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USAFOEHL REPORT

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**COMPLIANCE TESTING OF EIELSON AFB
CENTRAL HEATING AND POWER PLANT,
COAL FIRED BOILER NO. 3, EIELSON AFB AK**

JAMES A. GARRISON, Major, USAF, BSC

December 1988

Final Report

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

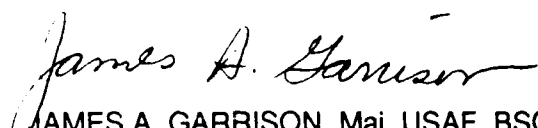
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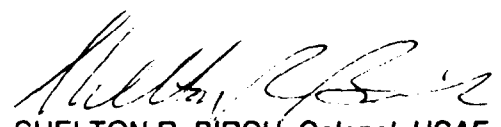
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The Public Affairs Office has reviewed this report, and it is releasable to the National Technical Information Service, where it will be available to the general public, including foreign nations.

This report has been reviewed and is approved for publication.


JAMES A. GARRISON, Maj, USAF, BSC
Chief, Air Quality Function


SHELTON R. BIRCH, Colonel, USAF, BSC
Chief, Consultant Services Division

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JAMES C. ROCK, Colonel, USAF, BSC
Commander

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REPORT DOCUMENTATION PAGE				Form Approved OMB No 0704-0188	
1a REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b RESTRICTIVE MARKINGS		
2a SECURITY CLASSIFICATION AUTHORITY NA			3 DISTRIBUTION/AVAILABILITY OF REPORT Distribution is unlimited; Approved for public release		
2b DECLASSIFICATION/DOWNGRADING SCHEDULE NA					
4 PERFORMING ORGANIZATION REPORT NUMBER(S) USAF OHL REPORT 88- EQ0686MEF			5 MONITORING ORGANIZATION REPORT NUMBER(S)		
6a NAME OF PERFORMING ORGANIZATION USAF OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY		6b OFFICE SYMBOL (if applicable) ECQ	7a NAME OF MONITORING ORGANIZATION		
6c ADDRESS (City, State, and ZIP Code) BROOKS AFB TX 78235-5501			7b ADDRESS (City, State, and ZIP Code)		
8a NAME OF FUNDING/SPONSORING ORGANIZATION Same as 6a		8b OFFICE SYMBOL (if applicable)	9 PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c ADDRESS (City, State, and ZIP Code)			10 SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO	PROJECT NO	TASK NO
					WORK UNIT ACCESSION NO
11 TITLE (Include Security Classification) Compliance Testing of Eielson AFB Central Heating and Power Plant, Coal Fired No. 3, Eielson AFB AK					
12 PERSONAL AUTHOR(S) Maj James A. Garrison					
13a TYPE OF REPORT Final		13b TIME COVERED FROM 12 TO 22 Jul		14 DATE OF REPORT (Year, Month, Day) Dec 1988	
15 PAGE COUNT 139					
16 SUPPLEMENTARY NOTATION					
17 COSATI CODES			18 SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP			
			Compliance Testing Eielson Source Emission Testing		
			Stack Sampling Particulates Boiler		
			Stack Emission(s) Garrison Air Pollution		
19 ABSTRACT (Continue on reverse if necessary and identify by block number) At the request of HQ AAC/SGPB, compliance testing for particulate and visible emissions was conducted on coal-fired boiler No. 3 in the Eielson AFB Central Heat and Power Plant on 12-22 July 88. The survey was conducted as a requirement for renewal of Alaska Department of Environmental conservation Air Quality Control permit to operate #8331-AA001. Boiler No. 3 was tested at capacities of 100,000 lbs steam/hr and 90,000 lbs steam/hr. Results indicate that boiler No. 3 passed the visible emissions standard, but failed the particulate emission standard. <i>Handwritten: Emission Standard (512) 536-2891</i>					
20 DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ OTIC USERS			21 ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a NAME OF RESPONSIBLE INDIVIDUAL James A. Garrison, Maj, USAF, BSC			22b TELEPHONE (Include Area Code) (512) 536-2891		22c OFFICE SYMBOL ECQ

DD Form 1473, JUN 86

Previous editions are obsolete

SECURITY CLASSIFICATION OF THIS PAGE

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I. INTRODUCTION

On 12-22 Jul 1988, compliance emission testing for particulate and opacity of visible emissions was conducted on coal fired boilers 2 and 3 at the Eielson AFB Central Heating and Power Plant (CH&PP), by the Air Quality Function of the USAF Occupational and Environmental Health Laboratory (USAFOEHL). This survey was requested by HQ AAC/SGPB to determine visible and particulate emission compliance status with regards to the renewal of Alaska Dept. of Environmental Conservation (ADEC) Air Quality Control Permit to Operate No. 8331-AA001. Personnel involved with on-site testing are listed in Appendix A.

II. DISCUSSION

A. Background

On 7 January 1988 Eielson AFB requested that ADEC renew Air Quality Control Permit to Operate No. 8331-AA001 for the CH&PP shown in Figure 1. As a condition of the permit renewal process and prior to issue of the new Air Quality Control Permit to Operate No.

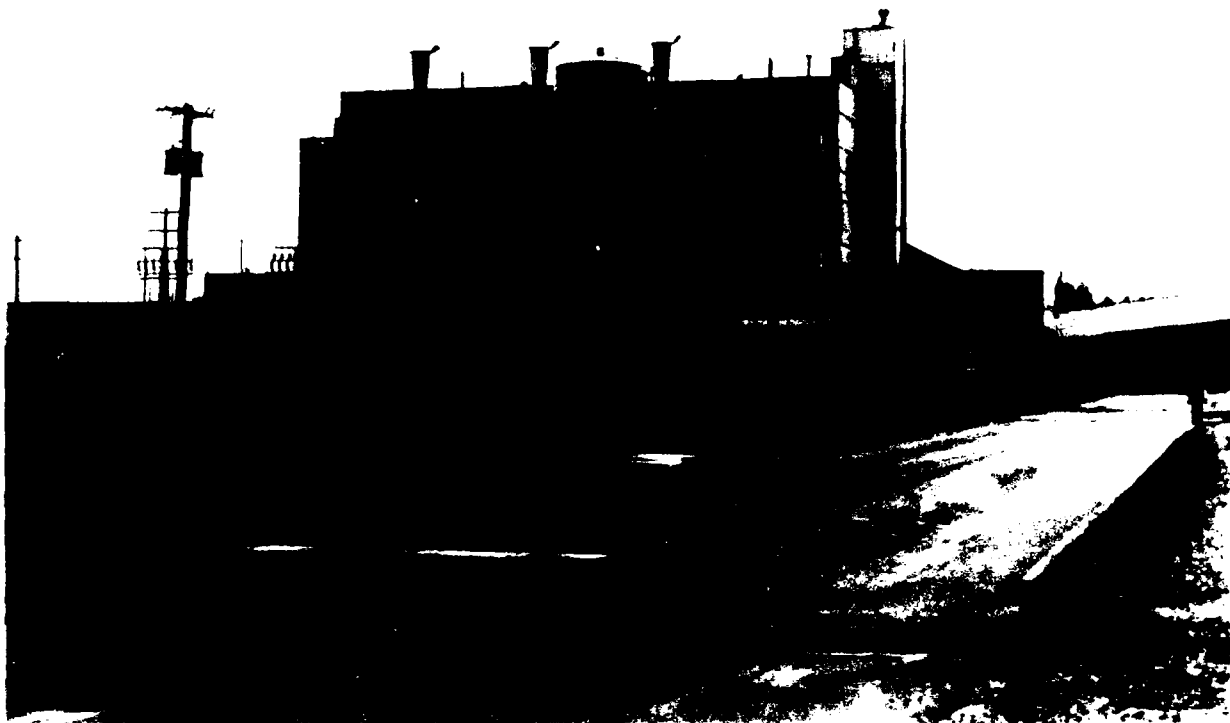


FIGURE 1: EIELSON AFB CENTRAL HEATING AND POWER PLANT

1-AA001 (Appendix B), ADEC required source testing of a representative boiler in accordance with Title 40 Code of Federal Regulations Part 60 (40 CFR 60) Appendix A, Methods 1 through 5 (determination of particulate emissions) and 9 (visual determination of the opacity of emissions) to determine the maximum steam load at which the boilers will meet the applicable emission standards. Permit No. 8831-AA001 limits the operation of the boilers to the maximum steam load at which the associated visible and particulate emissions meet the applicable standards.

To demonstrate and maintain compliance with Alaska Administrative Code, Title 18, Environmental Conservation, Chapter 50 - Air Quality Control (18 AAC 50) and other rules set forth by ADEC, Eielson AFB requested USAFOEHL assistance to: (1) determine particulate emissions from a representative boiler as specified in 40 CFR 60, Appendix A, Reference Methods 1-5, and (2) determine the opacity of visible emissions from the same boiler during Method 5 testing as specified in 40 CFR 60, Appendix A, Reference Method 9.

B. Site Description

The CH&PP operates a total of six boilers for electrical power and steam production:

<u>Boiler No./ Manufacturer</u>	<u>Steam Capacity (lb/hr)</u>	<u>Year Installed</u>	<u>Fuel</u>
1/Springfield Boiler Co.	120,000	1950	coal
2/Springfield Boiler Co.	120,000	1950	coal
3/Springfield Boiler Co.	120,000	1950	coal
4/Springfield Boiler Co.	120,000	1950	coal
5/Garrette and Schafer	120,000	1954	coal
6/Garrette and Schafer	120,000	1954	coal

The CH&PP also operates five steam turbine generators for electrical power production. The turbines range in size from 2500 KW to 10,000 KW. A typical turbine is shown in Figure 2.

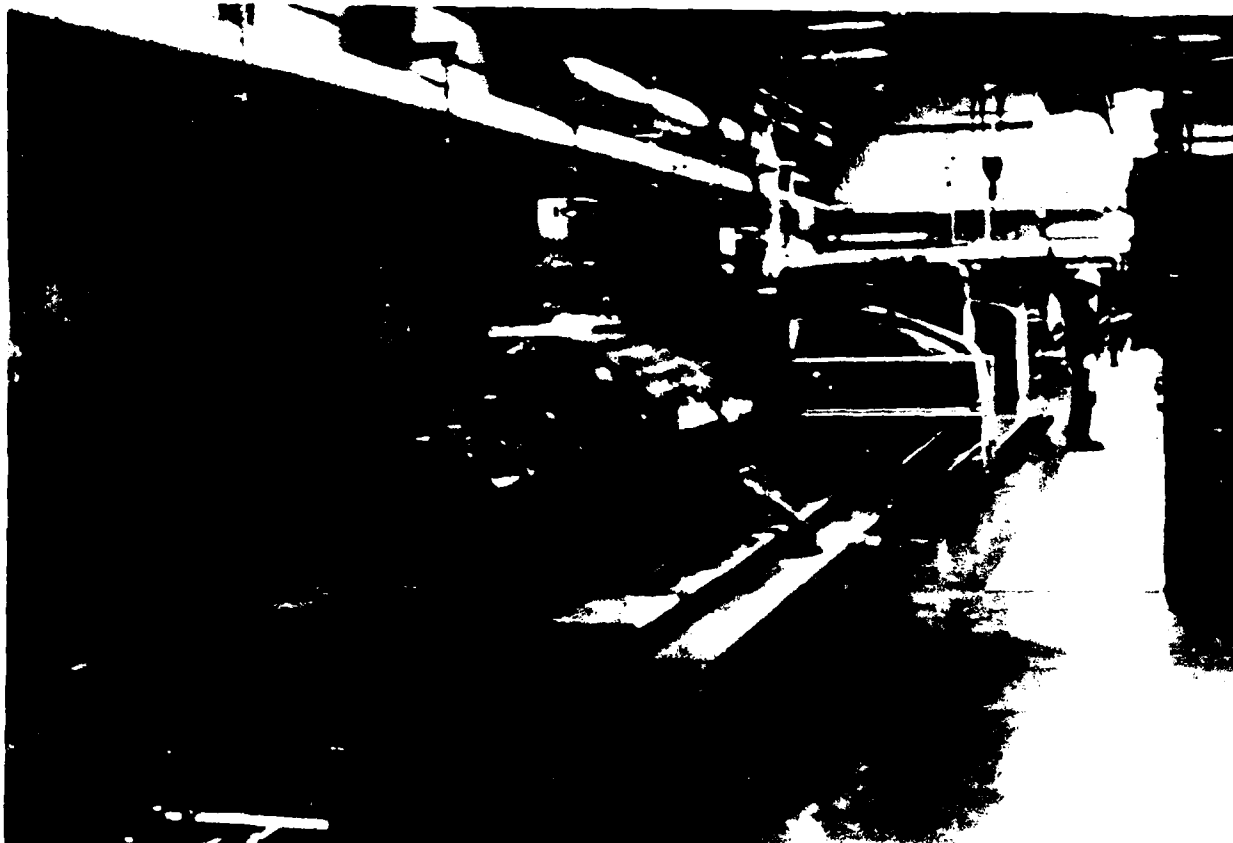


FIGURE 2: STEAM TURBINE GENERATOR

All boilers are spreader-stoker fired units with each having forced draft and induced-draft fans and mechanical fly-ash collection systems. The purpose of the forced-draft fan is to supply air for combustion and that of the induced-draft fan is to maintain a negative draft condition in the furnace part of the boiler for combustion, removal of gases, and to provide a positive static pressure at flue gas exhaust discharge points. Each unit is fitted with a steam-operated soot blower to remove fly-ash and soot from heat exchanger tubing.

Air pollution control consists of individual multiclone dust collectors on each boiler (Fig. 3). The multiclone dust collectors were manufactured by Western Precipitation Division - Joy Manufacturing Co. and consist of a number of cyclonic collectors operating in parallel. Each unit is located in the boiler exhaust duct upstream of the induced-draft fan.

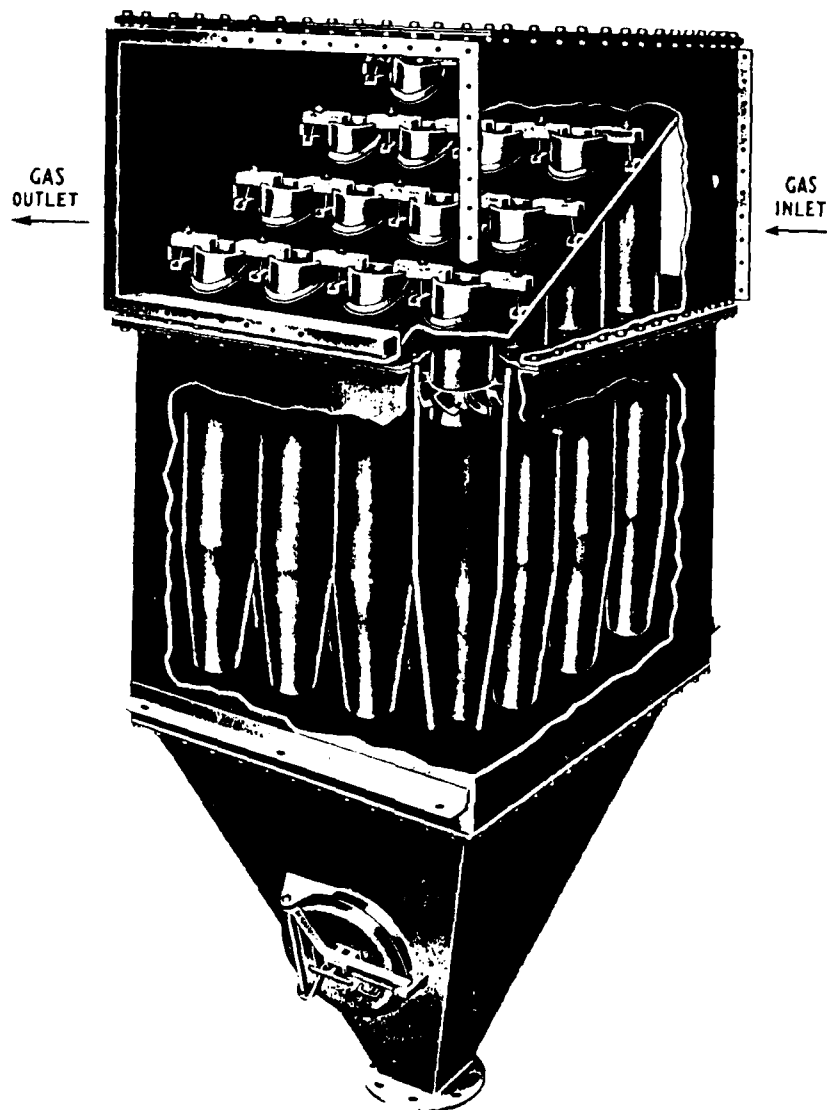


FIGURE 3: MULTICLONE DUST COLLECTOR

The exhaust effluent from each boiler is ducted to a separate exhaust stack located on the roof of the CH&PP. Figure 4 shows the exhaust stack for boiler 1 during testing. All boiler exhaust stacks are similar to the one pictured in Figure 4.

C. Applicable Standards

The opacity, particulate and source testing regulations are defined under 18 AAC 50.050(a), 50.050(b) and 50.500 respectively (Appendix C). Paragraph 50.050(a) states that 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.

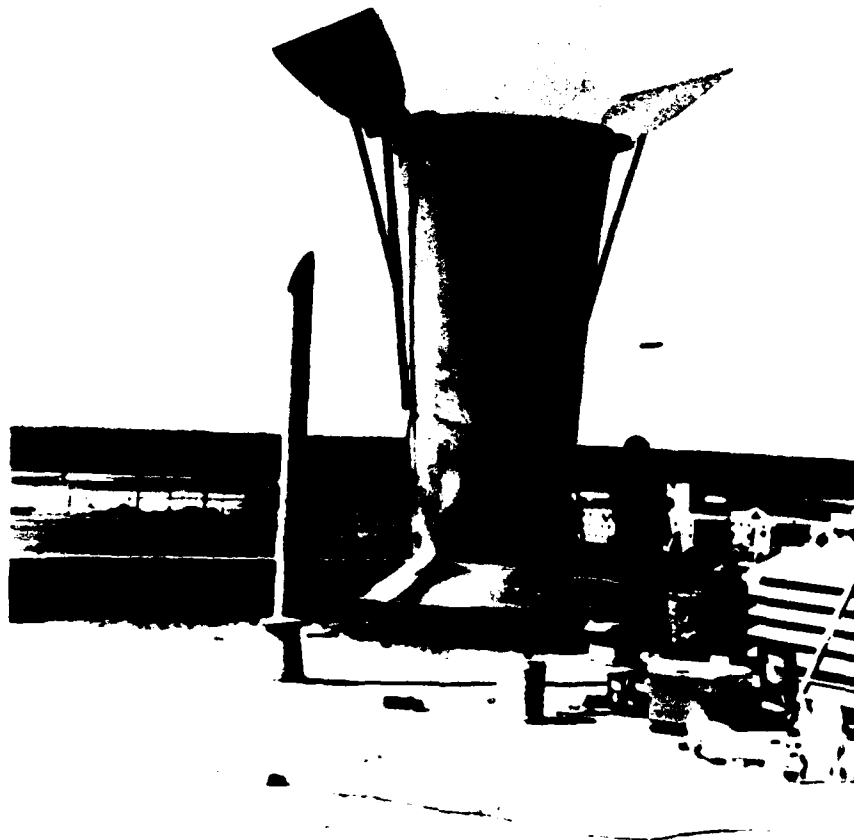


FIGURE 4: BOILER STACK DURING TESTING

Under 18 AAC 50.050(b), particulate matter emitted from industrial processes or fuel burning equipment may not exceed, per cubic foot of exhaust gas corrected to standard conditions, 0.1 grains per dry standard cubic foot (gr/dscf) 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.

