s} \cdot V_p$							
DATE 21 JUNE 89											
PLANT POWER PLANT											
BASE CLEVELAND											
SAMPLE BOX NUMBER				$P_{tot} \text{ Check} - 900 \text{ J}$ $P_{ic} \text{ test leak @ } 15'' H_2 - 6700 \text{ J}$ $P_{out} \text{ leak check @ } 10'' H_2 - 6700 \text{ J}$							
METER BOX NUMBER 2											
Qw/Qm											
Co											
TRAVERSE POINT NUMBER	SAMPLING TIME A (min)	STATIC PRESSURE (in H2O)	STACK TEMP		VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (in)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP		SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
			(°F)	(Ts) (°R)				IN (°F)	AVG (Tm) (°R)		
1	0	2	288		0.05	0.73	558.137	97		229	73
2	2.5	1	288		0.16	2.35		97		245	61
3	5	3	280		.15	2.23		100		252	58
4	2.5	2	293		.12	1.75		102		258	58
5	10	2	295		.10	1.46		104		261	58
6	12.5	2	295		.10	1.46		105		261	60
7	15	2	294		.08	1.17		105		260	58
8	17.5	2	293		.06	0.68		105		263	58
9	30	1	291		.05	0.73		104		264	58
10	32.5	1	291		.04	0.59		103		263	58
11	25	1	291		.06	0.88		102		261	58
12	27.5	2	290		.05	0.73		102		263	58
	30 (stop)						575.971				

AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE Clean AFS		DATE 21 June 89		RUN NUMBER 3	
BUILDING NUMBER CHHP			SOURCE NUMBER Bunker #1		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	0.6445	.2872	.3573		
ACETONE WASHINGS (Probe, Front Half Filter)	95.5911	95.5231	.0680		
BACK HALF (If needed)					
Total Weight of Particulates Collected			.4253 gm		
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	2.70	200	76.0		
IMPINGER 2 (H2O)	210	200	10.0		
IMPINGER 3 (Dry)	2	0	2.0		
IMPINGER 4 (Silica Gel)	212.2	200	12.2		
Total Weight of Water Collected			914 gm		
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	11.6	11.4	11.4		11.5
VOL % O ₂	8.4	8.6	8.6		8.5
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

VISIBLE EMISSION OBSERVATION FORM

No. 3

COMPANY NAME ISAP		
STREET ADDRESS CH 4 HP		
CITY Cian AFB	STATE AK	ZIP
PHONE (KEY CONTACT) Wendel Skowden	SOURCE ID NUMBER Boiler #1	

PROCESS EQUIPMENT Coal fired Boiler	OPERATING MODE 90 KPS/hr
CONTROL EQUIPMENT Cyclone Separator	OPERATING MODE nominal

DESCRIBE EMISSION POINT Steel Stack	
HEIGHT ABOVE GROUND LEVEL 100	HEIGHT RELATIVE TO OBSERVER Start 100 End
DISTANCE FROM OBSERVER Start 300 End	DIRECTION FROM OBSERVER Start N End

DESCRIBE EMISSIONS	
Start Lifting	End
EMISSION COLOR Start brown/white	IF WATER DROPLET FLUME Attached ☐ N/A Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 0-5 End	

DESCRIBE PLUME BACKGROUND		
Start Sky	End	
BACKGROUND COLOR Start Blue/white	SKY CONDITIONS Start Partly Cloudy End	
WIND SPEED Start 0-5 mph End	WIND DIRECTION Start NE End	
AMBIENT TEMP Start 75 End	WET BULB TEMP	RH, percent LID

Stack with Plume	SOURCE LAYOUT SKETCH		Draw North Arrow
Sun			①
Wind			0.
Observer's Position 140° Sun Location Line			

OBSERVATION DATE		START TIME				END TIME
21 JUN 89		1353				
SEC	0	15	30	45	COMMENTS	
MIN						
1	10	10	10	5		
2	5	5	10	10		
3	5	5	5	5		
4	5	5	5	5		
5	5	5	5	10		
6	10	10	10	10		
7	5	5	5	5		
8	5	5	5	5		
9	5	5	5	10		
10	5	5	5	5		
11	5	5	5	5		
12	5	5	5	5		
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30						

OBSERVER'S NAME (PRINT) Charles W. Attberry		DATE 21 JUN 89
OBSERVER'S SIGNATURE Charles W. Attberry		
ORGANIZATION AFOTL/CCA		
CERTIFIED BY Texas Air Control Board		DATE 17 MAR 89

ADDITIONAL INFORMATION

(Velocity and Temperature Traverse)

BASE
CLEAR AF S

DATE 21 JUNE 89

BOILER NUMBER 41

INSIDE STACK DIAMETER 23 Inches

STATION PRESSURE 29.05 In Hg

STACK STATIC PRESSURE -1.12 In H2O

SAMPLING TEAM 9% moisture

TRAVERSE POINT NUMBER	VELOCITY HEAD, V _p IN H ₂ O	$\sqrt{V_p}$	STACK TEMPERATURE (°F)
1	.14		~~272~~ 261
2	~~.17~~ .16		~~253~~ 281
3	.15		~~271~~ 281
4	.12		283
5	.10		293
6	.10		284
7	.10		285
8	.08		284
9	.06		283
10	.06		282
11	.06		281
12	.06		281
		ft/sec 281	D _m 0.415
		1,253	
		0.10	
		27.07	
		T _s 281	
	AVERAGE	47.66	6

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Appendix G
Field Data, 22 Jun 89

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AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE <i>Clear AFS</i>		DATE <i>22 June 89</i>		RUN NUMBER <i>1</i>	
BUILDING NUMBER			SOURCE NUMBER		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	<i>0.4891</i>	<i>0.2914</i>	<i>0.1977</i>		
ACETONE WASHINGS (Probe, Front Half Filter)	<i>93.6798</i>	<i>93.6322</i>	<i>0.0476</i>		
BACK HALF (If needed)					
		Total Weight of Particulates Collected		<i>2453</i> gm	
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	<i>270</i>	<i>200</i>	<i>70</i>		
IMPINGER 2 (H2O)	<i>218</i>	<i>200</i>	<i>18</i>		
IMPINGER 3 (Dry)	<i>2</i>	<i>0</i>	<i>2</i>		
IMPINGER 4 (Silica Gel)	<i>211.8</i>	<i>200</i>	<i>11.8</i>		
		Total Weight of Water Collected		<i>101.8</i> gm	
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	<i>13.3</i>	<i>13.3</i>	<i>13.3</i>		<i>13.3</i>
VOL % O ₂	<i>6.7</i>	<i>6.7</i>	<i>6.7</i>		<i>6.7</i>
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

VISIBLE EMISSION OBSERVATION FORM

No. 1

COMPANY NAME USAC		
STREET ADDRESS CH & HP		
CITY Clear AFB	STATE AK	ZIP
PHONE (KEY CONTACT) Wendel Shremaker	SOURCE ID NUMBER Boiler # 1	

PROCESS EQUIPMENT Coal fired boiler	OPERATING MODE 80 lbs/hr
CONTROL EQUIPMENT Cyclone separators	OPERATING MODE manual

DESCRIBE EMISSION POINT steel stack	
HEIGHT ABOVE GROUND LEVEL 100	HEIGHT RELATIVE TO OBSERVER Start 20 End
DISTANCE FROM OBSERVER Start 50 End	DIRECTION FROM OBSERVER Start W End

DESCRIBE EMISSIONS Start lighting End	
EMISSION COLOR Start brown/white End	IF WATER DROPLET PLUME Attached ☐ N/A Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 0-5' End	

DESCRIBE PLUME BACKGROUND Start 5/4 End	
F CKGR/ND COLOR Start blue/white End	SKY CONDITIONS Start slightly overcast End
WIND SPEED Start 10-15 mph End	WIND DIRECTION Start N End
AMBIENT TEMP Start 68 End	WET BULB TEMP Start < 10 End

Stack with Plume Sun Wind	SOURCE LAYOUT SKETCH
---------------------------------	--------------------------

OBSERVATION DATE				START TIME	END TIME
22 JUN 89				1125	1137
SEC	0	15	30	45	COMMENTS
MIN					
1	5	5	10	10	
2	5	5	5	5	
3	5	5	5	10	
4	10	10	10	5	
5	5	5	5	5	
6	5	10	5	5	
7	20	20	20	30	} sort slow
8	25	15	25	20	
9	20	20	20	15	
10	10	5	5	5	
11	5	5	5	5	
12	5	5	5	5	
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OBSERVER'S NAME (PRINT) CHARLES W. ATTERBURY	
OBSERVER'S SIGNATURE Charles W. Atterbury	DATE 22 JUN 89
ORGANIZATION AFCEHC/ECQ	
CERTIFIED BY Texas Air Control Board	DATE 17 MAR 89

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AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE Clear HFS		DATE 22 June 81		RUN NUMBER 2	
BUILDING NUMBER PP			SOURCE NUMBER Fuel #1		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	.4613	0.2909	.1704		
ACETONE WASHINGS (Probe, Front Half Filter)	102.7824	102.7366	.0458		
BACK HALF (If needed)					
	Total Weight of Particulates Collected			.2162 gm	
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	~~270~~ 254	200	54		
IMPINGER 2 (H2O)	~~254~~ 224	200	24		
IMPINGER 3 (Dry)	1	0	1		
IMPINGER 4 (Silica Gel)	213.8	200	13.8		
	Total Weight of Water Collected			92.8 gm	
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	13.3	13.3	13.5		13.3
VOL % O ₂	6.7	6.6	6.6		6.7
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100 - % CO ₂ - % O ₂ - % CO)					

VISIBLE EMISSION OBSERVATION FORM

No.

COMPANY NAME 115AF	
STREET ADDRESS CH & HP	
CITY Clear AFB	STATE AK
PHONE (KEY CONTACT) Wendell Shumaker	SOURCE ID NUMBER Boiler #1
PROCESS EQUIPMENT Coal fired boiler	OPERATING MODE 80 lbs/hr
CONTROL EQUIPMENT Cyclone separators	OPERATING MODE normal
DESCRIBE EMISSION POINT Steel Stack	
HEIGHT ABOVE GROUND LEVEL 100	HEIGHT RELATIVE TO OBSERVER Start 20/16 End
DISTANCE FROM OBSERVER Start 50 End	DIRECTION FROM OBSERVER Start End
DESCRIBE EMISSIONS Start lighting End	
EMISSION COLOR Start brown/white End	IF WATER DROPLET PLUME Attached ☒ U/A Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 0-5' End	
DESCRIBE PLUME BACKGROUND Start sky End	
BACKGROUND COLOR Start blue/white End	SKY CONDITIONS Start partly cloudy End
WIND SPEED Start 10-15 mph End	WIND DIRECTION Start N End
AMBIENT TEMP Start 68 End	WET BULB TEMP RH, percent 4/10
Stack with Plume Sun Wind SOURCE LAYOUT SKETCH Draw North Arrow	