Permit to Operate No. 8831-AA001, Exhibit B, reiterates the visible and particulate emissions standards imposed by 18 ACC 50.050(a) and (b).

D. Sampling Methods and Procedures

The permit to operate for the CH&PP limits the operation of the boilers to the maximum steam load at which the associated visible and particulate emissions meet standards. We analyzed particulate emission data on site to determine the operating capacity which would meet emission standards.

18 AAC 500 and Permit No. 8831-AA001 require that all emissions tests be conducted in accordance with the procedures and analysis methods specified in 40 CFR 60, Appendix A, Methods 1-5 and 9. Therefore, test methods, equipment, sample train preparation, sampling and recovery, calibration requirements and quality assurance were done in accordance with the methods and procedures outlined in 40 CFR 60, Appendix A.

The boiler exhaust stacks are tapered and diverge from a 52 inch (in) outside diameter (OD) at the roof line to a 72 in OD at the top. The included divergent angle of the stack is approximately 7 degrees. The stack height is 14.2 feet (ft). Based on the relative small divergent angle, we considered the stacks to be straight ducts. Sampling ports were already in place and located 38 in above the roof. Prior to the stack, exhaust gases pass through the induced draft fan, rectangular ducting and a transition to the stack located just below the roof (Figure 5). Even though the sampling port location did not meet Method 1 criteria, the ADEC on-scene observer and the test team evaluated the duct system and made the decision to use the existing sample ports. Figure 6 provides a schematic of the exhaust stack and associated duct work. Based on the port location, stack diameter at the sample port location and type of sample (particulate), a maximum number of 24 traverse points were used for emission evaluation.

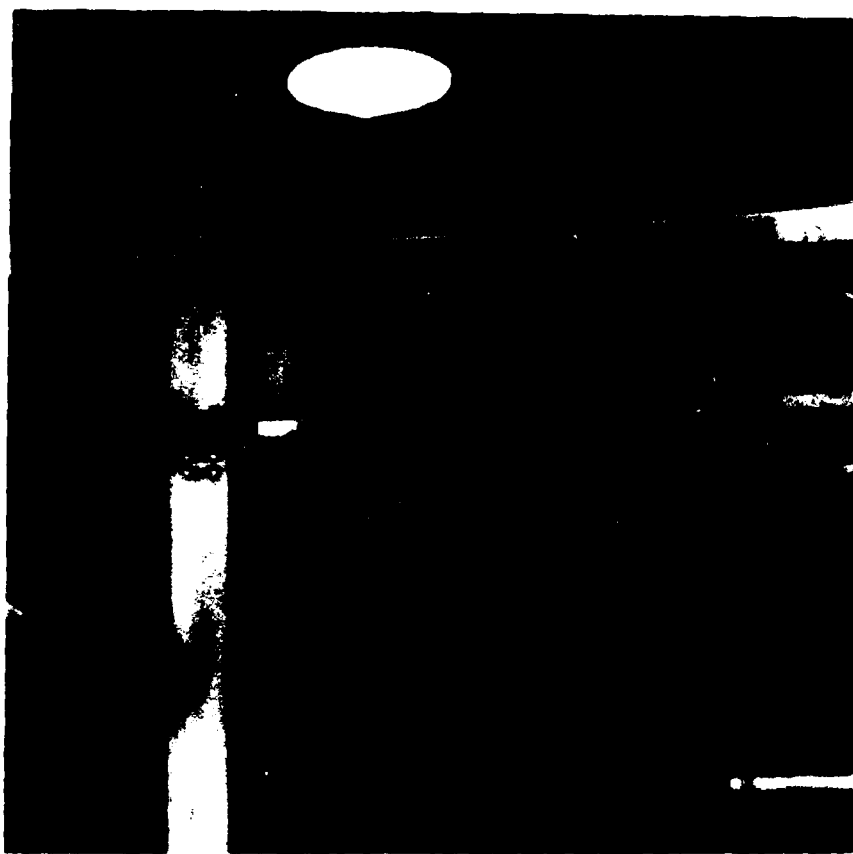


FIGURE 5: EXHAUST DUCT TRANSITION

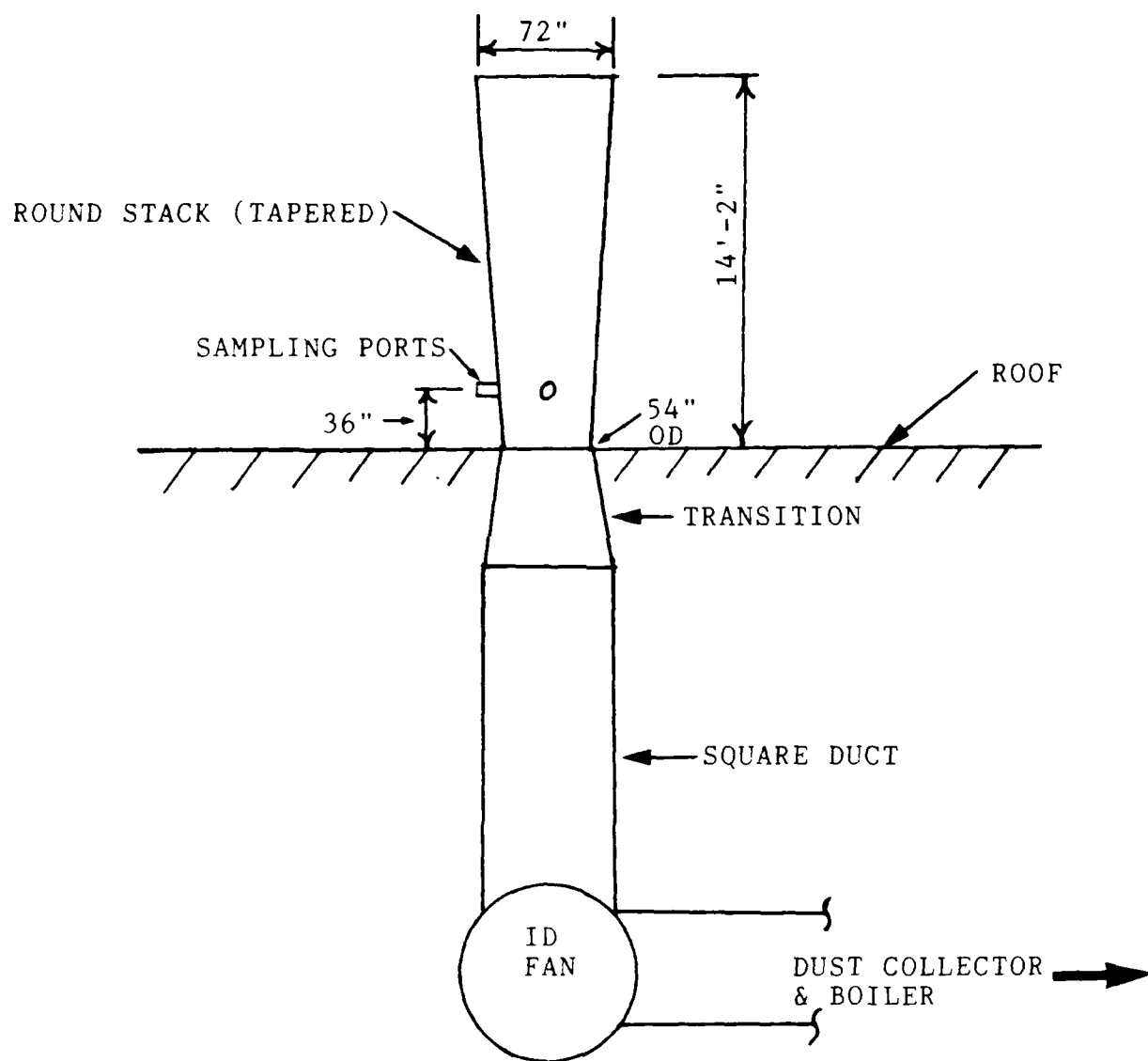


FIGURE 6: EXHAUST STACK DUCT SYSTEM

Particulate samples were collected using the sampling train shown in Figure 7. The train consisted of a button-hook probe nozzle, heated inconel probe, heated glass filter, impingers and pumping and metering device. The nozzle was sized prior to each sample run so that the gas stream could be sampled isokinetically; in other words, 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 ten inch inclined-verticle manometer. Type K thermocouples were used to measure flue gas, as well as, sampling train temperatures. The probe was heated to minimize moisture condensation. The heated filter was used to collect particulate material. 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.

The time for each sampling run was 60 minutes; therefore, the sampling time per traverse point was 2.5 minutes. These sample times were applicable for all runs except runs 2 and 3 on boiler 3 during testing at 100,000 lbs steam/hr on 17 July. A smaller nozzle size was used to reduce the total sample volume; however, this resulted in the isokinetic sampling rate being 115.5% and 110.9% for runs 2 and 3 respectively, values greater than the required 100 + 10% range for isokinetic sampling. Even though this would tend to bias the particulate sample low, the emission rates were not affected with regards to compliance. All subsequent runs, including the retest of boiler 3 at 90,000 lbs/hr were within the required isokinetic rate.

Prior to each sample run on a stack, a preliminary velocity pressure traverse was accomplished and cyclonic flow was determined. For acceptable flow conditions to exist in a stack, the average of the absolute value of the flow angle taken at each traverse point must be less than or equal to 20 degrees. The flow angle for the boiler 2 stack averaged 1.3 degrees and that for the boiler 3 stack averaged approximately 1.5 degrees.

During each sample run, a flue gas grab sample for orsat analysis (measures oxygen, and carbon dioxide for stack gas molecular weight determination and emissions correction) was taken. Orsat sampling and analysis equipment are shown in Figures 8 and 9. Flue gas moisture content, also needed for determination of gas molecular weight, was obtained during particulate sampling.

Testing was initially started on boiler 2 at the maximum rated steam output of 120,000 lbs/hr. However, the refractory in the boiler furnace fractured during the second test run of the Method 5 evaluation and testing of this unit was terminated. At the request of the ADEC on-scene observer, the data for the first test run is included in the test report at Appendix E.

Subsequent testing was accomplished on boiler 3 at steam output capacities of 100,000 lbs/hr and 90,000 lbs/hr. Typical boiler operating logs for the 100,000 lbs/hr (17 July) and 90,000 lbs/hr (20 July) test capacities are provided in Appendix D. These logs indicate hourly steam output and other operating parameters. We accomplished two complete Method 5 and Method 9 evaluations of this boiler at each of these operating capacities. One of the three runs which comprised a complete test included a soot blow. This is indicated on the field data sheets provided in Appendixes F-I.

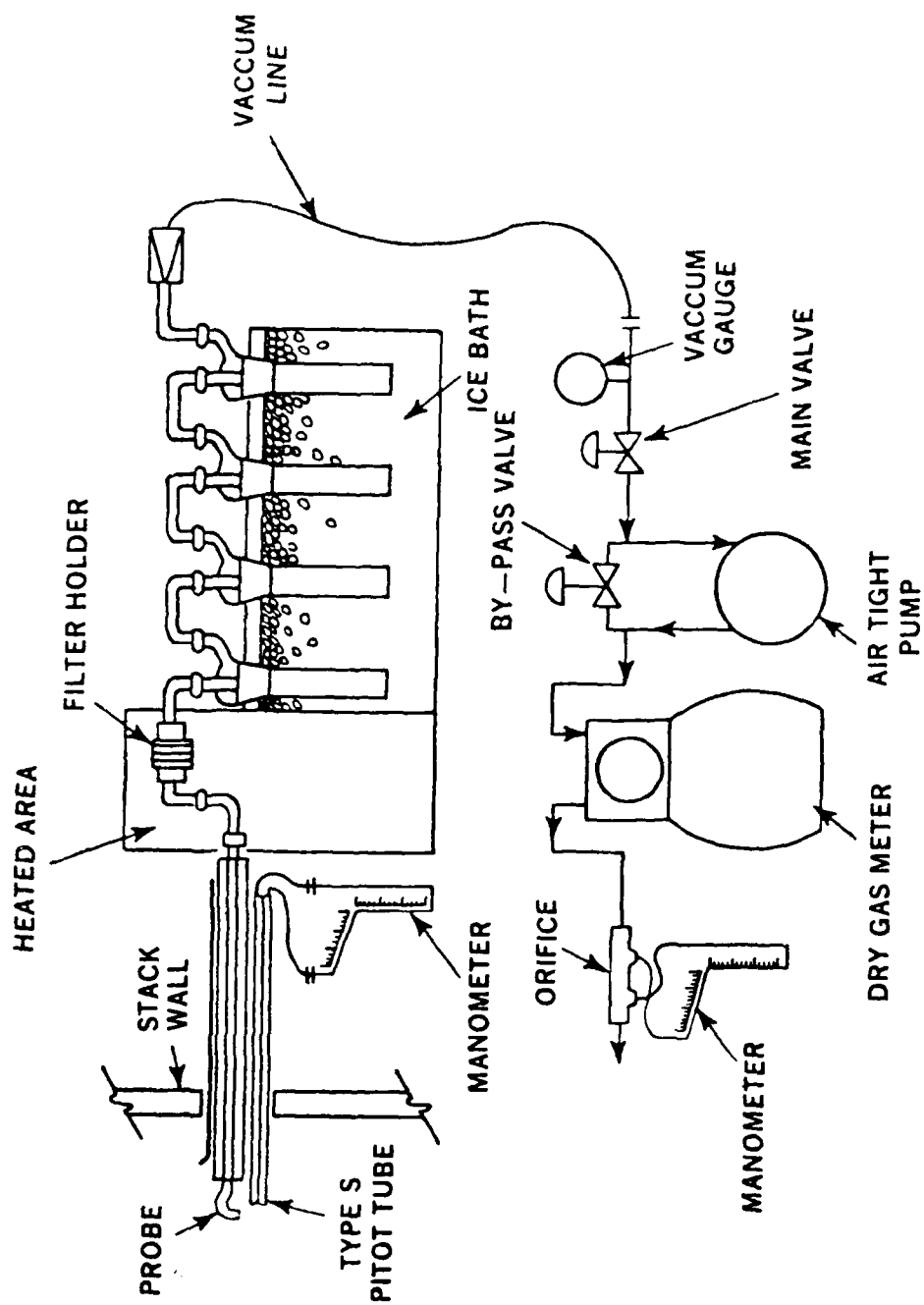


FIGURE 7: PARTICULATE SAMPLING TRAIN

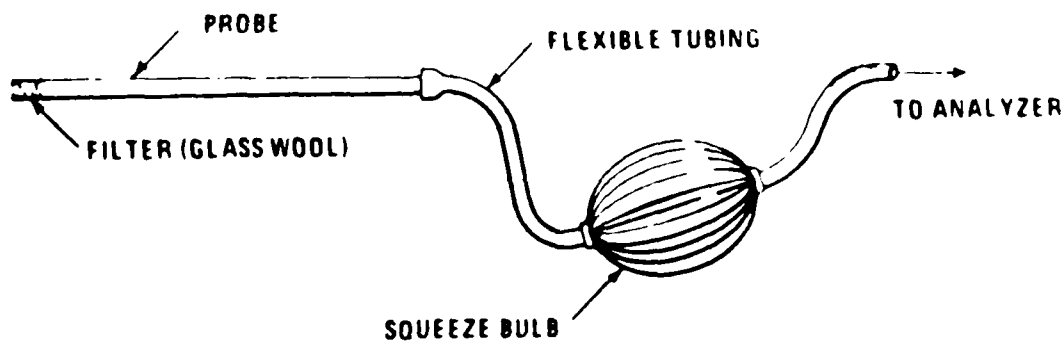


FIGURE 8: ORSAT SAMPLING TRAIN

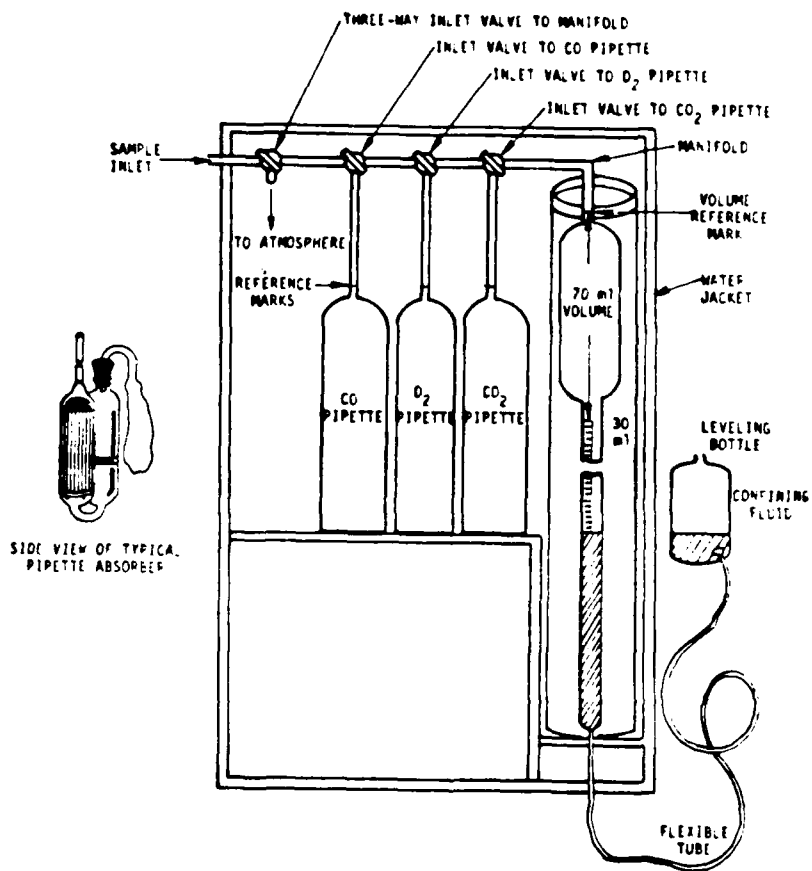


FIGURE 9: ORSAT APPRATUS

Emission calculations were done using "Source Test Calculation and Check Programs for Hewlett-Packard 41 Calculators" (EPA-340/1-85-018) developed by the EPA's Office of Air Quality Planning and Standards, Research Triangle Park NC. This is our standard method for calculating emissions data. Emissions calculations are found in Appendix J. Calibration data are presented in Appendix K.