OBSERVATION DATE 22 JUN 89				START TIME 1254	END TIME 1306
SEC	0	15	30	45	COMMENTS
MIN					
1	5	5	5	5	
2	5	5	5	5	
3	5	5	5	5	
4	5	5	5	5	
5	5	5	5	5	
6	5	5	5	5	
7	5	5	5	5	
8	5	5	5	5	
9	5	5	5	5	
10	5	5	5	5	
11	5	5	5	5	
12	5	5	5	5	
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29					
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OBSERVER'S NAME (PRINT) CHARLES W. ATTORBY	
OBSERVER'S SIGNATURE 	DATE 22 JUN 89
ORGANIZATION AFOEHL/ECB	
CERTIFIED BY Texas Air Control Board	DATE 17 JUN 89

Run Number	Date	Plant	Base	Sample Box Number	Meter Box Number	Qw/Qm	Co				
3	22 June 81										
80,000 lbs/hr $H = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m \cdot V_p}{T_s}$ Pilot Check - Good Pre-Check @ 15' Hg - Good Post Check @ 15' Hg - Good											
Station Press 27.25 Heater Box Temp Probe Heater Setting Probe Length 76 Nozzle Area (at P) 1.377 Cp 8.4 Dry Gas Fraction (Fd)											
Traverse Point Number	Sampling Time (min)	1/2 Static Pressure (in H2O)	Stack Temp		Velocity Head (Vp)	Orifice Diff. Press. (in)	Gas Sample Volume (cu ft)	Gas Meter Temp		Sample Box Temp (°F)	Impinger Outlet Temp (°F)
			(°F)	(°R)				In (°F)	Avg (Tm) (°R)		
1	0	1	274		1.12	1.69	667.871	75		234	58
2	2.5	1	274		1.19	2.68		78		234	56
3	5	2	270		1.16	2.29		82		238	54
4	7.5	2	276		1.16	2.26		81		242	54
5	10	2	277		1.14	1.95		83		242	55
6	12.5	2	278		1.1	1.55		81		250	54
7	15	1	278		1.05	0.71		83		255	58
8	17.5	1	275		1.04	0.57		83		257	58
9	20	1	273		1.05	0.71		83		257	58
10	22.5	1	273		1.06	0.85		80		257	57
11	25	1	274		1.07	0.97		80		257	58
12	27.5	1	273		1.08	1.14		82		264	58
30/563											

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE <i>Clear AF3</i>		DATE <i>22 June 89</i>		RUN NUMBER <i>3</i>	
BUILDING NUMBER			SOURCE NUMBER		

I. PARTICULATES			
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)
FILTER NUMBER	<i>.4496</i>	<i>0.2972</i>	<i>.1518</i>
ACETONE WASHINGS (Probe, Front Half Filter)	<i>98.7157</i>	<i>98.6688</i>	<i>.0469</i>
BACK HALF (If needed)			
Total Weight of Particulates Collected			<i>.1987 gm</i>

II. WATER			
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)
IMPINGER 1 (H2O)	<i>265</i>	<i>200</i>	<i>65</i>
IMPINGER 2 (H2O)	<i>212</i>	<i>200</i>	<i>12</i>
IMPINGER 3 (Dry)	<i>2</i>	<i>0</i>	<i>2</i>
IMPINGER 4 (Silica Gel)	<i>211.9</i>	<i>200</i>	<i>11.9</i>
Total Weight of Water Collected			<i>93.9 gm</i>

III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	<i>13.3</i>	<i>13.3</i>	<i>13.2</i>		<i>13.3</i>
VOL % O ₂	<i>6.6</i>	<i>6.7</i>	<i>6.6</i>		<i>6.7</i>
VOL % CO					
VOL % N ₂					

$$\text{Vol \% N}_2 = (100 - \% \text{CO}_2 - \% \text{O}_2 - \% \text{CO})$$

VISIBLE EMISSION OBSERVATION FORM

No. 3

COMPANY NAME <u>USAF</u>		
STREET ADDRESS <u>CH & HP</u>		
CITY <u>Clear AFS</u>	STATE <u>AK</u>	ZIP
PHONE (KEY CONTACT) <u>Wendel Shoemaker</u>	SOURCE ID NUMBER <u>Birch #1</u>	

PROCESS EQUIPMENT <u>Coal fired boiler</u>	OPERATING MODE <u>80 % to 100 %</u>
CONTROL EQUIPMENT <u>Cyclone separator</u>	OPERATING MODE <u>normal</u>

DESCRIBE EMISSION POINT <u>Steel Stack</u>	
HEIGHT ABOVE GROUND LEVEL <u>100</u>	HEIGHT RELATIVE TO OBSERVER Start <u>100</u> End
DISTANCE FROM OBSERVER Start <u>300</u> End	DIRECTION FROM OBSERVER Start End

DESCRIBE EMISSIONS Start <u>lighting</u> End	
EMISSION COLOR Start <u>brown/white</u>	IF WATER DROPLET PLUME Attached ☒ <u>N/A</u> Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start <u>0-5'</u> End	