Method 9 determinations for opacity during this project were accomplished during each test run by a certified test team member. EPA Method 9 certification documentation is provided in Appendix L.

III. CONCLUSIONS

Visible emissions averaged less than 10% for all runs except for time periods where soot blows occurred. Soot blows did cause opacity to exceed 20% but not for more than three-minute period. Visible emission observation forms are provided in Appendices E-I.

Table 1 provides operating parameters for boilers 2 and 3 during testing and the resultant particulate emission rates determined from these tests. Results indicate that the one test run conducted on boiler 2 showed the emissions rate was above the standard of 0.1 gr/dscf. However, this is inconclusive since Method 5 uses the average of the emission rates determined from three test runs as the reportable emission rate. Boiler 3 emissions were above the emission standard for each of the four Method 5 evaluations. Emission rates determined for each test run were above the standard except for run 2 on 20 July when boiler 3 was operating at 90,000 lbs/hr.

We believe that a primary factor in boiler 3 not meeting the emission standard was the physical quality of the coal entering the boiler. The coal should have had an aggregate size of about 3/4 inch; however, the largest aggregate size seen during testing was more on the order 1/4 - 1/2 inch along with a large quantity of very fine material. Coal which most closely matched the desired aggregate size was burned during run 2 of the boiler 3 evaluation on 20 July. As can be seen in Table 1, run 2 was the only test to show an emission rate below the standard.

IV. RECOMMENDATIONS

It is our recommendation that boiler 3 be retested with emphasis on testing with a coal that meets the desirable physical requirements as closely as possible. All aspects of the system (boiler, particulate control devices, etc.) should also be evaluated for proper operation prior to testing.

TABLE 1

STACK EMISSION TEST RESULTS

DATE	BOILER NO.	RUN NO.	BOILER OPERATING CAPACITY (1000 lbs steam/hr)	SOOT BLOW	PARTICULATE EMISSIONS (gr/dscf)*
14 JULY	2	1	120		0.15
17 JULY	3	1	100	X	0.21
17 JULY	3	2	100		0.15
17 JULY	3	3	100		0.14

					AVG = 0.17
18 JULY	3	1	100		0.16
18 JULY	3	2	100		0.14
18 JULY	3	3	100	X	0.29

					AVG = 0.20
19 JULY	3	1	90		0.10
19 JULY	3	2	90	X	0.23
19 JULY	3	3	90		0.11

					AVG = 0.15
20 JULY	3	1	90	X	0.11
20 JULY	3	2	90		0.09
20 JULY	3	3	90		0.13

					AVG = 0.11

* gr/dscf = grains per dry standard cubic foot

REFERENCES

1. "Standards of Performance for New Stationary Sources", Title 40, Part 60, Code of Federal Regulations, July 1, 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.

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APPENDIX A
Personnel Information

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1. USAFOEHL Test Team

Maj James Garrison, Chief, Air Quality Function
Capt Tim Fagin, Consultant, Air Quality Engineer
Capt Paul Scott, Consultant, Air Resources Meteorologist
SSGT Dan Schillings, Industrial Hygiene Technician
SGT Robert Davis, Environmental Engineering Technician

USAFOEHL/ECQ
Brooks AFB TX 78235-5501

Phone: AUTOVON 240-2891
Commercial (512) 536-2891

2. Eielson AFB on-site representatives

Col Dennis W. Franks	USAF Clinic Eielson/SG
MSGT L.S. Satterfield	USAF Clinic Eielson/SGPB
SRA Jay L. Dulik	USAF Clinic Eielson/SGPB
 Ted W. Tisdale	 343 CES/DEMP Utilities Operations General Foreman, Central Heat and Power Plant
 George Pousche	 343 CES/DEMP Assistant, Utilities Operations General Foreman, Central Heat and Power Plant
 Larry Bright	 343 CES/DEEV
 Jack Coutts	 Regional Air Coordinator/Dept of Environmental Conservation, State of Alaska

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APPENDIX B

Permit No. 8831-AA001

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STATE OF ALASKA

DEPT. OF ENVIRONMENTAL CONSERVATION

January 21, 1988

STEVE COWPER, GOVERNOR

(907) 452-1714

Northern Regional Office
1001 Noble Street
Suite 350
Fairbanks, Alaska 99701

CERTIFIED MAIL
RETURN RECEIPT
REQUESTED

Captain George A. Heiner
Chief, Environmental/Contract Planning
U.S. Department of the Air Force
343D Civil Engineer Squad (AAC)
Eielson AFB, Alaska 99702

Dear Capt. Heiner:

Re: Air Quality Control Permit to Operate 8831-AA001

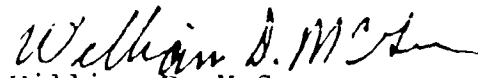
We have received your letter dated January 7, 1988, requesting renewal of Air Quality Control Permit to Operate 8331-AA001. In our review of the permit file, we find a letter dated March 11, 1986 from Capt. Blackshear in which he states "a source test will be conducted after repair. . ." Your letter indicated that the repairs were completed last summer. Since the source test has not been completed, we are requiring it as condition 4 of the new Air Quality Control Permit to Operate # 8831-AA001. Please note that the source test report must be submitted to the department by December 31, 1989. The source test will determine at which maximum load the boiler can be fired.

The new permit expires on January 30, 1993, and you must have it renewed if you intend to continue to operate the facility beyond that date. Please note that there are 11 conditions to be met on this permit. Failure to comply with any of these conditions will result in the suspension or revocation of your permit in accordance with 18 AAC 50.310.

January 21, 1988

Any person who disagrees with this decision may appeal the decision by requesting an adjudicatory hearing, using the procedures contained in 18 AAC 15.200-310. Hearing requests must be delivered to the Commissioner of the Department of Environmental Conservation, 3220 Hospital Drive, P.O. Box 0, Juneau, Alaska 99811-1800, within 30 days of receipt of this letter. If a hearing is not requested within 30 days, the right to appeal is waived and the decision becomes final.

Sincerely,



William D. McGee
Regional Environmental Supervisor

jc/wdm/tss

Enclosure

cc: A. Ewing, EPA/Anchorage
R. Joy, FHSB/Fairbanks
L. Verrelli, ADEC/Juneau
100.16.002

ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
NORTHERN REGION OFFICE
1001 NOBLE STREET, SUITE 350
FAIRBANKS, ALASKA 99701

AIR QUALITY CONTROL PERMIT TO OPERATE

Permit No. 8831-AA001
Renews Permit No. 8331-AA001,

Date of Issue January 21, 1988

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. Department of the Air Force
343D Civil Engineering Squadron (AAC)
Eielson A.F.B., Alaska 99702

FOR THE OPERATION OF the Eielson Air Force Base power and heating plant, consisting of six coal-fired boilers, as described in Exhibit A in accordance with the conditions of this permit and Exhibits A and B and as described in permit application documents listed in Exhibit C.

LOCATED near Fairbanks, Alaska on Eielson Air Force Base.

THE FOLLOWING CONDITIONS SHALL APPLY TO THIS PERMIT:

01. The permittee shall comply with the State Ambient Air Quality Standards established in Section 020 and the applicable emission limitation specified in Section 040 of the State Air Quality Control Regulations 18 AAC 50 and Exhibit B.
02. An Air Contaminant Emission Source Operating Report as described in Exhibit A shall be submitted semiannually to the department's Northern Regional Office, 1001 Noble Street, Suite 350, Fairbanks, Alaska 99701, by the 30th of January and July of each year.
03. The permittee shall maintain and operate all fuel burning equipment, emission control devices, testing equipment, and monitoring equipment to provide optimum fuel burning efficiency during all operating periods. The permittee shall establish and have in the control room written standard operating procedures for use by the operators of the boilers.
04. The permittee shall conduct a source test of one representative boiler in accordance with Title 40 Code of Federal Regulation Part 60 Appendix A, Methods 1 through 5 to determine the maximum steam load at which the boilers will meet the emission standards in Exhibit B. The source

test report must be in the format specified by Appendix IV-3 of the State Air Quality Control Plan and be submitted to the Department's Northern Regional Office by December 31, 1989.

05. Until the source test in Condition 4 is conducted, permittee shall operate the coal fired boilers at a firing rate, which at no time shall exceed 100,000 lbs/hr steam, (5/6) rated capacity, based on one-hour average steam production. The source test shall thereafter determine the maximum load.
06. Additional testing or monitoring, as deemed necessary, shall be conducted, installed, maintained, and operated in accordance with 18 AAC 50.500 and 50.520 to measure air contaminant emission concentrations. If any continuous monitor is malfunctioning or non-operable for three or more consecutive days, permittee shall notify the Northern Regional Office of the department on the fourth day indicating the cause of failure and anticipated time required to repair the instrument.
07. The permittee shall maintain test results, monitoring instrument recording charts, and other applicable data in an active file for not less than one year, and have them accessible, upon request, to the department for not less than three years.
08. Permittee shall notify the department's Northern Regional Office by telephone (452-1714) when equipment failures or operation conditions occur which increase air contaminant emissions. Opacity violations totaling less than one-half hour per day do not need to be reported. The permittee shall report the expected duration, nature of occurrence, amount and type of material burned, and steps taken to minimize emissions and avoid recurrence.
09. Permittee shall submit a written report by the 15th day of each month to the department's Northern Regional Office which summarizes the date, time, and other information requested in Condition 8 for each incident reported in accordance with that permit condition and in violation of performance limitations listed in Exhibit B.
10. The department's representative is allowed access to permittee's facilities to conduct inspections or tests to determine compliance with this permit and state environmental laws and regulations.

11. A copy of this permit shall be clearly displayed, and the State Air Quality Control Regulations 18 AAC 50 kept on file, at the permitted facility location.

This permit expires 30 January 1993 and may be suspended or revoked in accordance with 18 AAC 50.310.



William D. McGee

Regional Environmental Supervisor

EXHIBIT A
AIR QUALITY CONTROL PERMIT TO OPERATE 8831-AA001
AIR EMISSION SOURCE OPERATING REPORT

An Air Source Operating Emission Report shall be submitted to the Alaska Department of Environmental Conservation, Northern Regional Office, 1001 Noble Street, Suite 350, Fairbanks, Alaska 99701 semiannually by January 30 and July 30 each year. The report shall include, but not be limited to, the following information:

1. Facility identification and reporting period. Include the firm name, facility name and location, permit number and the period of time covered by the report.
2. Operating time and fuel consumption logged on permitted equipment tabulated by quarter. Include the number of days or hours of operation and quantity of fuel consumed by each boiler.
3. Report a change in type of fuel and tests or analyses performed.
4. A brief discussion of any change in monitoring equipment or failure which may affect reported results or yield incomplete data for any given day.
5. 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."

EXHIBIT B
AIR QUALITY CONTROL PERMIT TO OPERATE 8831-AA001
AIR CONTAMINANT EMISSION LIMITATIONS

Exhaust conditions shall be in accordance with the information submitted.

<u>Pollutant</u>	<u>Performance Limitation</u>	<u>Annual Limit TPY</u>
Particulate matter	0.1 grains per dry standard cubic foot, 100,000 lbs steam/hour for each of the 134 MMBTU/HR boilers	150 per each of the six boilers
	20 percent opacity not to be exceeded for more than 3 minutes in any one hour, except during upsets, startups, and shutdowns	

EXHIBIT C
AIR QUALITY CONTROL PERMIT TO OPERATE 8831-AA001
PERMITTEE'S DOCUMENTATION

1. Department of the Air Force Air Quality Control Permit to Operate application dated December 19, 1977, and emissions information report OMB 158-R75, dated February 2, 1976.
2. The Alaska Department of Environmental Conservation (ADEC) report of "Particulate Matter and Sulfur Dioxide Emissions Source Test" for Eielson Air Force Base's power plant May 14 and 15, 1981.
3. ADEC letter to U.S. Air Force Director, Engineering Energy and Environmental Planning Elmendorf Air Force Base, dated March 19, 1985, requesting a source test at the Eielson power plant.
4. U.S. Air Force letter dated March 11, 1986, to ADEC stating "a source test will be conducted. . ."
5. U.S. Air Force letter dated January 7, 1988, to ADEC requesting renewal of Eielson's Air Quality Control Permit to Operate.

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 I.
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. Deberah 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 1,000 kilograms of feed on a dry basis to the kiln; and

(B) kiln, 0.15 kilograms of particulate matter per 1,000 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(d)(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) waste-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) — (xvi) 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 or 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 (H_2S) — 10 tpy;

(xiv) total reduced sulfur including H_2S — 10 tpy;

(xv) reduced sulfur compounds including H_2S — 10 tpy;

(xvi) increased emissions of a pollutant regulated by the Clean Air Act (P.L. 91-604) as amended August 7, 1977 (P.L. 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 $1 \mu g/m^3$ 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 $\mu\text{g}/\text{m}^3$ eight-hour average or 2000 $\mu\text{g}/\text{m}^3$ 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.

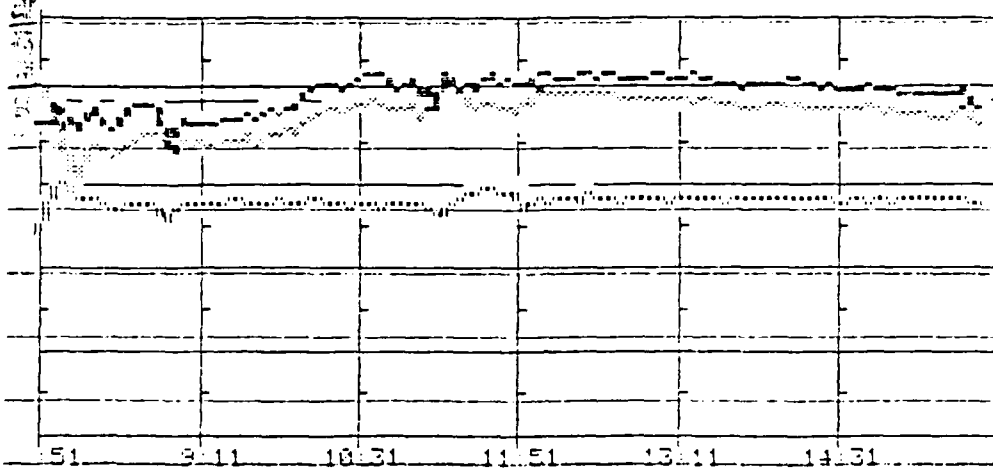
(c) The department will review the petition for reclassification within 30 days after receipt and will accept it for consideration if it satisfactorily describes the circumstances behind the proposed reclassification and meets the requirements of

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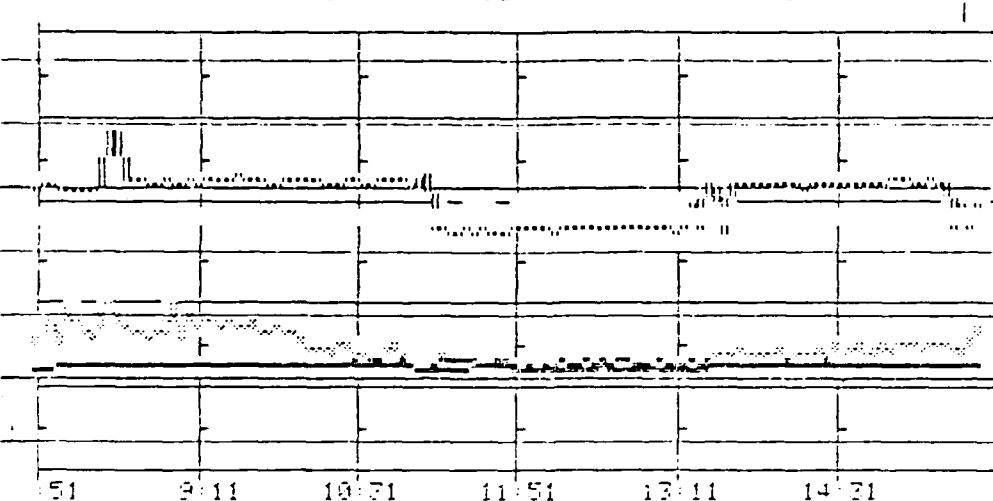
APPENDIX D
Plant Operating Data

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17 JUL 88 SUNDAY 6E BLR NO. 3 TRENDS 918345678 15:46:28



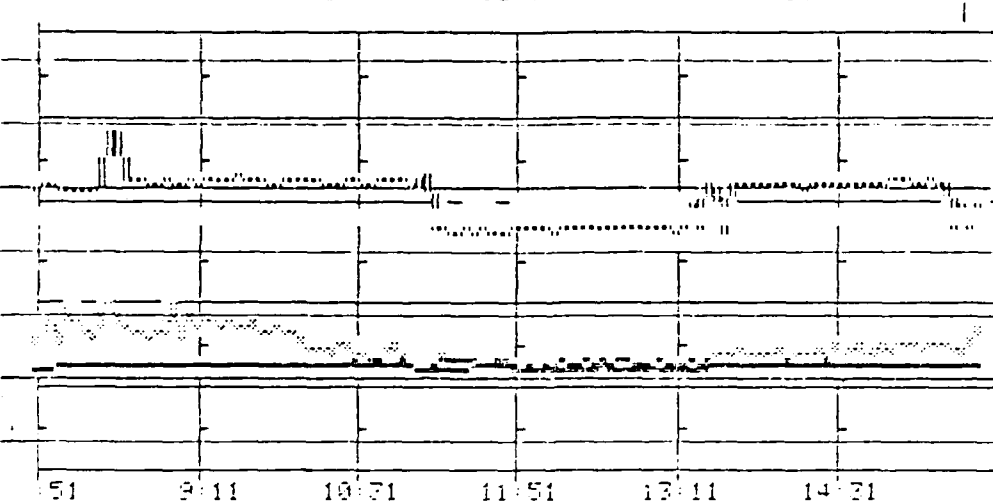
FI-283 BLR 3
SPEEDWATER 135.00
97.00 KLB/HR
0.00
SMP