DESCRIBE PLUME BACKGROUND Start <u>Sk</u> End	
BACKGROUND COLOR Start <u>blue</u> End	SKY CONDITIONS Start <u>Partly cloudy</u> End
WIND SPEED Start <u>10-15 mph</u> End	WIND DIRECTION Start <u>N</u> End
AMBIENT TEMP Start <u>68</u> End	WET BULB TEMP RH, percent <u>40</u>

Stack with Plume

Sun

Wind

SOURCE LAYOUT SKETCH

Draw North Arrow

OBSERVATION DATE <u>22 JUN 89</u>				START TIME <u>1441</u>	END TIME
SEC MIN	0	15	30	45	COMMENTS
1	5	5	5	5	
2	5	5	5	5	
3	5	5	5	5	
4	5	5	5	5	
5	5	5	5	5	
6	5	5	5	5	
7	5	5	5	5	
8	5	5	5	5	
9	5	5	5	5	
10	5	5	10	10	
11	10	5	5	5	
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OBSERVER'S NAME (PRINT) <u>CHARLES W. Attaberry</u>		DATE <u>22 JUN 89</u>
OBSERVER'S SIGNATURE <u>Charles W. Attaberry</u>		
ORGANIZATION <u>AFOL HCL/CCO</u>		
CERTIFIED BY <u>Texas Air Control Board</u>		DATE <u>17 MAR 89</u>

ADDITIONAL INFORMATION

BASE		DATE	
CLFAR		22 JUNE 89	
BOILER NUMBER 1			
INSIDE STACK DIAMETER		Inches	
83			
STATION PRESSURE		In Hg	
29.25			
STACK STATIC PRESSURE		In H2O	
-1.08			
SAMPLING TEAM			
TRAVERSE POINT NUMBER	VELOCITY HEAD, V_p IN H2O	$\sqrt{V_p}$	STACK TEMPERATURE ($^{\circ}F$)
1	.118		271 267
2	.1023		271 275
3	.122		272 278
4	.10		277
5	.16		277
6	.121		276
7	.08		274
8	.06		273
9	.08		273
10	.09		272
11	.10		271
12	.11		271
Ave F13 24 ~~1/100~~ 1/100 34625/60 T 271 Dia = 0.3865 Actual = 0.377 AVERAGE			

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Appendix H
EPA Method 9 Certification

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The Texas Air Control Board
Certifies That

CHARLES W. ATTEBERY

Has completed a course conducted by The Texas Air Control Board and
has met the requirements for evaluating visible emissions.



March 17, 1989

Date Certified

September 15, 1989

This Certificate Expires

[Signature]
Certifying Officer

3/17/89
Date

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Appendix I
Emission Calculations

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XROM "METH 5"

RUN NUMBER	1.1000	RUN
METER BOX Y?	1.0020	RUN
DELTA H?	1.9100	RUN
BAR PRESS ?	29.2000	RUN
METER VOL ?	34.5410	RUN
MTR TEMP F?	99.0000	RUN
% OTHER GAS REMOVED BEFORE DRY GAS METER ?		RUN
STATIC HOH IN ?	-.1300	RUN
STACK TEMP.	293.0000	RUN
ML. WATER ?	102.0000	RUN
% CO2?	9.0000	RUN
% OXYGEN?	10.0000	RUN
% CO ?	0.0000	RUN
MOL WT OTHER?	0.0000	RUN

MWd =29.84
MW WET=28.30

SORT PSTS ?	7.5978	RUN
TIME MIN ?	60.0000	RUN
NOZZLE DIA ?	.3770	RUN
STK DIA INCH ?	83.0000	RUN

* VOL MTR STD = 32.057
STK PRES ABS = 29.19
VOL HOH GAS = 4.80
% MOISTURE = 13.03
MOL DRY GAS = 0.870
% NITROGEN = 81.00
MOL WT DRY = 29.84
MOL WT WET = 28.30
VELOCITY FPS = 18.90
STACK AREA = 37.57
STACK ACFM = 42,798.
* STACK DSCFM = 25,464.
% ISOKINETIC = 101.76

XROM "METH 5"

RUN NUMBER	1.2000	RUN
METER BOX Y?	1.0020	RUN
DELTA H?	1.9100	RUN
BAR PRESS ?	29.2000	RUN
METER VOL ?	43.0420	RUN
MTR TEMP F?	100.0000	RUN
% OTHER GAS REMOVED BEFORE DRY GAS METER ?		RUN
STATIC HOH IN ?	-.1300	RUN
STACK TEMP.	294.0000	RUN
ML. WATER ?	92.0000	RUN
% CO2?	8.0000	RUN
% OXYGEN?	10.2000	RUN
% CO ?	0.0000	RUN
MOL WT OTHER?		RUN

MWd =29.82
MW WET=28.66

SORT PSTS ?	9.1975	RUN
TIME MIN ?	60.0000	RUN
NOZZLE DIA ?	.3770	RUN
STK DIA INCH ?	83.0000	RUN

* VOL MTR STD = 39.876
STK PRES ABS = 29.19
VOL HOH GAS = 4.33
% MOISTURE = 9.80
MOL DRY GAS = 0.902
% NITROGEN = 81.00
MOL WT DRY = 29.82
MOL WT WET = 28.66
VELOCITY FPS = 22.84
STACK AREA = 37.57
STACK ACFM = 51,482.
* STACK DSCFM = 31,726.
% ISOKINETIC = 101.59