LI-144 BLR 3
STEAM DRUM 100.00
55.13 %
0.00
SMP

FI-103 BLR 3
STEAM FLOW 125.00
103.50 KLB/HR
0.00
SMP

TIME = 15:15:00



AI-846 BLR 3
OXYGEN PERCENT 25.00
8.92 %
0.00
SMP

FI-154 AIR 3
AIR 100.00
56.82 KLB/HR
0.00
SMP

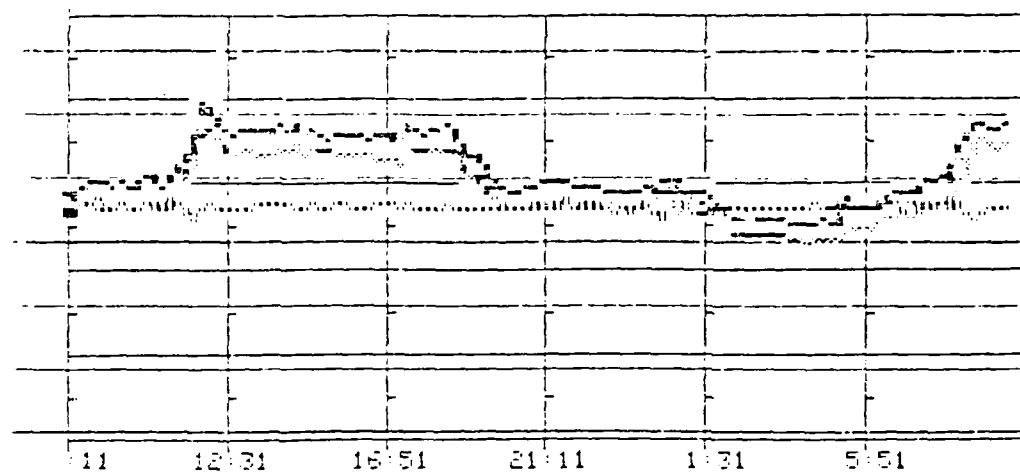
TI-571 BLR 3
FLUE GAS OUTLET 1500.0
390.85 DEG
0.00
SMP

30 JUL 88 WEDNESDAY 02

BLR NO. 3 TRENDS

AS12345678

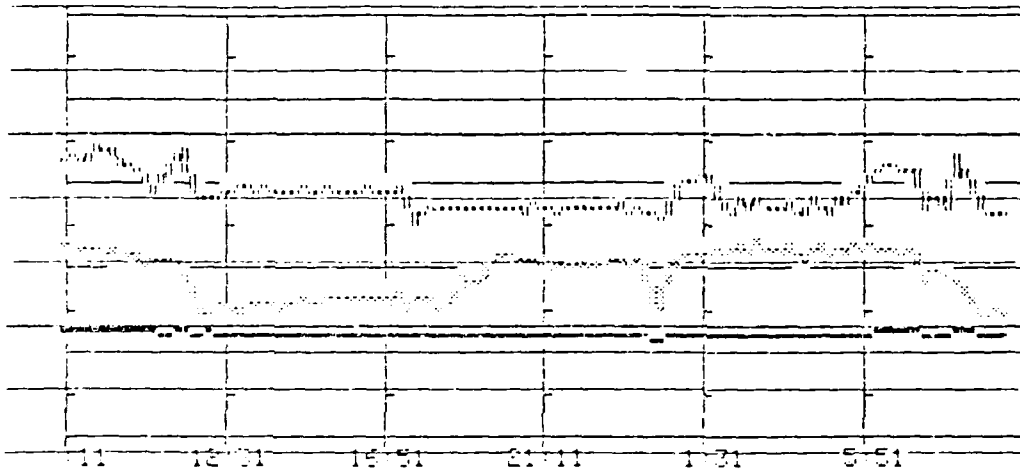
09:47:37



FI-303 BLR 3
SPEEDWATER
125.00
80.00 KLB/HR
SMP 0.00

FI-144 BLR 2
WATERM DRUM
100.00
50.00 KLB/HR
SMP 0.00

FI-103 BLR 3
WATERM FLOW
100.00
50.00 KLB/HR
SMP 0.00



FI-845 BLR 2
OXYGEN PERCENT
20.00
8.66 %
SMP 0.00

FI-134 BLR 3
WCOMB. AIR
100.00
60.00 KLB/HR
SMP 0.00

FI-574 BLR 3
GALVE GAS OUTLET
1000.0
300.00 DEG F
SMP 0.00

TIME = 11:00:00

APPENDIX E

Boiler 2, Field Data, 120,000 lbs/hr, 14 July 88

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PARTICULATE SAMPLING DATA SHEET

RUN NUMBER #1	SCHEMATIC OF STACK CROSS SECTION 2.12 ch. 2-18 in. Hg Mult. cone probe setup: 4 "H ₂ O 2" 2" 8"	EQUATIONS $P_R = P_A + 400$ $H = \left[\frac{5130 \cdot F_d \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m}{T_s} \cdot V_p$ $\bar{T}_s = 412^\circ F$ $\bar{T}_m = 98^\circ F$ $\bar{\Delta}H = 3.7$ $P_{S15} = 32.86$ $53,952$	AMBIENT TEMP OF STATION PRESS 29.235 in Hg HEATER BOX TEMP OF PROBE HEATER SETTING PROBE LENGTH 6' in NOZZLE AREA (in ²) 0.252 Cp 0.84 DRY GAS FRACTION (F.I.) 5
-------------------------	--	---	---

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H ₂ O)	STACK TEMP		VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (in)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP		SAMPLE BOX TEMP (°F)	IMPINGEN OUTLET TEMP (°F)
			(°F)	(T _s) (°R)				IN (°F)	AVG (T _m) (°R)		
1	0	-6	411		1.80	2.3	53.952	95		240	71
2	2.5	-6	411		1.5	4.31		94		241	69
3	5.0	-7	409		1.6	4.63		95		246	74
4	7.5	-7	414		1.6	4.64		94		250	85
5	10.0	-7	415		1.5	4.32		99		252	97
6	12.5	-7.5	413		1.3	4.33		101		253	99
7	15.0	-8.0	413		1.4	4.05		103		254	96
8	17.5	-8.0	413		1.3	3.77		103		257	91
9	20.0	-8.2	413		1.3	3.77		103		258	87
10	22.5	-8.5	412		1.3	3.78		104		264	85
11	25.0	-9.0	412		1.2	3.49		105		268	83
12	27.5	-8.5	412		1.0	2.91	81.338	105		262	81

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)	ELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (in)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP (°F)	IN (°F)	AVG (T _m) (°F)	OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	30	-3.0	400	1.06	2.17	81.338	102	97		97	246	76
2	32.5	-10.0	400	1.4	4.07		101	98		98	245	70
3	35.0	-12.0	400	1.6	4.65		101	97		97	243	70
4	37.5	-12.0	414	1.5	4.34		102	97		97	245	75
5	40.0	-12.0	415	1.4	4.06		101	98		98	241	86
6	42.5	-12.0	414	1.35	3.92		102	98		98	246	81
7	45.0	-12.1	413	1.3	3.78		105	98		98	245	82
8	47.5	-12.0	413	1.3	3.78		106	98		98	244	83
9	50.0	-13.0	413	1.25	3.64		106	99		99	239	82
10	52.5	-13.5	412	1.30	3.77		106	98		98	251	80
11	55.0	-14.0	413	1.25	3.61		105	99		99	252	82
12	57.5	-13.0	413	0.97	2.83	107.229	106	99		99	256	83
						REF VOL = 53.277						
						REF VOL = 31.657						

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE EIELSON AFB		DATE 14 JULY 88		RUN NUMBER 1	
BUILDING NUMBER			SOURCE NUMBER BOILER #2		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	0.4919	0.2903	.2016		
ACETONE WASHINGS (Probe, Front Half Filter)	105.7112	105.3781	.3331		
BACK HALF (If needed)			-		
			Total Weight of Particulates Collected		.5347 gm
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	152 ml	100 ml	52.0 g		
IMPINGER 2 (H2O)	152 ml	100 ml	52.0 g		
IMPINGER 3 (Dry)	14 ml	-	14.0 g		
IMPINGER 4 (Silica Gel)	337.3 g	2.00 g	135.3 g		
			Total Weight of Water Collected		255.3 gm
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	13.6	13.6	13.6		13.6
VOL % O ₂	6.0	5.8	5.8		5.9
VOL % CO					
VOL % N ₂					

47

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

(Stack Geometry)

OEHL 15

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

BASE Eielson	DATE July 88	+ 2.8 in D. in - 5.4 in D. in
BOILER NUMBER #2		
INSIDE STACK DIAMETER 52.5		Inches
STATION PRESSURE 29.235		In Hg
STACK STATIC PRESSURE - 1.45		In H2O
SAMPLING TEAM UEHL/ECQ		

45
411

TRAVERSE POINT NUMBER	VELOCITY HEAD, V_p IN H2O	CYCLONIC $\frac{V_p}{\alpha}$	STACK TEMPERATURE (°F)
1	1.1	4°	402
2	1.5	0	402
3	1.6	0	411
4	1.6	0	414
5	1.5	1	414
6	1.4	0	414
7	1.3	0	414
8	1.3	0	413
9	1.3	0	412
10	1.3	10	412
11	1.1	0	412
12	0.84	0	410
		<u>1.25°</u>	
	MW ₃ 28.17		
	$\overline{V_p}$ 5110	$\phi = 0.218$	
	$\overline{V_p}$ 1.32		
	2934		
	$\overline{V_p}$ 411		
	7683		
	DSCFM 43389		
	AVERAGE		

NOZZLE CALIBRATION DATA FORM

Date 14 JUL-1958

Calibrated by EMERSON

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.)		
1.25	257	252	252	0.001	0.252

where:

^aD_{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 .

Quality Assurance Handbook M5-2.6

VISIBLE EMISSION OBSERVATION FORM

RUN #1
No. 1 of 2

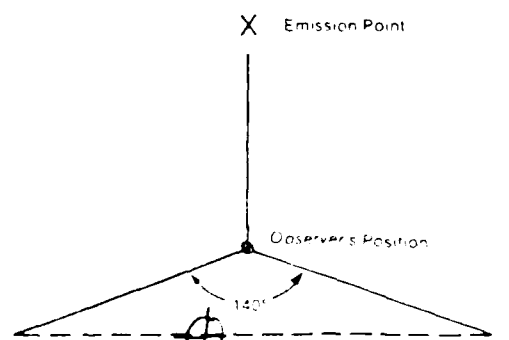
COMPANY NAME EIELSON AFB		
STREET ADDRESS		
CITY	STATE	ZIP
PHONE (KEY CONTACT)		SOURCE ID NUMBER CH+PP

PROCESS EQUIPMENT COAL-FIRED BOILER #2	OPERATING MODE
CONTROL EQUIPMENT MULTICLONES	OPERATING MODE

DESCRIBE EMISSION POINT TAPERED STACK SE CORNER OF BLDG. (E-001 BOILER HAS DEDICATED STACK)	
HEIGHT ABOVE GROUND LEVEL 14' ASSESS' R.O.C.F.	HEIGHT RELATIVE TO OBSERVER Start 14' End
DISTANCE FROM OBSERVER Start 90' End	DIRECTION FROM OBSERVER Start SSW End

DESCRIBE EMISSIONS CONTINUOUS PLUME	
Start CONNING	End
EMISSION COLOR Start LT BROWN End	IF WATER DROPLET PLUME Attached ☒ N/A Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 2-4" ABOVE STACK End	

DESCRIBE PLUME BACKGROUND	
Start SLIGHTLY HAZY	End
BACKGROUND COLOR Start GREEN-WHITE End SAME	SKY CONDITIONS Start SCATTERED End SAME
WIND SPEED Start CALM End SAME	WIND DIRECTION Start CALM End SAME
AMBIENT TEMP Start 75°F End 78°F	WET BULB TEMP RH. percent

Stack with Plume Sun Wind	SOURCE LAYOUT SKETCH Draw North Arrow 
---------------------------------	---

ADDITIONAL INFORMATION

OBSERVATION DATE		START TIME				END TIME
14 JUN 88						
SEC	0	15	30	45	COMMENTS	
MIN						
1	5	5	5	5		
2	5	5	5	5	ALL RINGS	
3	5	5	5	5	EXHIBITED SOME	
4	5	5	5	5	CAPACITY	
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		
13	5	5	5	5		
14	5	5	5	5		
15	5	5	5	5		
16	5	5	5	5		
17	5	5	5	5		
18	5	5	5	5		
19	5	5	10	5		
20	10	10	5	5		
21	5	5	10	10	SLIGHT UPSET - GREATEST	
22	15	10	10	10	CAPACITY OCCURRED BETWEEN	
23	10	10	10	5	21:15 + 21:30.	
24	5	5	5	5		
25	5	5	5	5		
26	5	5	5	5		
27	5	5	10	10		
28	10	10	10	5		
29	5	5	5	5		
30	5	5	5	5	WENT - OVER TO PART B	

OBSERVER'S NAME (PRINT) MR JAMES A. GARRISON	DATE 14 JUNE 88
OBSERVER'S SIGNATURE <i>James A. Garrison</i>	
ORGANIZATION LSAFC/HL/ACG	
CERTIFIED BY EASTERN TECHNICAL ASSOCIATE (STATE OF FLA. DER)	DATE 1 JUNE 88

CONTINUED ON VEG FORM NUMBER	
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VISIBLE EMISSION OBSERVATION FORM

RUN #1
No. 2 of 2

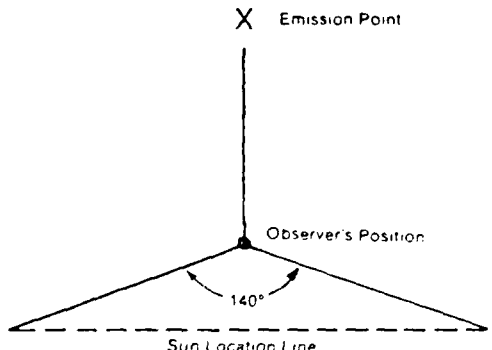
COMPANY NAME		
STREET ADDRESS		
CITY	STATE	ZIP
PHONE (KEY CONTACT)	SOURCE ID NUMBER <i>Boiler # 2</i>	

PROCESS EQUIPMENT	OPERATING MODE
CONTROL EQUIPMENT	OPERATING MODE

DESCRIBE EMISSION POINT	
HEIGHT ABOVE GROUND LEVEL	HEIGHT RELATIVE TO OBSERVER Start End
DISTANCE FROM OBSERVER Start End	DIRECTION FROM OBSERVER Start End

DESCRIBE EMISSIONS	
Start	End
EMISSION COLOR	IF WATER DROPLET PLUME Attached ☐ Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED	Start End

DESCRIBE PLUME BACKGROUND	
Start	End
BACKGROUND COLOR	SKY CONDITIONS
Start End	Start End
WIND SPEED	WIND DIRECTION
Start End	Start End
AMBIENT TEMP	WET BULB TEMP RH, percent
Start End	

Stack with Plume  Sun  Wind 	SOURCE LAYOUT SKETCH Draw North Arrow  
---	---

ADDITIONAL INFORMATION

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

OBSERVER'S NAME (PRINT)	
OBSERVER'S SIGNATURE	DATE
ORGANIZATION	
CERTIFIED BY	DATE
CONTINUED ON VEO FORM NUMBER	

APPENDIX F

Boiler 3, Field Data, 100,000 lbs/hr, 17 July 88

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AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE EIELSON AFB		DATE 17 JUN 1988		RUN NUMBER 1	
BUILDING NUMBER			SOURCE NUMBER Boiler # 3		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	0.6714	0.2854	0.3860		
ACETONE WASHINGS (Probe, Front Half Filter)	107.8106	107.4366	0.3740		
BACK HALF (if needed)					
			Total Weight of Particulates Collected		0.7600 gm
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	177	100	77		
IMPINGER 2 (H2O)	140	100	40		
IMPINGER 3 (Dry)	8.6	C.C	8.6		
IMPINGER 4 (Silica Gel)	336.4	300	36.4		
			Total Weight of Water Collected		gm
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	10.6	10.6	10.6	10.6	10.6
VOL % O ₂	8.8	8.8	8.8	8.8	8.8
VOL % CO					
VOL % N ₂					
$\text{Vol \% N}_2 = (100\% - \% \text{CO}_2 - \% \text{O}_2 - \% \text{CO})$					

651
2-1

$$\Delta H_a = 1.736$$

642

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER		SCHEMATIC OF STACK CROSS SECTION		EQUATIONS		AMBIENT TEMP					
DATE		W. A. F.		$\text{OR} = \text{OR} + 460$ $H = \left[\frac{5130 \cdot F \cdot D \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m}{T_s} \cdot V_p$		STATION PRESS					
PLANT		A				HEATER BOX TEMP					
BASE		Pre. Leaks check good at 15				PROBE HEATER SETTING					
SAMPLE BOX NUMBER						PROBE LENGTH					
METER BOX NUMBER						NOZZLE AREA					
IN/OUT						sq ft					
Cp						184					
Cp						28.17					
TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H ₂ O)	STACK TEMP (°F)	STACK TEMP (°F)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (psi)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP OUT (°F)	SAMPLE BOX TEMP (°F)	IMPIINGER OUTLET TEMP (°F)
1	15.4	0.41	354	354	4.6	0.16	818.512	82	81	252	
2	15.5	0.41	354	354	7.3	0.26		84	81	263	
3	15.6	0.41	351	351	1.4	0.54		87	82	275	
4	15.7	0.41	356	356	1.5	0.54		91	82	274	
5	15.8	0.41	362	362	1.8	0.64		93	83	268	
6	15.9	0.41	364	364	1.8	0.64		94	83	248	
7	16.0	0.41	367	367	1.8	0.64		94	83	253	
8	16.1	0.41	367	367	1.8	0.64		95	84	263	
9	16.2	0.41	367	367	1.8	0.64		95	84	266	
10	16.3	0.41	367	367	1.75	0.62		97	83	268	
11	16.4	0.41	367	367	1.74	0.43		96	83	246	
12	16.5	0.41	365	365	0.55	0.20		91	83	254	
3 min sampling time											

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)	STACK TEMP (°F)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (in)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°F)	OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
#2 17 Jun 88 CHSPP E. I. du Pont RAC METER BOX NUMBER Qm/Qm Cp Post Leach check good at 20 100,000 lb/hr				$^{\circ}R = ^{\circ}F + 460$ $H = \left[\frac{5130 \cdot F \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m}{T_s} \cdot V_p$				78 29.2-20 HEATER BOX TEMP PROBE HEATER SETTING 72 NOZZLE AREA (A) 155 Cp 84 DRY GAS FRACTION (Fd)				
1	15	1.05	355		1.25	0.45	843.621	83		81	253	
2	45	1.5	358		1.55	0.55	843.621	84		82	251	
3	50	1.8	364		1.75	0.62		85		81	274	
4	75	1.0	366		1.90	0.67		84		81	231	
5	100	1.0	368		1.90	0.67		88		82	253	
6	125	1.0	368		1.85	0.65		89		87	245	
7	150	2.0	368		1.85	0.65		92		87	263	
8	175	2.2	368		1.85	0.65		93		81	234	
9	200	2.5	368		1.85	0.62		94		81	261	
10	225	2.0	368		1.18	0.43		94		82	260	
11	240	1.0	366		1.58	0.27		94		82	234	
12	275	1.0	366		1.56	0.20	848.551	92		83		
				$\bar{H} = 52$ 30.039								
				$13.5 = 33.905$								
				$C_{FH} = 848.551 - 818.512 = 30.039$								

AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE ELFELSON		DATE 17 JULY 88		RUN NUMBER #2	
BUILDING NUMBER CH + PP			SOURCE NUMBER BOILER #3		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	0.4415	0.2850	0.1565		
ACETONE WASHINGS (Probe, Front Half Filter)	99.7674	99.6269	0.1405		
BACK HALF (if needed)					
	Total Weight of Particulates Collected		0.2970 gm		
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	143	100	43		
IMPINGER 2 (H2O)	114	100	14		
IMPINGER 3 (Dry)	4	0	4		
IMPINGER 4 (Silica Gel)	310.7	300	10.7		
	Total Weight of Water Collected		71.7 gm		
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	10.6	10.6	10.6		10.6
VOL % O ₂	8.4	8.4	8.4		8.4
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE <i>Evelson</i>		DATE <i>17th July 58</i>		RUN NUMBER <i>#3</i>	
BUILDING NUMBER <i>CH&DD</i>		SOURCE NUMBER <i>Boiler #3</i>			
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	<i>0.4352</i>	<i>.2877</i>	<i>.1475</i>		
ACETONE WASHINGS (Probe, Front Half Filter)	<i>98.8771</i>	<i>98.7231</i>	<i>.1540</i>		
BACK HALF (if needed)					
		Total Weight of Particulates Collected		<i>.3015 gm</i>	
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H ₂ O)	<i>194 ml</i>	<i>100</i>	<i>94</i>		
IMPINGER 2 (H ₂ O)	<i>70 ml</i>	<i>100</i>	<i>-30</i>		
IMPINGER 3 (H ₂ O)	<i>1 ml</i>	<i>0</i>	<i>1</i>		
IMPINGER 4 (Silica Gel)	<i>318.6</i>	<i>300</i>	<i>18.6</i>		
		Total Weight of Water Collected		<i>83.6 gm</i>	
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	<i>10.6</i>	<i>5.6</i>	<i>5.6</i>		<i>10.6</i>
VOL % O ₂	<i>0.4</i>	<i>5.4</i>	<i>5.4</i>		<i>8.5</i>
VOL % CO					
VOL % N ₂					
Vol % N ₂ = 100% - % CO ₂ - % O ₂ - % CO					

[illegible]

PRELIMINARY SURVEY DATA SHEET NO. 2 (Velocity and Temperature Traverse)			
BASE		DATE	
Boiler Number		Date	
Inlet Stack Diameter		Inches	
Stack Static Pressure		In H ₂ O	
Sampling Team			
Eielson		17 July 88	
#3			
52.5		P.H. -37 +53	
29.624		In H ₂	
-1.9		In H ₂ O	
EQ			
TRAVERSE POINT NUMBER	VELOCITY HEAD, V _h IN H ₂ O	CYCLONE $\frac{V_h}{V_d} \propto$	STACK TEMPERATURE (°F)
1	0.74	1	355
2	0.91	3	356
3	1.3	1	358
4	1.6	1	360
5	1.9	2	360
6	1.9	2	360
7	1.9	5	360
8	1.85 1.9	1	361
9	1.85 1.85	0	360
10	1.85 1.85	0	359
11	1.85 1.85	3	359
12	0.53	4	357
MW = 28.17 $PM = 1.5^\circ$ FTS = 6			
AVERAGE			

NOZZLE CALIBRATION DATA FORM

Date 17 July 88 Calibrated by Fagin

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.)		
stack #3 run 1 .25	.254	.254	.253	.001	.254
run 2 & 3 .15	.155	.155	.154	.001	.155
18 July	.25 ϕ	.25 ϕ	.251	.001	.25 ϕ

where:

^a $D_{1,2,3}$ = three different nozzle 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 .

Quality Assurance Handbook MS-2.6

VISIBLE EMISSION OBSERVATION FORM

No. _____

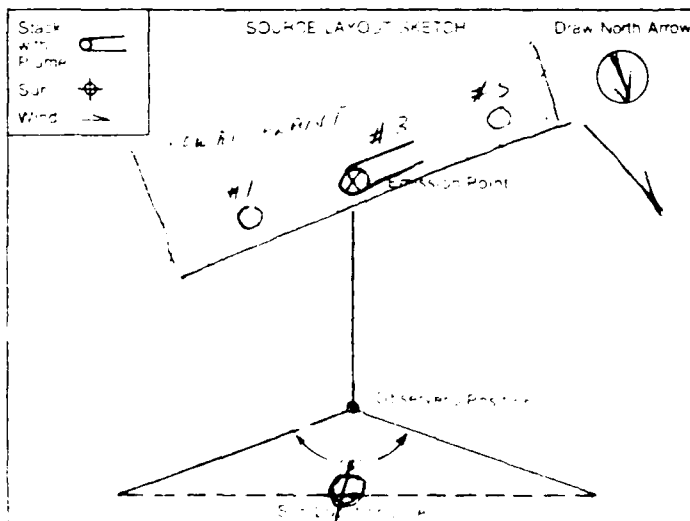
COMPANY NAME EIELSON AFB		
STREET ADDRESS		
CITY	STATE AK	ZIP
PHONE (KEY CONTACT)	SOURCE ID NUMBER BOILER # 3	

PROCESS EQUIPMENT COAL-FIRED BOILER	OPERATING MODE 100% UCL 4/42
CONTROL EQUIPMENT MULTICLONE	OPERATING MODE

DESCRIBE EMISSION POINT TAPERED STEEL STACK	
HEIGHT ABOVE GROUND LEVEL 108'	HEIGHT RELATIVE TO OBSERVER Start 108' End SAME
DISTANCE FROM OBSERVER Start 352' End SAME	DIRECTION FROM OBSERVER Start End

DESCRIBE EMISSIONS CONING PLUME	
Start CONING	End SAME
EMISSION COLOR	IF WATER DROPLET PLUME
Start LT BROWN End SAME	Attached N/A Detached
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 1-5' ABOVE STACK End SAME	

DESCRIBE PLUME BACKGROUND	
Start BLUE SKY	End SAME
BACKGROUND COLOR	SKY CONDITIONS
Start BLU End SAME	Start SCATTERED End SAME
WIND SPEED	WIND DIRECTION
Start 6 KTS End SAME	Start SE End SAME
AMBIENT TEMP	WET BULB TEMP RH percent
Start 75 F End	



OBSERVATION DATE 17 JUL 1988				START TIME	END TIME
SEC MIN	0	15	30	45	COMMENTS
1	5	5	5	5	ALL RUNS
2	5	10	5	5	EXHIBITED SHIRK
3	5	5	5	5	OPACITY.
4	5	5	10	5	
5	5	10	10	10	
6	10	10	10	5	
7	5	5	5	5	
8	5	5	5	5	
9	5	5	5	5	
10	5	5	5	10	
11	5	5	5	5	
12	5	5	5	10	
13					
14					
15					
16					
17					
18					
19					
20	50	75	75	50	
21	30	20	60	5	
22	20	40	50	10	
23					
24					
25					
26					
27					
28					
29					
30					

OBSERVER'S NAME (PRINT)	
OBSERVER'S SIGNATURE	DATE
ORGANIZATION	
CERTIFIED BY	DATE

CONTINUED ON VEG FORM NUMBER				
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APPENDIX G

Boiler 3, Field Data, 100,000 lbs/hr, 18 July 88

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2013

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THEO 18

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE EIELSON AFB		DATE 18 JULY 88		RUN NUMBER BOILER 3 R1	
BUILDING NUMBER CHAPP			SOURCE NUMBER BOILER 3		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	0.5428	0.2857	0.3072		
ACETONE WASHINGS (Probe, Front Half Filter)	107.7100	107.4346	0.2734		
BACK HALF (if needed)					
			Total Weight of Particulates Collected		0.5805 gm
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	141	100	41		
IMPINGER 2 (H2O)	138	100	38		
IMPINGER 3 (Dry)	11.9	0	11.9		
IMPINGER 4 (Silica Gel)	327.1	300	27.3		
			Total Weight of Water Collected		118.2 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	9.6	9.6	9.6		9.6
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER # 2	SCHEMATIC OF STACK CROSS SECTION		EQUATIONS		AMBIENT TEMP 79	
DATE 18 July 88			$^{\circ}R = ^{\circ}F + 460$		STATION PRESS 29.789	of
PLANT ELECTRA			$H = \left[\frac{5130 \cdot F \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m}{T_s} \cdot V_p$		HEATER BOX TEMP	in Hg
BASE CH PD					PROBE HEATER SETTING	of
SAMPLE BOX NUMBER 2610					PROBE LENGTH 72	
METER BOX NUMBER			NOZZLE AREA 25	in		
Qw/Qm			Cp	sq ft		
Co			DRY GAS FRACTION (F _d)			

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STACK PRESSURE (in H ₂ O)	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)	(T _s) (°R)				IN (°F)	AVG (T _m) (°R)		
1	2.5	-6.5	383		0.92	2.45	257.65	100		250	58
2	2.5	-8.5	384		1.10	2.93		102		248	57
3	5.0	-11.5	388		1.40	3.72		104		250	56
4	2.5	-10.5	388		1.75	4.66		106		255	60
5	10.0	-18.5	388		1.80	4.79		105		250	61
6	12.5	-18.5	387		1.8	4.80		106		252	64
7	15.0	-18.5	387		1.75	4.67		106		255	64
8	11.5	-17.8	387		1.8	4.80		106		258	64
9	10.0	-18.5	387		1.5	4.04		105		263	64
10	12.5	-8.5	387		0.69	1.81		103		264	63
11	15.0	-3.4	386		0.15	0.44		105		264	63
12	27.5	-3.4	386		0.14	0.37	282.54	103		264	65
$T_m = 104$ $T_s = 386$											
$W = 342$											
$W = 342$											
$PSB = 31.8630$											

PARTICULATE SAMPLING DATA SHEET												
Schematic of Stack Cross Section												
Run Number	Date	Plant	Base	Sample Box Number	Meter Box Number	Q _{avg} (Gm)	C _p	Dry Gas Fraction (F _D)	Ambient Temp			
A12	18 July	CH2D	15						20.2			
$OR = 9F + 460$ $H = \left[\frac{5130 \cdot F \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m}{T_s} \cdot V_p$ Intermediate taken at 10 in. 15 to 282.873 from 282.254 2nd Intermediate 11.9 to 282.971 from 282.873 11.65 cc 60/61												
Traverse Point Number	Sampling Time (min)	Stack 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 Temp (°F)	Gas In Temp (°R)	Out Temp (°F)	Sample Box Temp (°F)	Impinger Outlet Temp (°F)
B1	0	-6.0	385		0.51	1.36	282.873	102		102	259	64
B2	2.5	-8.0	385		0.72	1.92		102		101	258	58
3	5.0	-11.5	386		1.10	2.93		104		102	259	58
4	7.5	-14.0	387		1.50	4.01		105		102	260	52
5	10.0	-17.0	387		1.70	4.54		107		102	258	61
6	12.5	-19.5	388		1.70	4.54		107		102	256	60
7	15.0	-19.5	388		1.75	4.67		108		102	260	62
8	17.5	-19.8	387		1.75	4.68		108		102	261	64
9	20.0	-20.0	386		1.7	4.51		106		102	260	63
10	22.5	-20.0	387		1.65	4.40		106		102	260	62
11	25.0	-18.0	388		1.15	3.09		106		104	264	72
12	27.5	-12.0	383		0.74	1.99	307.732	106		101	265	73
CU FT = 49.550												

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE <i>Eielson</i>		DATE <i>18 July</i>		RUN NUMBER <i>2</i>	
BUILDING NUMBER <i>CHDP</i>		SOURCE NUMBER <i>Boiler #3</i>			
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	<i>0.5698</i>	<i>.2876</i>	<i>.2822</i>		
ACETONE WASHINGS (Probe, Front Half Filter)	<i>99.8128</i>	<i>99.6269</i>	<i>.1851</i>		
BACK HALF (if needed)					
		Total Weight of Particulates Collected		<i>.4673 gm</i>	
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H ₂ O)	<i>168</i>	<i>100</i>	<i>68</i>		
IMPINGER 2 (H ₂ O)	<i>111</i>	<i>100</i>	<i>11</i>		
IMPINGER 3 (Dry)	<i>5.4</i>	<i>—</i>	<i>5.4</i>		
IMPINGER 4 (Silica Gel)	<i>333</i>	<i>200</i>	<i>133</i>		
		Total Weight of Water Collected		<i>117.4 gm</i>	
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	<i>10.0</i>	<i>10.0</i>	<i>10.0</i>		<i>10.0</i>
VOL % O ₂	<i>9.4</i>	<i>9.4</i>	<i>9.4</i>		<i>9.4</i>
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

B⁻⁴ 713

PARTICULATE SAMPLING DATA SHEET

1022

EQUATIONS
$$^{\circ}\text{R} = ^{\circ}\text{F} + 460$$

$$H = \left[\frac{5120 \cdot F \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m}{T_s} \cdot v_p$$

SCHEMATIC OF STACK CROSS SECTION

SOOT BLOW at 1930

2000

15

Leah closed all in by good

11. 10. 1961

11. 2.

DRY GAS FRACTION (FGD)
 $MW = 30.0$

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H ₂ O)	STACK TEMP		VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (ft)	GAS SAMPLE VOLUME (cu ft)	GAS AFTER TEMP			SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
			(°F)	(Ts) (°R)				IN (°F)	AVG (Tm) (°R)	OUT (°F)		
1	0	-2.46	384		6.60	1.64	301.713	102		101	267	73
2	2.5	-2.46	384		6.70	1.81		102		101	267	70
3	5.0	-2.46	380		1.10	2.93		104		102	270	74
4	7.5	-2.46	380		1.45	3.87		106		102	272	67
5	10.0	-2.46	384		1.10	4.54		108		103	272	70
6	12.5	-2.46	381		1.13	4.96		111		103	266	83
7	15.0	-2.46	382		1.35	4.71		111		103	259	83
8	20.0	-2.46	384		1.35	4.71		111		104	273	88
9	25.0	-2.46	380		1.24	4.57		111		104	272	84
10	30.0	-2.46	384		1.05	2.82		111		104	266	79
11	35.0	-2.46	385		0.78	2.10	335.917	113		105	258	75

PARTICULATE SAMPLING DATA SHEET

PLANT NUMBER # 3	SCHEMATIC OF STACK CROSS SECTION		EQUATIONS		AMBIENT TEMP	
DATE 1/6/2004	Point load stack at 15 m long good 3000000		$H = \left[\frac{5120 \cdot F \cdot A \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m \cdot V_p}{T_s}$		72	
PLANT 2100			$OR = OR + 460$		STATION PRESS	
BASE 1000					HEATER BOX TEMP	
SAMPLE BOX NUMBER					PROBE HEATER SETTING	
METER BOX NUMBER					PROBE LENGTH	
NOZZLE AREA (A)					72	
Cp					22	
DRY GAS FRACTION (Fd)					81	

TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H ₂ O)	STACK TEMP		VELOCITY HEAD (V _p)	ORIFICE DIFF. PRESS. (in)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP			SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
			(°F)	(T _s) (°R)				IN (°F)	AVG (T _m) (°R)	OUT (°F)		
1	2.0	-6.5	385		9.0	2.41	335.917	107		104	267	67
2	2.5	-7.0	384		1.5	3.09		107		104	260	65
3	3.0	-8.5	384		1.5	4.02		108		107	266	65
4	2.5	-10.0	387		1.7	4.95		108		105	267	71
5	1.0	-11.0	385		1.8	4.83		107		107	269	75
6	12.5	-11.0	382		1.8	4.85		107		104	266	78
7	12.0	-11.0	384		1.7	4.72		107		104	268	74
8	20.0	-12.0	377		1.75	4.64		108		107	268	75
9	2.0	-13.0	380		1.55	4.19		108		107	269	75
10	2.5	-14.0	381		1.6	2.59		108		104	262	69
11	2.5	-8.0	380		1.68	1.81	363.475	108		105	263	68
12												
$\Delta H = 3.74$												
$T_{PSIB} = 33.896$												
$C_w F = 53.712$												
$T = 106$												

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE EIKELSON		DATE 18 July 88		RUN NUMBER 3	
BUILDING NUMBER CH & PP			SOURCE NUMBER BEILER 3		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	0.7544	0.2851	0.4693		
ACETONE WASHINGS (Probe, Front Half Filter)	99.2870 0.7	98.7231	0.5639		
BACK HALF (If needed)					
Total Weight of Particulates Collected			1.0332 gm		
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	140	100	40		
IMPINGER 2 (H2O)	144	100	44		
IMPINGER 3 (Dry)	12	0	12		
IMPINGER 4 (Silica Gel)	333.4	300	33.4		
Total Weight of Water Collected			129.4 gm		
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	10.6	10.6	10.2		10.1
VOL % O ₂	9.4	9.4	9.6		9.5
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

(Stack Geometry)

GEHL 15

[illegible]

NOZZLE CALIBRATION DATA FORM

Date 18 July

Calibrated by 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.)		
125	0.250	0.250	0.251	0.001	0.250

where:

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

^b AD = maximum difference between any two diameters, mm (in.),
AD < {0.10 mm} 0.004 in.

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

Quality Assurance Handbook HS-2.6

VISIBLE EMISSION OBSERVATION FORM

No.