SF 04
XROM "METH 5"

RUN NUMBER	1.3000	RUN
METER BOX Y?	1.0020	RUN
DELTA H?	1.9100	RUN
BAR PRESS ?	29.2000	RUN
METER VOL ?	43.6700	RUN
MTR TEMP F?	96.0000	RUN
STATIC HOH IN ?	-.1300	RUN
STACK TEMP.	297.0000	RUN
ML. WATER ?	88.0000	RUN
% CO2?	8.0000	RUN
% OXYGEN?	11.0000	RUN
% CO ?	0.0000	RUN

MWd =29.72
MW WET=28.64

SORT PSTS ?	9.5940	RUN
TIME MIN ?	60.0000	RUN
NOZZLE DIA ?	.3770	RUN
STK DIA INCH ?	83.0000	RUN

* VOL MTR STD = 40.749
STK PRES ABS = 29.19
VOL HOH GAS = 4.14
% MOISTURE = 9.23
MOL DRY GAS = 0.908
% NITROGEN = 81.00
MOL WT DRY = 29.72
MOL WT WET = 28.64
VELOCITY FPS = 23.83
STACK AREA = 37.57
STACK ACFM = 53,720.
* STACK DSCFM = 33,182.
% ISOKINETIC = 99.26

END OF FIELD DATA

20 June Emission Calculations

XROM "MASSFLO"

RUN NUMBER	1.1000	PUR
VOL MTR STD ?	32.0570	RUN
STACK DSCFM ?	25,464.0000	RUN
FRONT 1/2 MG ?	341.3000	RUN
BACK 1/2 MG ?	0.0000	PUR

F GR/DSCF = 0.1643
F MG/MMH = 375.9762
F LB/HR = 35.8607
F KG/HR = 16.2664

XROM "MASSFLO"

RUN NUMBER	1.2000	RUN
VOL MTR STD ?	39.8760	RUN
STACK DSCFM ?	31,726.0000	RUN
FRONT 1/2 MG ?	400.3000	RUN
BACK 1/2 MG ?	0.0000	RUN

F GR/DSCF = 0.1580
F MG/MMH = 361.5886
F LB/HR = 42.9696
F KG/HR = 19.4910

XROM "MASSFLO"

RUN NUMBER	1.3000	RUN
VOL MTR STD ?	40.7490	RUN
STACK DSCFM ?	33,182.0000	RUN
FRONT 1/2 MG ?	515.7000	RUN
BACK 1/2 MG ?	0.0000	RUN

F GR/DSCF = 0.1953
F MG/MMH = 446.9172
F LB/HR = 55.5470
F KG/HR = 25.1961

21 JUNE 89

XROM "METH 5"

RUN NUMBER
CLEAR, BOIL. 1, RUN 1

METER BOX Y? RUN

1.0020 RUN

DELTA H? RUN

1.8000 RUN

BAR PRESS ? RUN

29.0500 RUN

METER VOL ? RUN

41.7090 RUN

MTR TEMP F? RUN

80.0000 RUN

% OTHER GAS
REMOVED BEFORE
DRY GAS METER ? RUN

STATIC HOH IN ? RUN

-1.200 RUN

STACK TEMP. RUN

287.0000 RUN

ML. WATER ? RUN

105.0000 RUN

% CO2? RUN

6.9000 RUN

% OXYGEN? RUN

13.0000 RUN

% CO ? RUN

MOL WT OTHER? RUN

MWd =29.62

MW WET=28.34

SORT PSTS ? RUN

9.4202 RUN

TIME MIN ? RUN

60.0000 RUN

NOZZLE DIA ? RUN

.3770 RUN

STK DIA INCH ? RUN

83.0000 RUN

* VOL MTR STD = 39.856

STK PRES ABS = 29.04

VOL HOH GAS = 4.94

% MOISTURE = 11.03

MOL DRY GAS = 0.890

% NITROGEN = 80.10

MOL WT DRY = 29.62

MOL WT WET = 28.34

VELOCITY FPS = 23.58

STACK AREA = 37.57

STACK ACFM = 53.158.

* STACK DSCFM = 32.447.

% ISOKINETIC = 99.29

XROM "METH 5"

RUN NUMBER
CLEAR, BOIL. 1, RUN 2

METER BOX Y? RUN

1.0020 RUN

DELTA H? RUN

1.5900 RUN

BAR PRESS ? RUN

29.0500 RUN

METER VOL ? RUN

38.4120 RUN

MTR TEMP F? RUN

94.0000 RUN

% OTHER GAS
REMOVED BEFORE
DRY GAS METER ? RUN

STATIC HOH IN ? RUN

-1.200 RUN

STACK TEMP. RUN

288.0000 RUN

ML. WATER ? RUN

103.0000 RUN

% CO2? RUN

10.4000 RUN

% OXYGEN? RUN

9.6000 RUN

% CO ? RUN

MOL WT OTHER? RUN

MWd =30.05

MW WET=28.61

SORT PSTS ? RUN

8.7299 RUN

TIME MIN ? RUN

60.0000 RUN

NOZZLE DIA ? RUN

.3770 RUN

STK DIA INCH ? RUN

83.0000 RUN

* VOL MTR STD = 35.759

STK PRES ABS = 29.04

VOL HOH GAS = 4.85

% MOISTURE = 11.94

MOL DRY GAS = 0.881

% NITROGEN = 80.00

MOL WT DRY = 30.05

MOL WT WET = 28.61

VELOCITY FPS = 21.75

STACK AREA = 37.57

STACK ACFM = 49.032.