COMPANY NAME FIELSON AFB		
STREET ADDRESS		
CITY	STATE AK	ZIP
PHONE (KEY CONTACT)	SOURCE ID NUMBER BOILER #3	

PROCESS EQUIPMENT COAL-FIRED BOILER	OPERATING MODE 100,000 lb/hr
CONTROL EQUIPMENT MULTICLONES	OPERATING MODE

DESCRIBE EMISSION POINT TAPERED STEEL STACK	
HEIGHT ABOVE GROUND LEVEL 14	HEIGHT RELATIVE TO OBSERVER Start 14 End SAME
DISTANCE FROM OBSERVER Start 90' End SAME	DIRECTION FROM OBSERVER Start NW End SAME

DESCRIBE EMISSIONS VERTICAL PLUME - ALMOST INVIS.	
Start	End
EMISSION COLOR Start LT BROWN End SAME	IF WATER DROPLET PLUME Attached ☒ N/A Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 2-5' ABOVE STACK End SAME	

DESCRIBE PLUME BACKGROUND	
Start 14727	End
BACKGROUND COLOR Start SKY BLUE End SAME	SKY CONDITIONS Start SCATTERED End SAME
WIND SPEED Start CALM End SAME	WIND DIRECTION Start SE End SAME
AMBIENT TEMP Start 78 End SAME	WET BULB TEMP RH percent

Stack with Plume	SOURCE LAYOUT SKETCH
Sun	
Wind	

ADDITIONAL INFORMATION

OBSERVATION DATE 18 JUL 88					START TIME 1303	END TIME 1313
SEC	0	15	30	45	COMMENTS	
MIN						
1	5	5	5	5	PLUME ALMOST	
2	5	5	5	5	NEARSTANT ABOUT	
3	5	5	5	5	30' ABOVE STACK	
4	5	5	5	5		
5	5	5	5	5	RUNS 2+3	
6	5	5	5	5	REMAINED THE	
7	5	5	5	5	SAME	
8	5	5	5	5		
9	5	5	5	5		
10	5	5	5	5		
11						
12						
13						
14						
15						
16						
17						
18						
19						
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22						
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25						
26						
27						
28						
29						
30						

OBSERVER'S NAME (PRINT)	
OBSERVER'S SIGNATURE	DATE
ORGANIZATION	
CERTIFIED BY	DATE

CONTINUED ON VES FORM NUMBER	
------------------------------	--

VISIBLE EMISSION OBSERVATION FORM

No.

COMPANY NAME		
STREET ADDRESS		
CITY	STATE	ZIP
PHONE (KEY CONTACT)	SOURCE ID NUMBER BILAR NUMBER 3	

PROCESS EQUIPMENT COAL FIRED BOILER	OPERATING MODE 100% ON 60/40
CONTROL EQUIPMENT MULTIPLANE	OPERATING MODE 4" H ₂ O

DESCRIBE EMISSION PLANT THREE INCH STEEL STACK	
HEIGHT ABOVE GROUND LEVEL 14	HEIGHT RELATIVE TO OBSERVER Start End
DISTANCE FROM OBSERVER Start End	DIRECTION FROM OBSERVER Start End

DESCRIBE EMISSIONS	
Start End	IF WATER DROPLET PLUME
Start End	Analyzed Detected
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED	
Start End	

DESCRIBE PLUME BACKGROUND	
Start End	SKY CONDITIONS
Start End	WIND DIRECTION
Start End	WIND SPEED
Start End	WET BULB TEMP
Start End	Humidity percent

Sketch of Plant	SOURCE LOCATION SKETCH	Draw North Arrow

ADDITIONAL INFORMATION

OBSERVATION DATE		START TIME				END TIME
15 JULY 85		1923				1936
SEC	0	15	30	45	COMMENTS	
1	5	5	5	5	SOOT BLOW	
2	5	5	5	5	RUN #3	
3	5	5	5	5		
4	5	5	5	5	STACK CAPACITY	
5	5	5	5	5	READ MOCM RECT	
6	5	5	5	5		
7	5	25	45	60		
8	70	100	80	75		
9	80	10	15	5		
10	5	5	5	10		
11	15	15	15	20		
12	50	10	15	15		
13	5	5	5	5		
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

OBSERVER'S NAME (PRINT)	
OBSERVER'S SIGNATURE	DATE
ORGANIZATION	
CERTIFIED BY	DATE
CONTINUED ON VEO FORM NUMBER	

APPENDIX H

Boiler 3, Field Data, 100,000 lbs/hr, 19 July 88

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$\Delta H_Q = 2.07$

PARTICULATE SAMPLING DATA SHEET

1 of 2

RUN NUMBER		ONE A		SCHEMATIC OF STACK CROSS SECTION		EQUATIONS		AMBIENT TEMP	
DATE		19 July 88		③ ③ ③ ③ PreLeak ck good at 15 min w/ 15 min $\Delta P_{static} = -1.05$ 90,000 cfm		$\Delta R = \Delta P + 460$		STATION PRESS	
PLANT		CHIPP Bulker #1				HEATER BOX TEMP			
BASE		Eielson		PROBE HEATER SETTING		PROBE LENGTH		IMPIINGER OUTLET TEMP	
SAMPLE BOX NUMBER		2010 NUTEC H		VELOCITY HEAD (Vp)		GAS METER TEMP		SAMPLE BOX TEMP	
METER BOX NUMBER				STACK TEMP		IN		OUT	
Qw/Qm				(°F)		(°F)		(°F)	
Co				(°R)		(°F)		(°F)	
TRAVERSE POINT NUMBER		SAMPLING TIME (min)		STATIC PRESSURE (in. Hg)		ORIFICE DIFF. PRESS. (in. Hg)		GAS SAMPLE VOLUME (cu ft)	
1		0		-3.0		2.64		362.343	
2		25		-3.5		3.03		103	
3		50		-5.0		4.02		103	
4		75		-5.5		4.43		103	
5		100		-6.0		4.43		104	
6		125		-6.5		4.43		104	
7		150		-7.0		4.43		104	
8		175		-7.5		4.43		104	
9		200		-8.0		4.43		105	
10		225		-8.5		4.43		105	
11		250		-9.0		4.43		106	
12		275		-9.5		4.43		107	

start time 1307

PARTICULATE SAMPLING DATA SHEET												
SCHEMATIC OF STACK CROSS SECTION												
EQUATIONS												
$^{\circ}R = ^{\circ}F + 460$ $H = \left[\frac{5130 \cdot F \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m}{T_s} \cdot V_p$												
RUN NUMBER: 01E B DATE: 19 July 88 PLANT: CHCOP Bldg #3 BASE: Eickson SAMPLE BOX NUMBER: 2010 METER BOX NUMBER: Qw/Qm: Co:												
Post Lock ck good at 12:10 p.m. 90,000 lb/hr stop time 1410												
TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H ₂ O) / lb	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)	(T _s) (°R)				IN (°F)	AVG (T _m) (°R)	OUT (°F)		
1	0	-4.5	376		0.59	1.65	388.714	110		108	254	71
2	25	-5.2	378		0.74	2.07		110		108	253	71
3	50	-6.6	380		0.90	2.68		111		108	254	70
4	75	-8.0	380		1.35	3.77		112		108	254	70
5	100	-8.6	380		1.60	4.48		113		108	254	71
6	125	-9.0	381		1.60	4.48		114		109	254	72
7	150	-10.0	382		1.55	4.33		114		109	254	74
8	175	-10.0	380		1.55	4.34		114		109	250	78
9	200	-10.0	380		1.50	4.70		114		109	251	85
10	225	-10.0	381		1.45	4.06		114		109	251	86
11	250	-10.7	382		1.05	2.94		116		110	254	81
12	275	-7.0	381		0.77	2.11	915.085	116		110	254	82
$\bar{T}_g = 109$ $\bar{T}_s = 380$ $\Delta H = 3.37$ $\bar{V}_{S13} = 31683$ $CUPI = 52.57$												

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE <i>Eickson AFB</i>		DATE <i>19 July 99</i>		RUN NUMBER <i>#1</i>	
BUILDING NUMBER <i>6203</i>			SOURCE NUMBER <i>Boiler #3</i>		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	<i>Ø.48ØØ</i>	<i>.2878</i> <i>0.28569</i>	<i>0.1922</i>		
ACETONE WASHINGS (Probe, Front Half Filter)	<i>107.5895</i>	<i>107.4366</i>	<i>0.1529</i>		
BACK HALF (if needed)					
			Total Weight of Particulates Collected <i>0.3451 gm</i>		
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	<i>138</i>	<i>100mls</i>	<i>38</i>		
IMPINGER 2 (H2O)	<i>132mls</i>	<i>100mls</i>	<i>32</i>		
IMPINGER 3 (Dry)	<i>8.4</i>	<i>0</i>	<i>8.4</i>		
IMPINGER 4 (Silica Gel)	<i>323.9</i>	<i>300g</i>	<i>23.9</i>		
			Total Weight of Water Collected <i>102.3 gm</i>		
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	<i>8.6</i>	<i>8.4</i>	<i>8.6</i>		<i>8.5</i>
VOL % O ₂	<i>11</i>	<i>11</i>	<i>10.6</i>		<i>10.9</i>
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

PARTICULATE SAMPLING DATA SHEET

(cont) 2 of 2

SCHEMATIC OF STACK CROSS SECTION

Q₁ Q₂ Q₃ Q₄ Q₅ Q₆ Q₇ Q₈ Q₉ Q₁₀ Q₁₁ Q₁₂

Post leak check
good @ 20" Hg

96,100 W/h

Send blow at 1512
(point 15)

STATION PRESS	29.628	in Hg
HEATER BOX TEMP		°F
PROBE HEATER SETTING		°F
PROBE LENGTH	72	in
NOZZLE AREA	25	sq ft
Cp	0.84	
DRY GAS FRACTION (F _d)		

AMBIENT TEMP		°F
STATION PRESS	29.628	in Hg
HEATER BOX TEMP		°F
PROBE HEATER SETTING		°F
PROBE LENGTH	72	in
NOZZLE AREA	25	sq ft
Cp	0.84	
DRY GAS FRACTION (F _d)		

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 METER TEMP (°F)	IN (°F)	OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
B1	0	9.0	378		1.00	2.81	441.100		113	112	246	73
2	2.5	-14.8	380		1.20	3.37			113	112	246	75
3	5.0	-19.8	381		1.40	3.93			114	112	246	76
4	7.5	-19.5	382		1.60	4.49			115	113	246	73
5	10.0	-20.4	379		1.53	4.35			113	111	246	69
6	12.5	-20.4	379		1.60	4.52			113	111	246	69
7	15.0	-20.0	376		1.53	4.35			110	110	246	68
8	17.5	-20.4	377		1.55	4.35			111	110	246	68
9	20.0	-19.6	378		1.50	4.20			109	108	246	67
10	22.5	-19.6	376		1.40	3.92			109	108	246	70
11	25.0	-19.8	372		0.91	2.55			107	108	246	67
12	27.5	-19.8	373		0.79	2.21	467.36		108	108	246	67
T _m	112											
T _s	329											
ΔH	3.60											
10513	32.470A											
MAKRE	10.52.259											

step time 1533

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE <i>Eielson AFB</i>		DATE <i>19 July 86</i>		RUN NUMBER <i>#2</i>	
BUILDING NUMBER <i>6203</i>		SOURCE NUMBER <i>Boiler #3</i>			
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	<i>0.6374</i>	<i>0.2839g</i>	<i>0.3531</i>		
ACETONE WASHINGS (Probe, Front Half Filter)	<i>100.0338</i>	<i>99.6269</i>	<i>0.4069</i>		
BACK HALF (if needed)					
		Total Weight of Particulates Collected		<i>.7600 gm</i>	
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	<i>200</i>	<i>100 ml</i>	<i>100</i>		
IMPINGER 2 (H2O)	<i>60</i>	<i>100 ml</i>	<i>-40</i>		
IMPINGER 3 (Dry)	<i>8.4</i>	<i>0</i>	<i>5.4</i>		
IMPINGER 4 (Silica Gel)	<i>322.5</i>	<i>300</i>	<i>22.5</i>		
		Total Weight of Water Collected		<i>83.9 gm</i>	
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	<i>9.1</i>	<i>9.6</i>	<i>9.6</i>		<i>9.5</i>
VOL % O ₂	<i>10</i>	<i>12</i>	<i>15</i>		<i>9.9</i>
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

2501

[illegible]

PARTICULATE SAMPLING DATA SHEET

(cont) 2 of 2

RUN NUMBER THREE B		SCHEMATIC OF STACK CROSS SECTION 		EQUATIONS $\text{OR} = \text{OR} + 460$ $H = \left[\frac{5130 \cdot F \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m \cdot V_p}{T_a}$		AMBIENT TEMP 79	
DATE 19 July 88						STATION PRESS 29.628	
PLANT CHOPP Bldg. #3						HEATER BOX TEMP 	
BASE Kielson						PROBE HEATER SETTING 	
SAMPLE BOX NUMBER 2010						PROBE LENGTH 72	
METER BOX NUMBER 						NOZZLE AREA (A) 	
Qw/Qm 						Cp 0.84	
Co 						DRY GAS FRACTION (Fg) 	

Post leak dr at 6:11"

90,000 lb/hr

step time 4.59

TRAVERSE POINT NUMBER	SAMPLING TIME (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) (°F)				IN (°F)	AVG (Tm) (°F)	OUT (°F)		
1	0	3.5	375		.42	1.18	499.693	110		107	251	69
2	2.5	4.5	375		.62	1.74		106		107	250	67
3	5.0	6	375		.96	2.89		104		106	251	64
4	7.5	8	376		1.4	3.91		104		106	249	65
5	10.0	8	380		1.55	4.32		110		106	242	66
6	12.5	8.5	379		1.55	4.32		110		106	249	67
7	15.0	9	380		1.55	4.32		104		106	240	69
8	17.5	9	380		1.55	4.31		104		105	249	71
9	20.0	9.5	380		1.45	4.03		108		105	247	67
10	22.5	9.5	378		1.4	3.90		108		105	246	66
11	25.0	7.5	379		.85	2.36		108		104	246	68
12	27.5	6	378		.58	1.06	520.066	107		104	248	68
Tm = 108 Ts = 378 ΔH = 3.41 VpTs = 31.4201 Cu Ft = 52.496												

AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE <i>Eielson AFB</i>		DATE <i>19 July 65</i>		RUN NUMBER <i>43</i>	
BUILDING NUMBER <i>6203</i>			SOURCE NUMBER		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	<i>.4823</i>	<i>0.2853</i>	<i>0.1970</i>		
ACETONE WASHINGS (Probe, Front Half Filter)	<i>98.9072</i>	<i>98.7231</i>	<i>0.1841</i>		
BACK HALF (if needed)					
Total Weight of Particulates Collected			<i>0.3811 gm</i>		
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	<i>146</i> 246	<i>100 ml</i>	<i>46.0</i>		
IMPINGER 2 (H2O)	<i>131</i> 231	<i>100 ml</i>	<i>31.0</i>		
IMPINGER 3 (Dry)	21 <i>7.0</i>	<i>0</i>	<i>7.0</i>		
IMPINGER 4 (Silica Gel)	23.6 32.5	<i>300g</i>	<i>23.6</i>		
Total Weight of Water Collected			<i>107.6 gm</i>		
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	<i>7.2</i>	<i>7.2</i>	<i>7.4</i>		<i>7.3</i>
VOL % O ₂	<i>12</i>	<i>12.2</i>	<i>12.2</i>		<i>12.3</i>
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

(Stack Geometry)

DEHL FORM 15
APR 76

(Velocity and Temperature Traverse)

BASE

Eielson AFB

DATE

19 July 88

BOILER NUMBER

#3

INSIDE STACK DIAMETER

52.5

Inches

STATION PRESSURE

29.628

In Hg

STACK STATIC PRESSURE

-1.05

In H₂O

SAMPLING TEAM

DEHL/ECG

Garrison Scott, Foreign Schoolmaster

TRAVERSE POINT NUMBER	VELOCITY HEAD, V_p IN H ₂ O	V_p	STACK TEMPERATURE (°F)
one	0.78		374
two	0.88		375
three	1.10		376
four	1.15		378
five	1.20		382
six	1.20		382
seven	1.20		382
eight	1.20		382
nine	1.20		382
ten	1.05		381
eleven	0.84		380
twelve	0.71		380
OPERATING at 90,000			
wet - 3.3			
+ 1.2			
FPS = 72.4			
$\Delta P = 1.04$			
$\bar{T}_s = 380$			
noz dia = 0.2364			
AVERAGE			

NOZZLE CALIBRATION DATA FORM

Date 19 JUL 1 Calibrated by 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.)		
0.25	0.251	0.250	0.250	0.001	0.250

where:

^a $D_{1,2,3}$ = three different nozzle 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 .

Quality Assurance Handbook MB-2.6

VISIBLE EMISSION OBSERVATION FORM

No

COMPANY NAME EIELSON AFB		
STREET ADDRESS		
CITY	STATE AK	ZIP
PHONE (KEY CONTACT)	SOURCE ID NUMBER BOILER # 3	

PROCESS EQUIPMENT COAL-FIRED BOILER	OPERATING MODE 90,000 lb/hr
CONTROL EQUIPMENT MULTIPLANE	OPERATING MODE

DESCRIBE EMISSION POINT TAPERED STEEL STACK	
HEIGHT ABOVE GROUND LEVEL 14	HEIGHT RELATIVE TO OBSERVER Start 14 End
DISTANCE FROM OBSERVER Start 90' End SAME	DIRECTION FROM OBSERVER Start NW End SAME

DESCRIBE EMISSIONS VERTICAL PLUME ABOVE STACK	
Start CUNNING	End SAME
EMISSION COLOR Start LT. BROWN End SAME	IF WATER DROPLET PLUME Attached ☒ N/A Detached ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 2-5' ABOVE STACK End SAME	

DESCRIBE PLUME BACKGROUND	
Start HAZY	End
BACKGROUND COLOR Start SKY BLUE End SAME	SKY CONDITIONS Start SCATTERED End
WIND SPEED Start 14 MPH End	WIND DIRECTION Start VAR End
AMBIENT TEMP Start 82 End	WET BULB TEMP RH percent

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

ADDITIONAL INFORMATION

OBSERVATION DATE 19 JUL 88		START TIME				END TIME
MIN	SEC	0	15	30	45	COMMENTS
1	5	5	5	5	5	OPACITY READ
2	5	5	5	5	5	FROM RECF.
3	5	5	5	5	5	
4	5	5	5	5	5	PLUME ALMOST
5	5	5	5	5	5	INVISIBLE.
6	5	5	5	5	5	
7	5	5	5	5	5	ALL PLUME EXISTING
8	5	5	5	5	5	SHINE OPACITY
9	5	5	5	5	5	
10	5	5	5	5	5	
11						
12						
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OBSERVER'S NAME (PRINT)	
OBSERVER'S SIGNATURE	DATE
ORGANIZATION	
CERTIFIED BY	DATE
CONTINUED ON VEO FORM NUMBER	

VISIBLE EMISSION OBSERVATION FORM

No.

COMPANY NAME EKLSON AF13		
STREET ADDRESS		
CITY	STATE AK	ZIP
PHONE (KEY CONTACT)	SOURCE ID NUMBER BOILER #3	

PROCESS EQUIPMENT COAL-FIRED BOILER	OPERATING MODE 90,000 lb/hr
CONTROL EQUIPMENT MULTICONE	OPERATING MODE

DESCRIBE EMISSION POINT	
HEIGHT ABOVE GROUND LEVEL 14'	HEIGHT RELATIVE TO OBSERVER Start 14' End SAME
START FROM OBSERVER Start 90 End SAME	START FROM OBSERVER Start 14' End SAME

DESCRIBE EMISSIONS VERTICLE PLUME 5' ABOVE STACK	
Start CONVING	End
EMISSION COLOR Start LT BROWN End SAME	IF WATER DROPLET PLUME Attached N/A Detached
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 2-5' ABOVE STACK End SAME	

DESCRIBE PLUME BACKGROUND	
Start Hazy	End
BACKGROUND COLOR	SKY CONDITIONS
Start End	Start End
WIND SPEED	WIND DIRECTION
Start CalM End	Start VAR. End
AMBIENT TEMP	WET BULB TEMP RH percent
Start End	

Stack with Plume	SOURCE LAYOUT SKETCH
Sun	
Wind	

ADDITIONAL INFORMATION

OBSERVATION DATE 19 JULY 88		START TIME		END TIME	COMMENTS
SEC	MIN	0	15	30	
1	5	5	5	5	SOOT BLOW RUN #2
2	10	5	5	5	
3	5	5	5	5	
4	5	5	5	5	
5	10	15	25	45	
6	40	30	5	5	
7	5	5	40	40	
8	70	75	60	15	
9	10	5	5	5	
10	5	5	5	5	
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

OBSERVER'S NAME (PRINT)	DATE
OBSERVER'S SIGNATURE	DATE
ORGANIZATION	
CERTIFIED BY	DATE

CONTINUED ON VEO FORM NUMBER	
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APPENDIX I

Boiler 3, Field Data, 100,000, 20 July 88

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PARTICULATE SAMPLING DATA SHEET												
SCHEMATIC OF STACK CROSS SECTION				EQUATIONS		GAS METER TEMP						
RUN NUMBER: <u>11 A</u> DATE: <u>20 JUL 88</u> PLANT: <u>1</u> BASE: <u>1125C</u> SAMPLE BOX NUMBER: <u>250</u> METER BOX NUMBER: <u>84</u> CO: <u>1125C</u>				$OR = OF + 460$ $H = \left[\frac{5130 \cdot F \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{I_m}{I_s} \cdot V_p$		AMBIENT TEMP: <u>70</u> OF STATION PRESS: <u>29.245</u> in Hg HEATER BOX TEMP: <u>72</u> OF PROBE HEATER SETTING: <u>72</u> OF PROBE LENGTH: <u>250</u> in NOZZLE AREA (A): <u>84</u> sq ft CP: <u>1125C</u> DRY GAS FRACTION (FG): <u>1125C</u>						
TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H ₂ O)	STACK TEMP (°F)	STACK TEMP (°F)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (F)	GAS SAMPLE VOLUME (cu ft)	IN (°F)	AVG (Im) (°F)	OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	0.5	3.4	371	371	0.52	1.47	520.285	91	91	91	243	72
2	0.5	3.4	374	374	0.54	1.75		92	92	92	240	70
3	0.5	3.4	374	374	0.54	2.45		92	92	92	243	66
4	0.5	3.4	374	374	1.3	3.57		94	94	94	246	67
5	0.5	3.4	374	374	1.3	3.87		95	95	95	247	66
6	0.5	3.4	374	374	1.4	3.87		97	97	97	243	69
7	0.5	3.4	374	374	1.4	3.87		98	98	98	243	71
8	0.5	3.4	374	374	1.3	3.63		99	99	99	245	70
9	0.5	3.4	374	374	1.35	3.98		99	99	99	247	69
10	0.5	3.4	374	374	0.95	2.66		99	99	99	249	70
11	0.5	3.4	374	374	0.72	2.61		101	101	101	249	70
12	0.5	3.4	374	374	0.72	2.61		101	101	101	249	70

PARTICULATE SAMPLING DATA SHEET												
SCHEMATIC OF STACK CROSS SECTION				EQUATIONS								
				$OR = OF + 460$ $H = \left[\frac{5130 \cdot F \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m \cdot V_p}{T_s}$								
RUN NUMBER	A1 B											
DATE	2/1/82											
PLANT	Coke											
BASE	Coke											
SAMPLE BOX NUMBER	1000											
METER BOX NUMBER												
Q _{gas} (cfm)												
C _d												
				step time 125 s								
TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H ₂ O)	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)	(T _s) (°R)				IN (°F)	AVG (T _m) (°R)	OUT (°F)		
1	2.5	-5.2	370		0.17	2.74	545.095	110		102	250	69
2	2.5	-7.4	371		1.10	3.91		110		102	250	65
3	5.4	-8.5	370		1.00	3.73		110		102	249	67
4	2.5	-9.0	371		1.54	4.21		112		104	251	68
5	1.5	-9.5	375		1.5	4.21		112		105	254	64
6	1.5	-10.8	370		1.5	4.20		113		105	252	64
7	1.5	-11.3	372		1.9	3.49		113		103	250	64
8	1.5	-11.8	371		1.9	3.43		112		103	251	65
9	2.5	-14.2	370		1.45	3.47		112		103	250	66
10	2.5	-14.8	374		1.16	3.49		112		105	250	67
11	2.5	-17.4	373		0.61	1.72		112		106	254	64
12	2.5	-16.4	371		0.36	1.02	570.494	113		106	254	64
T _m = 16.4 T _s = 373 A _H = 3.19 F _{PS} = 30.4434 V _{OL} = 49.809												

AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE Eielson		DATE 20 July 88		RUN NUMBER one	
BUILDING NUMBER CH&PP.			SOURCE NUMBER Boiler #3		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	0.4496	0.2871	0.1625		
ACETONE WASHINGS (Probe, Front Hall Filter)	107.6335	107.4366	0.1969		
BACK HALF (if needed)					
			Total Weight of Particulates Collected		.3594 gm
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H ₂ O)	174	100	74.0		
IMPINGER 2 (H ₂ O)	129	100	29.0		
IMPINGER 3 (Dry)	3.2		3.2		
IMPINGER 4 (Silica Gel)	311.7	300	11.7		
			Total Weight of Water Collected		117.9 gm
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	9.6	9.6	9.8		9.7
VOL % O ₂	9.4	9.2	9.2		9.3
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

PARTICULATE SAMPLING DATA SHEET												
RUN NUMBER		SCHEMATIC OF STACK CROSS SECTION				EQUATIONS			AMBIENT TEMP			
# 2						$OR = OF + 460$ $H = \left[\frac{5130 \cdot F \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m \cdot V_p}{T_s}$			STATION PRESS 27.238			
DATE 20 July 88									HEATER BOX TEMP			
PLANT 14 DD									PROBE HEATER SETTING			
BASE Carlson									PROBE LENGTH			
SAMPLE BOX NUMBER 2010									NOZZLE AREA (A) .25			
METER BOX NUMBER									Cp .84			
Qw/Qm									DRY GAS FRACTION (Fd)			
Co												
TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H2O)	STACK TEMP (°F)	STACK TEMP (Ts) (°R)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (in)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP IN (°F)	GAS METER TEMP AVG (Tm) (°R)	OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	0	-7.8	374		0.87	2.44	511.240	106		104	242	74
2	2.5	-9.4	372		1.16	3.68		106		104	246	76
3	5.0	-13.0	372		1.35	3.78		106		104	248	68
4	7.5	-17.4	374		1.41	3.91		108		104	251	78
5	10.0	-17.4	374		1.45	4.66		109		104	252	81
6	12.5	-17.4	373		1.48	3.72		110		104	252	83
7	15.0	-17.4	374		1.35	3.26		104		104	254	79
8	17.5	-18.4	374		1.4	3.43		111		104	256	83
9	20.0	-19.4	374		1.4	3.94		112		104	256	85
10	22.5	-16.4	374		1.2	3.35		106		104	256	85
11	25.0	-8.4	374		0.76	1.95		106		104	254	87
12	27.5	-8.0	373		0.62	1.73		106		104	254	87

start time 1237

Probe located at 15 in Hg
96,000 lb/hr

PARTICULATE SAMPLING DATA SHEET

RUN NUMBER #2 B		SCHEMATIC OF STACK CROSS SECTION		EQUATIONS		AMBIENT TEMP					
DATE 20 July 88		Post work done at 22 mi/h 90,000 w/h		$H = \left[\frac{5130 \cdot F \cdot A \cdot C_p \cdot A}{C_o} \right]^2 \cdot \frac{T_m}{T_a} \cdot V_p$		$^{\circ}R = ^{\circ}F + 460$					
PLANT LUPP						STATION PRESS 29.238		in Hg			
BASE Beltline						HEATER BOX TEMP		of			
SAMPLE BOX NUMBER 1016						PROBE HEATER SETTING					
METER BOX NUMBER						PROBE LENGTH 72		in			
Q _w , Q _m				NOZZLE AREA (A) 1.25		sq ft					
C _p				C _p 84							
C _o				DRY GAS FRACTION (Fd)							
				STEP TIME 1338							
TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H ₂ O)	STACK TEMP		VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (in)	GAS SAMPLE VOLUME (cu ft)	GAS METER TEMP		SAMPLE BOX TEMP (°F)	IMPIPING OUTLET TEMP (°F)
			(°F)	(T _s) (°R)				IN (°F)	OUT (°F)		
1	0	-6.5	370		0.48	1.35	577.407	106	106	250	74
2	2.5	-8.4	371		0.69	1.93		106	104	250	71
3	5.0	-10.0	373		0.91	2.57		107	104	251	72
4	7.5	-13.4	374		1.15	3.21		108	105	246	70
5	10.0	-17.0	376		1.35	3.77		110	105	246	71
6	12.5	-17.0	375		1.35	3.75		111	106	244	73
7	15.0	-14.5	374		1.30	3.63		111	105	240	78
8	17.5	-11.5	375		1.50	3.63		111	107	247	79
9	20.0	-10.5	375		1.2	3.65		111	108	247	79
10	22.5	-14.5	374		0.84	3.37		111	108	247	80
11	25.0	-17.5	374		0.84	2.36		111	108	249	75
12	27.5		374		0.69	1.94	622.015	111	108	249	76
T _m = 107											
T _s = 373											
ΔH = 3.13											
VPSIS = 30.1997											
VOC = 50.775											

AIR POLLUTION PARTICULATE ANALYTICAL DATA

BASE Eielson AFB		DATE 20 July 88		RUN NUMBER Two	
BUILDING NUMBER CHETP			SOURCE NUMBER Boiler # 3		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	0.4456	.2851	.1605		
ACETONE WASHINGS (Probe, Front Half Filter)	99.7448	99.6269	.1229		
BACK HALF (if needed)					
		Total Weight of Particulates Collected		.2834 gm	
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	152	100	52.0		
IMPINGER 2 (H2O)	120	100	20.0		
IMPINGER 3 (Dry)	7.5	0	7.5		
IMPINGER 4 (Silica Gel)	336.1	300	36.1		
		115.6 Total Weight of Water Collected		115.6 gm	
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	15.2	15.4	14.2		14.3
VOL % O ₂	9.0	8.8	9.0		8.9
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

PARTICULATE SAMPLING DATA SHEET

FORM 10
CEN
C

PARTICULATE SAMPLING DATA SHEET

SCHEMATIC OF STACK CROSS SECTION				EQUATIONS				AMBIENT TEMP				
RUN NUMBER	DATE	PLANT	BASE	$OR = 9F + 460$ $H = \left[\frac{5130 \cdot F \cdot Cp \cdot A}{Co} \right]^2 \cdot \frac{Tm}{Ts} \cdot Vp$	STATION PRESS	HEATER BOX TEMP	PROBE HEATER SETTING	PROBE LENGTH	NOZZLE AREA (A)	Cp	DRY GAS FRACTION (F _d)	
					in Hg	°F	°F	in	sq ft			
133	1/1/78	4123	1500		27.2	27.2	72	72	1.50	1.51		
METER BOX NUMBER												
Q _w /Q _m												
Co												
TRAVERSE POINT NUMBER	SAMPLING TIME (min)	STATIC PRESSURE (in H ₂ O)	STACK TEMP (°F)	(T _s) (°F)	VELOCITY HEAD (Vp)	ORIFICE DIFF. PRESS. (in)	GAS SAMPLE VOLUME (cu ft)	IN (°F)	AVG (T _m) (°F)	OUT (°F)	SAMPLE BOX TEMP (°F)	IMPINGER OUTLET TEMP (°F)
1	1.0	-5.5	372		0.45	2.68	646.728	111		112	245	68
2	2.5	-6.4	372		1.85	2.96		111		108	247	68
3	5.0	-7.4	375		1.25	3.51		112		112	248	68
4	7.5	-8.4	373		1.45	2.10		113		108	248	59
5	10.0	-8.4	373		1.45	4.00		113		108	248	59
6	12.5	-8.4	372		1.46	5.11		113		108	247	59
7	15.0	-8.4	371		1.35	2.42		113		108	249	60
8	17.5	-8.5	371		1.35	3.81		112		108	246	61
9	20.0	-9.4	371		1.35	3.81		112		108	246	61
10	22.5	-9.4	374		1.35	3.53		112		108	248	64
11	25.0	-7.5	371		0.74	2.66		113		108	248	65
12	27.5	-7.4	371		0.75	2.12	673.505	112		108	248	66
T _m = 110												
T _s = 372												
ΔH = 3.19												
VOL = 512.5												

AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE <i>Eielsm</i>		DATE <i>20 July 88</i>		RUN NUMBER <i>THREE</i>	
BUILDING NUMBER <i>CHSPP</i>			SOURCE NUMBER <i>Boiler #3</i>		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	<i>0.4883</i>	<i>.2858</i>	<i>.2025</i>		
ACETONE WASHINGS (Probe, Front Half Filter)	<i>98.9511</i>	<i>98.7231</i>	<i>.2280</i>		
BACK HALF (If needed)			<i>.2280</i>		
		Total Weight of Particulates Collected		<i>5.4305 gm</i>	
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H2O)	<i>122 ml</i>	<i>0</i>	<i>22.0</i>		
IMPINGER 2 (H2O)	<i>172 ml</i>	<i>0</i>	<i>72.0</i>		
IMPINGER 3 (Dry)	<i>4.6</i>	<i>0</i>	<i>4.6</i>		
IMPINGER 4 (Silica Gel)	<i>316</i>	<i>300</i>	<i>16.0</i>		
		Total Weight of Water Collected		<i>114.6 gm</i>	
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂	<i>16.2</i>	<i>15.4</i>	<i>15.3</i>	<i>15.3</i>	<i>15.3</i>
VOL % O ₂	<i>6.2</i>	<i>5.4</i>	<i>5.3</i>	<i>5.3</i>	<i>5.3</i>
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

BASE Eielson AFB		PLANT CH & PP	
DATE 14-20 July		SAMPLING TEAM ECQ	
SOURCE TYPE AND NAME			
SOURCE NUMBER Boilers #2, #3		INSIDE STACK DIAMETER 52.5 Inches	
RELATED CAPACITY 10		TYPE FUEL Coal	
DISTANCE FROM OUTSIDE OF NIPPLE TO INSIDE DIAMETER 1.5 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			2.6
2			5.0
3			7.7
4			10.8
5			14.6
6			20.2
7			35.3
8			40.9
9			44.7
10			47.8
11			50.5
12			52.9

PRELIMINARY SURVEY DATA SHEET NO. 2 (Velocity and Temperature Traverse)			
BASE Eielson AFB		DATE 20 July 88	
BOILER NUMBER Boiler #3			
INSIDE STACK DIAMETER 52.5		Inches	
STATION PRESSURE 29.245		In Hg	
STACK STATIC PRESSURE -1.1		In H ₂ O	
SAMPLING TEAM ECQ Air Function			
TRAVERSE POINT NUMBER	VELOCITY HEAD, V _p IN H ₂ O	CYCLONIC $\bar{V}_p - \alpha$	STACK TEMPERATURE (°F)
1	0.48 0.52	4°	370
2	0.59	0	371
3	0.83	0	371
4	1.2	0	372
5	1.4	1	375
6	1.4	0	377
7	1.3	0	377
8	1.2	0	377
9	1.2	0	377
10	1.1	10	377
11	0.87	0	377
12	0.77	0	376
		avg = 1.25°	
FFS = 72			
ΔD = 1.03			
T _g = 375			
avg. = 237			
AVERAGE			

NOZZLE CALIBRATION DATA FORM

Date 20 July 88 Calibrated by Scot

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.)		
.25φ	.250	.250	.251	.001	.250

where:

^aD_{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.),
 $\Delta D < (0.10 \text{ mm}) 0.004 \text{ in.}$

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

Quality Assurance Handbook 15-2.6

VISIBLE EMISSION OBSERVATION FORM

No.