* STACK DSCFM = 29.583.

% ISOKINETIC = 97.71

RUN NUMBER
CLEAR, BOIL. 1, RUN 3

METER BOX Y? RUN

1.0020 RUN

DELTA H? RUN

1.4500 RUN

BAR PRESS ? RUN

29.0500 RUN

METER VOL ? RUN

37.4070 RUN

MTR TEMP F? RUN

101.0000 RUN

% OTHER GAS
REMOVED BEFORE
DRY GAS METER ? RUN

STATIC HOH IN ? RUN

-1.200 RUN

STACK TEMP. RUN

291.0000 RUN

ML. WATER ? RUN

94.0000 RUN

% CO2? RUN

11.5000 RUN

% OXYGEN? RUN

8.5000 RUN

% CO ? RUN

MOL WT OTHER? RUN

MWd =30.18

MW WET=28.79

SORT PSTS ? RUN

8.2914 RUN

TIME MIN ? RUN

60.0000 RUN

NOZZLE DIA ? RUN

.3770 RUN

STK DIA INCH ? RUN

83.0000 RUN

* VOL MTR STD = 34.377

STK PRES ABS = 29.04

VOL HOH GAS = 4.42

% MOISTURE = 11.40

MOL DRY GAS = 0.886

% NITROGEN = 80.00

MOL WT DRY = 30.18

MOL WT WET = 28.79

VELOCITY FPS = 20.59

STACK AREA = 37.57

STACK ACFM = 46.422.

* STACK DSCFM = 28.066.

% ISOKINETIC = 99.01

END OF FIELD DATA

21 June 89

Emission Calculations

XROM "MASSFLOW"

RUN NUMBER		
2.1000	PUR	
VOL MTR STD ?		
39.8560	PUR	
STACK DSCFM ?		
32,447.0000	PUR	
FRONT 1/2 MG ?		
204.6000	RUN	
BACK 1/2 MG ?		
0.0000	RUN	

F GR/DSCF = 0.0792
 F MG/MMH = 101.2837
 F LB/HR = 22.0325
 F KG/HR = 9.9940

XROM "MASSFLOW"

RUN NUMBER		
2.2000	RUN	
VOL MTR STD ?		
35.7590	RUN	
STACK DSCFM ?		
29,503.0000	RUN	
FRONT 1/2 MG ?		
310.2000	RUN	
BACK 1/2 MG ?		
0.0000	RUN	

F GR/DSCF = 0.1339
 F MG/MMH = 306.3397
 F LB/HR = 33.9451
 F KG/HR = 15.3975

XROM "MASSFLOW"

RUN NUMBER		
2.3000	RUN	
VOL MTR STD ?		
34.3770	RUN	
STACK DSCFM ?		
28,066.0000	RUN	
FRONT 1/2 MG ?		
425.3000	RUN	
BACK 1/2 MG ?		
0.0000	RUN	

F GR/DSCF = 0.1909
 F MG/MMH = 436.8922
 F LB/HR = 45.9289
 F KG/HR = 20.8334

22 June 89
Clear AFS

22 June

XROM "METH 5"
RUN NUMBER 1.0000 RUN
METER BOX Y? 1.0020 RUN
DELTA H? 1.9100 RUN
BAR PRESS ? 29.2500 RUN
METER VOL ? 35.7660 RUN
MTR TEMP F? 71.0000 RUN
% OTHER GAS
REMOVED BEFORE
DRY GAS METER ? RUN
STATIC HOH IN ? -0.0000 RUN
STACK TEMP. 273.0000 RUN
ML. WATER ? 101.0000 RUN
% CO2? 13.3000 RUN
% OXYGEN? 6.7000 RUN
% CO ? RUN
MOL WT OTHER? RUN
MWd =30.40
MW WET=28.90
SORT PSTS ? 8.2144 RUN
TIME MIN ? 60.0000 RUN
NOZZLE DIA ? .3770 RUN
STK DIA INCH ? 83.0000 RUN
* VOL MTR STD = 35.004
STK PRES ABS = 29.24
VOL HOH GAS = 4.79
% MOISTURE = 12.04
MOL DRY GAS = 0.880
% NITROGEN = 80.00
MOL WT DRY = 30.40
MOL WT WET = 28.90
VELOCITY FPS = 20.29
STACK AREA = 37.57
STACK ACFM = 45.742.
* STACK DSCFM = 28,327.
% ISOKINETIC = 99.80

XROM "METH 5"
RUN NUMBER 2.0000 RUN
METER BOX Y? 1.0020 RUN
DELTA H? 1.9100 RUN
BAR PRESS ? 29.2500 RUN
METER VOL ? 34.8940 RUN
MTR TEMP F? 74.0000 RUN
STATIC HOH IN ? -0.0000 RUN
STACK TEMP. 275.0000 RUN
ML. WATER ? 92.0000 RUN
% CO2? 13.3000 RUN
% OXYGEN? 6.7000 RUN
% CO ? RUN
MWd =30.40
MW WET=28.90
SORT PSTS ? 7.8886 RUN
TIME MIN ? 60.0000 RUN
NOZZLE DIA ? .3770 RUN
STK DIA INCH ? 83.0000 RUN
* VOL MTR STD = 33.959
STK PRES ABS = 29.24
VOL HOH GAS = 4.37
% MOISTURE = 11.40
MOL DRY GAS = 0.886
% NITROGEN = 80.00
MOL WT DRY = 30.40
MOL WT WET = 28.90
VELOCITY FPS = 19.46
STACK AREA = 37.57
STACK ACFM = 43.867.
* STACK DSCFM = 27,290.
% ISOKINETIC = 100.50

CLX
XROM "METH 5"
RUN NUMBER 3.0000 RUN
METER BOX Y? 1.0020 RUN
DELTA H? 1.9100 RUN
BAR PRESS ? 29.2500 RUN
METER VOL ? 36.6570 RUN
MTR TEMP F? 80.0000 RUN
STATIC HOH IN ? -0.0000 RUN
STACK TEMP. 275.0000 RUN
ML. WATER ? 93.9000 RUN
% CO2? 13.3000 RUN
% OXYGEN? 6.7000 RUN
% CO ? RUN
MWd =30.40
MW WET=29.02
SORT PSTS ? 8.0667 RUN
TIME MIN ? 60.0000 RUN
NOZZLE DIA ? .3770 RUN
STK DIA INCH ? 83.0000 RUN
* VOL MTR STD = 35.270
STK PRES ABS = 29.24
VOL HOH GAS = 4.42
% MOISTURE = 11.13
MOL DRY GAS = 0.889
% NITROGEN = 80.00
MOL WT DRY = 30.40
MOL WT WET = 29.02
VELOCITY FPS = 19.89
STACK AREA = 37.57
STACK ACFM = 44.832.
* STACK DSCFM = 27,974.
% ISOKINETIC = 101.94

Emissions Calculations

22 Jun 89

XROM "MASSFLO"

RUN NUMBER		
1.0000	RUN	
VOL MTR STD ?		
35.0040	RUN	
STACK DSCFM ?		
28,327.0000	RUN	
FRONT 1/2 MG ?		
245.3000	RUN	
BACK 1/2 MG ?		
0.0000	RUN	

F GR/DSCF = 0.1081
 F MG/MMH = 247.4724
 F LB/HR = 26.2578
 F KG/HR = 11.9105

XPOM "MASSFLO"

RUN NUMBER		
2.0000	RUN	
VOL MTR STD ?		
33.9590	RUN	
STACK DSCFM ?		
27,290.0000	RUN	
FRONT 1/2 MG ?		
216.2000	RUN	
BACK 1/2 MG ?		
0.0000	RUN	

F GR/DSCF = 0.0982
 F MG/MMH = 224.8266
 F LB/HR = 22.9817
 F KG/HR = 10.4245

XROM "MASSFLO"

RUN NUMBER		
3.0000	RUN	
VOL MTR STD ?		
35.2780	RUN	
STACK DSCFM ?		
27,974.0000	RUN	
FRONT 1/2 MG ?		
198.7000	RUN	
BACK 1/2 MG ?		
0.0000	RUN	

F GR/DSCF = 0.0869
 F MG/MMH = 198.9028
 F LB/HR = 20.8414
 F KG/HR = 9.4537

Appendix J
Calibration Data

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TYPE S PITOT TUBE INSPECTION DATA FORM

#8A

Pitot tube assembly level? ✓ yes no

Pitot tube openings damaged? yes (explain below) ✓ no

$\alpha_1 = \underline{1}^\circ (<10^\circ)$, $\alpha_2 = \underline{2}^\circ (<10^\circ)$, $\beta_1 = \underline{\phi}^\circ (<5^\circ)$,

$\beta_2 = \underline{2}^\circ (<5^\circ)$

$\gamma = \underline{1}^\circ$, $\theta = \underline{1}^\circ$, $A = \overset{(0.938)}{\underline{15/16}}$ cm (in.)

$z = A \sin \gamma = \overset{0.1250}{\underline{0.0164}}$ cm (in.); <0.32 cm ($<1/8$ in.),

$w = A \sin \theta = \underline{0.0164}$ cm (in.); $<.08$ cm ($<1/32$ in.)

$P_A \overset{0.0313}{\underline{15/32 (0.469)}}$ cm (in.) $P_b \overset{0.0313}{\underline{15/32 (0.469)}}$ cm (in.)

$D_t = \underline{3/8 (.375)}$ cm (in.)

Comments: CONSTRUCTED IAW 40CFR 60, APPA, METH 2,
FIG 2.2 ASSIGNED BASELINE COEFFICIENT = 0.84

Calibration required? yes ✓ no

Quality Assurance Handbook M2-1.7

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 21 Nov 88

Meter box number Nutch #2

Barometric pressure, $P_b = 30.02$ in. Hg

Calibrated by Scott & Vaughn

Orifice manometer setting (ΔH), in. H_2O	Gas volume		Temperature				Time (θ), min	Y_i	$\Delta H @ i$ in. H_2O
	Wet test meter (V_w), ft ³	Dry gas meter (V_d), ft ³	Wet test meter (t_w), °F	Dry gas meter					
				Inlet (t_{di}), °F	Outlet (t_{do}), °F	Avg ^a (t_d), °F			
4.0 0.5	5	5.057	75 75 535	77 82	75 77	537.75	12.40	0.9926	1.73
4.0 1.0	5	5.031	76 76 536	77 81	77 80	542.5	9.14	1.0034	1.87
4.0 1.5	10	10.101	77 77 537	77 81	77 84	547.75	15.35	1.0061	1.97
4.0 2.0	10	10.230	78 78 538	77 85	77 87	552.0	13.45	0.9981	2.00
4.0 3.0	10	10.170	78 78 538	77 87	77 89	554.75	10.92	1.0065	1.97
4.0 4.0	10	10.191	78 78 538	77 89	77 91	557.0	9.35	1.0061	1.92
							Avg	1.002	1.91

ΔH , in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t + 460)}$	$\Delta H @ i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460) \theta}{V_w} \right]^2$
0.5	0.0368	$\frac{(5)(30.02)(537.75)}{(5.057)(30.02 + \frac{0.5}{13.6})(535)}$	$\frac{(0.0317)(0.5)}{(30.02)(537.75)} \left[\frac{(535)(12.4)}{5} \right]^2$
1.0	0.0737	$\frac{(5)(30.02)(542.5)}{(5.031)(30.02 + \frac{1.0}{13.6})(536)}$	$\frac{(0.0317)(1.0)}{(30.02)(542.5)} \left[\frac{(536)(9.14)}{5} \right]^2$
1.5	0.110	$\frac{(10)(30.02)(547.75)}{(10.101)(30.02 + \frac{1.5}{13.6})(537)}$	$\frac{(0.0317)(1.5)}{(30.02)(547.75)} \left[\frac{(537)(15.35)}{10} \right]^2$
2.0	0.147	$\frac{(10)(30.02)(552)}{(10.230)(30.02 + \frac{2.0}{13.6})(538)}$	$\frac{(0.0317)(2.0)}{(30.02)(552)} \left[\frac{(538)(13.45)}{10} \right]^2$
3.0	0.221	$\frac{(10)(30.02)(554.75)}{(10.170)(30.02 + \frac{3.0}{13.6})(538)}$	$\frac{(0.0317)(3.0)}{(30.02)(554.75)} \left[\frac{(538)(10.92)}{10} \right]^2$
4.0	0.294	$\frac{(10)(30.02)(557)}{(10.191)(30.02 + \frac{4.0}{13.6})(538)}$	$\frac{(0.0317)(4.0)}{(30.02)(557)} \left[\frac{(538)(9.35)}{10} \right]^2$

^a If there is only one thermometer on the dry gas meter, record the temperature under t_d .

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number One Date 23 Jun 89 Meter box number Nutech 2 Plant Clearfield
 Barometric pressure, $P_b = 29.123$ in. Hg Dry gas meter number 1.002 Pretest Y 1.002

Orifice manometer setting, (ΔH), in. H_2O	Gas volume		Temperature				Time (θ), min	Vacuum setting, in. Hg	Y_i	$V_w P_b (t_d + 460)$ $V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)$
	Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter (t_w), $^{\circ}F$	Inlet (t_i), $^{\circ}F$	Outlet (t_o), $^{\circ}F$	Average (t_d), $^{\circ}F$				
<u>1.4</u>	<u>10</u>	<u>10.212</u>	<u>80</u> <u>540</u>	<u>87</u> <u>550</u>	<u>85</u> <u>545</u>	<u>547.5</u>	<u>15.67</u>	<u>4.0</u>	<u>0.963</u>	<u>10.347 (29.123 + 13.6) 540</u>
<u>1.4</u>	<u>10</u>	<u>10.223</u>	<u>81</u> <u>541</u>	<u>87</u> <u>554</u>	<u>85</u> <u>546</u>	<u>550</u>	<u>15.83</u>	<u>4.0</u>	<u>0.963</u>	<u>10.347 (29.123 + 13.6) 541</u>
<u>1.4</u>	<u>10</u>	<u>10.347</u>	<u>81</u> <u>541</u>	<u>87</u> <u>555</u>	<u>85</u> <u>547.5</u>	<u>551.5</u>	<u>16.12</u>	<u>4.0</u>	<u>0.963</u>	<u>10.347 (29.123 + 13.6) 551.5</u>
									<u>Y = .981</u>	

^a If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3 .

V_d = Gas volume passing through the dry gas meter, ft^3 .

t_w = Temperature of the gas in the wet test meter, $^{\circ}F$.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, $^{\circ}F$.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, $^{\circ}F$.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o} , $^{\circ}F$.

ΔH = Pressure differential across orifice, in. H_2O .

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs;
 tolerance = pretest $Y \pm 0.05Y$.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

$Y \pm 0.05Y$
 1.002 ± 0.0511

NOZZLE CALIBRATION DATA FORM

21 JUNE 89
20 JUNE 89
Date 19 JUNE 89 Calibrated by MAJ GARRISON

Nozzle identification number	Nozzle Diameter ^a			ΔD , ^b mm (in.)	D_{avg} ^c
	D_1 , mm (in.)	D_2 , mm (in.)	D_3 , mm (in.)		
1	0.377	0.377	0.377	0	0.377

where:

^a $D_{1,2,3}$ = three different nozzles diameters, mm (in.); each diameter must be within (0.025 mm) 0.001 in.

^b ΔD = maximum difference between any two diameters, mm (in.),
 $\Delta D \leq (0.10 \text{ mm}) 0.004 \text{ in.}$

^c D_{avg} = average of D_1 , D_2 , and D_3 .

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