COMPANY NAME KIELSON		
STREET ADDRESS		
CITY	STATE AK	ZIP
PHONE (KEY CONTACT)	SOURCE ID NUMBER EXILER # 3	

PROCESS EQUIPMENT COAL-FIRED BOILER	OPERATING MODE 90,000 lb/hr
CONTROL EQUIPMENT MANUAL	OPERATING MODE 3" H₂O

DESCRIBE EMISSION POINT	
HEIGHT ABOVE GROUND LEVEL 14	
HEIGHT RELATIVE TO OBSERVER Start 14 End	
DISTANCE FROM OBSERVER Start 90 End 500	DIRECTION FROM OBSERVER Start W End

DESCRIBE EMISSIONS NIGHT - PLUME - BARELY VISIBLE	
Start CROWN	End SHADE
EMISSION COLOR Start LT BROWN End SHADE	IF WATER DROPLET PLUME Attached: N/A Detached
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED Start 4' ABOVE STACK End SHADE	

DESCRIBE PLUME BACKGROUND	
Start Hazy	End SHADE
BACKGROUND COLOR Start SKY BLUE End SHADE	SKY CONDITIONS Start SLIGHTLY End SHADE
WIND SPEED Start CALM End SHADE	WIND DIRECTION Start LAIR End
AMBIENT TEMP Start 75 End SHADE	WET BULB TEMP RH percent

Stack with Plume	SOURCE LAYOUT SKETCH	Draw North Arrow
Sun		
Wind		

ADDITIONAL INFORMATION

OBSERVATION DATE 20 JUL 88		START TIME 1112		END TIME	
SEC	0	15	30	45	COMMENTS
MIN					
1	5	5	5	5	RUN # 1
2	5	5	5	5	
3	5	5	5	5	INCL. DROSCOT
4	5	5	5	5	
5	5	5	5	5	BROWN
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	
13	5	5	5	5	
14	5	15	30	35	} SOOT BLUE
15	35	30	25	30	
16	35	35	20	5	
17	5	5	5	5	
18					
19					H.C. LINE F. P. 10
20					
21					THE SAME C. 10
22					
23					
24					
25					
26					
27					
28					
29					
30					

OBSERVER'S NAME (PRINT)		DATE
OBSERVER'S SIGNATURE		DATE
ORGANIZATION		DATE
CERTIFICATE		DATE
CONTINUED ON VET FORM 100-1		

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APPENDIX J

Acetone Blank Results and Emissions Calculations

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ACETONE BLANK ANALYTICAL DATA FORM

Plant: CENTRAL HEAT + POWER PLANT

Location: EIELSON AFB

Date of analysis: 20 JULY 88

Density of acetone(p_a): 0.79 g/ml

Acetone blank volume(V_a): 200 ml

Acetone wash volume(V_{aw}): 400 ml *

Average gross wt: 95303.2 mg

Tare wt: 95302.1 mg

Weight of blank(m_{ab}): 1.1 mg

Acetone blank residue concentration(C_a):

$$C_a = \frac{m_{ab}}{V_a \times p_a} = \frac{1.1}{(200)(0.79)} = \underline{0.0070} \text{ mg/g}$$

Weight of residue in acetone wash(W_a):

$$W_a = C_a \times V_{aw} \times p_a = (0.007)(400)(0.79) = \underline{2.2} \text{ mg} **$$

* ALL ACETONE WASH SAMPLES BROUGHT UP TO 400 ml
 ** RESIDUE IN WASH SAMPLES INSIGNIFICANT IN EMISSION CALCULATIONS, THEREFORE NOT SUBTRACTED FROM FRONT HALF CATCH.

AIR POLLUTION PARTICULATE ANALYTICAL DATA					
BASE <i>FIELSON AFB</i>		DATE <i>20 JULY 78</i>		RUN NUMBER <i>N/A</i>	
BUILDING NUMBER <i>CH 411</i>			SOURCE NUMBER <i>200 ml. HCL/ROCK. BLANK</i>		
I. PARTICULATES					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT PARTICLES (gm)		
FILTER NUMBER	<i>N/A</i>		→		
ACETONE WASHINGS (Probe, Front Half Filter) <i>BLANK</i>	<i>95.3032</i>	<i>95.3021</i>	<i>0.0011</i>		
BACK HALF (if needed)					
			Total Weight of Particulates Collected		<i>0.0011 gm</i>
II. WATER					
ITEM	FINAL WEIGHT (gm)	INITIAL WEIGHT (gm)	WEIGHT WATER (gm)		
IMPINGER 1 (H ₂ O)					
IMPINGER 2 (H ₂ O)					
IMPINGER 3 (Dry)					
IMPINGER 4 (Silica Gel)					
			Total Weight of Water Collected		<i>gm</i>
III. GASES (Dry)					
ITEM	ANALYSIS 1	ANALYSIS 2	ANALYSIS 3	ANALYSIS 4	AVERAGE
VOL % CO ₂					
VOL % O ₂					
VOL % CO					
VOL % N ₂					
Vol % N ₂ = (100% - % CO ₂ - % O ₂ - % CO)					

BOILER 2, 14 JULY

XROM "METH 5"

RUN NUMBER

B2 R1 14 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.7000 RUN

BAR PRESS ? RUN

29.2350 RUN

METER VOL ? RUN

53.2770 RUN

MTF TEMP F? RUN

98.0000 RUN

% OTHER GAS

REMOVED BEFORE

DRY GAS METER ?

STATIC MOH IN ? RUN

-1.4500 RUN

STACK TEMP. RUN

412.0000 RUN

ML. WATER ? RUN

255.3000 RUN

IMP. % MOH = 10.3

% MOH=10.3

% CO2? RUN

13.6000 RUN

% OXYGEN? RUN

5.9000 RUN

% CO ? RUN

MOL WT OTHER? RUN

MW = 30.41

MW MET=26.14

SOP? PSTS ? RUN

32.0000 RUN

TIME MIN ? RUN

60.0000 RUN

NOZZLE DIA ? RUN

.2520 RUN

STK DIA INCH ? RUN

52.5000 RUN

% VOL MTF STI = 53.545

STY PRES ABS = 29.13

VOL MOH GAS = 12.02

% MOISTURE = 10.37

MO. DRY GAS = 0.017

% NITROGEN = 00.50

MO. WT DRY = 30.41

MO. WT MET = 26.14

VELOCITY FPS = 62.47

STACK AREA = 15.03

STACK AREA = 74.347

% STACK DSCFM = 35.793

% ISOKEMIC = 100.20

XROM "MAREFLO"

RUN NUMBER

B2 R1 14 JULY

VOL MTF STI ? RUN

53.545 RUN

STACK DSCFM ? RUN

35.793.00 RUN

FRONT 1/2 MG ? RUN

534.70 RUN

BACK 1/2 MG ? RUN

F GF/ISCF = 0.15

F MG/MM = 352.65

F LB/HF = 47.20

F KG/HF = 21.45

BOILER 3, 17JULY

XROM "METH S"

RUN NUMBER

B3 R1 17 July

METER BOX Y? RUN

1.0000 RUN

DELTA H? RUN

3.8900 RUN

BAR PRESS ? RUN

29.6200 RUN

METER VOL ? RUN

56.3230 RUN

MTF TEMP F? RUN

97.0000 RUN

2 OTHER GAS RUN

REMOVED BEFORE RUN

DRY GAS METER ? RUN

STATIC MOH IN ? RUN

-1.9000 RUN

STACK TEMP. RUN

361.0000 RUN

ML. WATER ? RUN

160.0000 RUN

INF. 2 MOH = 11.7

2 MOH=11.7

2 CO2? RUN

10.6000 RUN

2 OXYGEN? RUN

8.8000 RUN

2 CO ? RUN

MOL WT OTHER? RUN

MWD = 36.05

MW MET=28.64

SOFT PSTS ? RUN

33.8050 RUN

TIME MIN ? RUN

60.0000 RUN

NOZZLE DIA ? RUN

1.2540 RUN

STK DIA INCH ? RUN

50.5000 RUN

• VOL. MTF STI = 57.675

STI PRES REQ = 29.45

VOL. MOH GAS = 7.97

2 MOISTURE = 11.87

MOL. DRY GAS = 8.997

2 NITROGEN = 80.66

MOL. WT. DRY = 36.05

MOL. WT. MET = 28.64

VELOCITY FPS = 57.55

STACK AREA = 15.87

STACK AREA = 75.77

• STACK BSCFM = 40.170

2 ISOINETIC = 90.77

XROM "METH S"

RUN NUMBER

B3 R1 17 July

VOL. MTF STI ? RUN

57.6750 RUN

STACK BSCFM ? RUN

42.170.0000 RUN

FRONT 1/2 MOH ? RUN

760.0000 RUN

BACK 1/2 MOH ? RUN

F GR BSCF = 8.2075

F MC/MMH = 46.5657

F LB/HF = 73.5580

F KG/HF = 33.3654

XROM "METH S"

RUN NUMBER

B3 R2 17 July

METER BOX Y? RUN

1.0000 RUN

DELTA H? RUN

.5200 RUN

BAR PRESS ? RUN

29.6200 RUN

METER VOL ? RUN

30.0300 RUN

MTF TEMP F? RUN

86.0000 RUN

2 OTHER GAS RUN

REMOVED BEFORE RUN

DRY GAS METER ? RUN

STATIC MOH IN ? RUN

-1.9000 RUN

STACK TEMP. RUN

363.0000 RUN

ML. WATER ? RUN

71.7000 RUN

INF. 2 MOH = 9.8

2 MOH=9.8

2 CO2? RUN

10.6000 RUN

2 OXYGEN? RUN

8.4000 RUN

2 CO ? RUN

MOL. WT. OTHER? RUN

MWD = 36.05

MW MET=28.85

SOFT PSTS ? RUN

33.9050 RUN

TIME MIN ? RUN

72.0000 RUN

NOZZLE DIA ? RUN

1.1550 RUN

STK DIA INCH ? RUN

50.5000 RUN

• VOL. MTF STI = 31.095

STI PRES REQ = 29.45

VOL. MOH GAS = 3.77

2 MOISTURE = 9.74

MOL. DRY GAS = 8.990

2 NITROGEN = 81.06

MOL. WT. DRY = 36.05

MOL. WT. MET = 28.85

VELOCITY FPS = 93.45

STACK AREA = 15.87

STACK AREA = 75.386

• STACK BSCFM = 40.970

2 ISOINETIC = 115.47

XROM "METH S"

RUN NUMBER

B3 R3 17 July

METER BOX Y? RUN

1.0000 RUN

DELTA H? RUN

.4900 RUN

BAR PRESS ? RUN

29.6200 RUN

METER VOL ? RUN

32.3140 RUN

MTF TEMP F? RUN

86.0000 RUN

2 OTHER GAS RUN

REMOVED BEFORE RUN

DRY GAS METER ? RUN

STATIC MOH IN ? RUN

-1.9000 RUN

STACK TEMP. RUN

377.0000 RUN

ML. WATER ? RUN

82.6000 RUN

INF. 2 MOH = 10.6

2 MOH=10.6

2 CO2? RUN

10.6000 RUN

2 OXYGEN? RUN

8.4000 RUN

2 CO ? RUN

MOL. WT. OTHER? RUN

MWD = 36.05

MW MET=28.77

SOFT PSTS ? RUN

33.2150 RUN

TIME MIN ? RUN

84.0000 RUN

NOZZLE DIA ? RUN

1.1550 RUN

STK DIA INCH ? RUN

50.5000 RUN

• VOL. MTF STI = 32.329

STI PRES REQ = 29.45

VOL. MOH GAS = 7.94

2 MOISTURE = 10.56

MOL. DRY GAS = 8.994

2 NITROGEN = 81.06

MOL. WT. DRY = 36.05

MOL. WT. MET = 28.76

VELOCITY FPS = 81.45

STACK AREA = 15.87

STACK AREA = 73.895

• STACK BSCFM = 41.874

2 ISOINETIC = 114.97

XROM "METH S"

RUN NUMBER

B3 P2 17 July

VOL. MTF STI ? RUN

32.3290 RUN

STACK BSCFM ? RUN

41.874.0000 RUN

FRONT 1/2 MOH ? RUN

381.5000 RUN

BACK 1/2 MOH ? RUN

F GR BSCF = 8.134

F MC/MMH = 319.456

F LB/HF = 49.1455

F KG/HF = 22.293

BOILER 3, 18 JULY

XROM "METH 5"		XROM "METH 5"		XROM "METH 5"		XROM "METH 5"		XROM "METH 5"	
RUN NUMBER		RUN NUMBER		RUN NUMBER		RUN NUMBER		RUN NUMBER	
B3 R1 18 JULY		B3 R2 18 JULY		B3 R3 18 JULY		B3 R3 18 JULY		B3 R3 18 JULY	
METER BOX Y?	RUN	METER BOX Y?	RUN	METER BOX Y?	RUN	METER BOX Y?	RUN	METER BOX Y?	RUN
1.0770	RUN	1.0770	RUN	1.0770	RUN	1.0770	RUN	1.0770	RUN
DELTA W?	RUN	DELTA W?	RUN	DELTA W?	RUN	DELTA W?	RUN	DELTA W?	RUN
3.7300	RUN	3.4200	RUN	3.7400	RUN	3.7400	RUN	3.7400	RUN
BAR PRESS ?	RUN	BAR PRESS ?	RUN	BAR PRESS ?	RUN	BAR PRESS ?	RUN	BAR PRESS ?	RUN
29.7890	RUN	29.7890	RUN	29.7890	RUN	29.7890	RUN	29.7890	RUN
METER VOL ?	RUN	METER VOL ?	RUN	METER VOL ?	RUN	METER VOL ?	RUN	METER VOL ?	RUN
54.2510	RUN	49.5500	RUN	53.7120	RUN	53.7120	RUN	53.7120	RUN
MTR TEMP F?	RUN	MTR TEMP F?	RUN	MTR TEMP F?	RUN	MTR TEMP F?	RUN	MTR TEMP F?	RUN
103.0000	RUN	104.0000	RUN	106.0000	RUN	106.0000	RUN	106.0000	RUN
% OTHER GAS	RUN	% OTHER GAS	RUN	% OTHER GAS	RUN	% OTHER GAS	RUN	% OTHER GAS	RUN
REMOVED BEFORE	RUN	REMOVED BEFORE	RUN	REMOVED BEFORE	RUN	REMOVED BEFORE	RUN	REMOVED BEFORE	RUN
DRY GAS METER ?	RUN	DRY GAS METER ?	RUN	DRY GAS METER ?	RUN	DRY GAS METER ?	RUN	DRY GAS METER ?	RUN
STATIC MOW IN ?	RUN	STATIC MOW IN ?	RUN	STATIC MOW IN ?	RUN	STATIC MOW IN ?	RUN	STATIC MOW IN ?	RUN
-1.1000	RUN	-1.1000	RUN	-1.1000	RUN	-1.1000	RUN	-1.1000	RUN
STACK TEMP.	RUN	STACK TEMP.	RUN	STACK TEMP.	RUN	STACK TEMP.	RUN	STACK TEMP.	RUN
387.2000	RUN	386.0000	RUN	384.0000	RUN	384.0000	RUN	384.0000	RUN
ML. WATER ?	RUN	ML. WATER ?	RUN	ML. WATER ?	RUN	ML. WATER ?	RUN	ML. WATER ?	RUN
118.2000	RUN	117.4000	RUN	129.4000	RUN	129.4000	RUN	129.4000	RUN
INF. % MOW = 9.2		INF. % MOW = 9.9		INF. % MOW = 10.1		INF. % MOW = 10.1		INF. % MOW = 10.1	
% MOW=9.2		% MOW=9.9		% MOW=10.1		% MOW=10.1		% MOW=10.1	
% CO2?	RUN	% CO2?	RUN	% CO2?	RUN	% CO2?	RUN	% CO2?	RUN
9.0000	RUN	10.0000	RUN	10.1000	RUN	10.1000	RUN	10.1000	RUN
% OXYGEN?	RUN	% OXYGEN?	RUN	% OXYGEN?	RUN	% OXYGEN?	RUN	% OXYGEN?	RUN
9.6000	RUN	9.4000	RUN	9.5000	RUN	9.5000	RUN	9.5000	RUN
% CO ?	RUN	% CO ?	RUN	% CO ?	RUN	% CO ?	RUN	% CO ?	RUN
MOL WT OTHER?	RUN	MOL WT OTHER?	RUN	MOL WT OTHER?	RUN	MOL WT OTHER?	RUN	MOL WT OTHER?	RUN
MWD = 29.82		MWD = 29.90		MWD = 30.00		MWD = 30.00		MWD = 30.00	
MW MET = 26.74		MW MET = 26.74		MW MET = 26.74		MW MET = 26.74		MW MET = 26.74	
RUN NUMBER		RUN NUMBER		RUN NUMBER		RUN NUMBER		RUN NUMBER	
B3 R2 18 JULY		B3 R2 18 JULY		B3 R2 18 JULY		B3 R2 18 JULY		B3 R2 18 JULY	
METER BOX Y?	RUN	METER BOX Y?	RUN	METER BOX Y?	RUN	METER BOX Y?	RUN	METER BOX Y?	RUN
34.0274	RUN	31.0630	RUN	33.0016	RUN	33.0016	RUN	33.0016	RUN
TIME MIN ?	RUN	TIME MIN ?	RUN	TIME MIN ?	RUN	TIME MIN ?	RUN	TIME MIN ?	RUN
60.0000	RUN	60.0000	RUN	60.0000	RUN	60.0000	RUN	60.0000	RUN
NOZZLE DIA ?	RUN	NOZZLE DIA ?	RUN	NOZZLE DIA ?	RUN	NOZZLE DIA ?	RUN	NOZZLE DIA ?	RUN
.2500	RUN	.2500	RUN	.2500	RUN	.2500	RUN	.2500	RUN
STK DIA INCH ?	RUN	STK DIA INCH ?	RUN	STK DIA INCH ?	RUN	STK DIA INCH ?	RUN	STK DIA INCH ?	RUN
52.5000	RUN	52.5000	RUN	52.5000	RUN	52.5000	RUN	52.5000	RUN
* VOL MTR STD = 55.050		* VOL MTR STD = 50.160		* VOL MTR STD = 54.224		* VOL MTR STD = 54.224		* VOL MTR STD = 54.224	
STK PRES ABS = 29.71		STK PRES ABS = 29.71		STK PRES ABS = 29.71		STK PRES ABS = 29.71		STK PRES ABS = 29.71	
VOL MOW GAS = 5.56		VOL MOW GAS = 5.57		VOL MOW GAS = 6.00		VOL MOW GAS = 6.00		VOL MOW GAS = 6.00	
% MOISTURE = 9.15		% MOISTURE = 9.92		% MOISTURE = 10.10		% MOISTURE = 10.10		% MOISTURE = 10.10	
MOL DRY GAS = 0.900		MOL DRY GAS = 0.900		MOL DRY GAS = 0.900		MOL DRY GAS = 0.900		MOL DRY GAS = 0.900	
% NITROGEN = 81.40		% NITROGEN = 80.60		% NITROGEN = 80.40		% NITROGEN = 80.40		% NITROGEN = 80.40	
MOL WT DRY = 29.82		MOL WT DRY = 29.90		MOL WT DRY = 30.00		MOL WT DRY = 30.00		MOL WT DRY = 30.00	
MOL WT MET = 26.74		MOL WT MET = 26.74		MOL WT MET = 26.74		MOL WT MET = 26.74		MOL WT MET = 26.74	
VELOCITY FPS = 97.67		VELOCITY FPS = 76.24		VELOCITY FPS = 87.00		VELOCITY FPS = 87.00		VELOCITY FPS = 87.00	
STACK AREA = 15.02		STACK AREA = 15.02		STACK AREA = 15.02		STACK AREA = 15.02		STACK AREA = 15.02	
STACK ACFM = 75.471		STACK ACFM = 74.577		STACK ACFM = 74.871		STACK ACFM = 74.871		STACK ACFM = 74.871	
* STACK DSCFM = 42.394		* STACK DSCFM = 39.394		* STACK DSCFM = 41.810		* STACK DSCFM = 41.810		* STACK DSCFM = 41.810	
% ISOINETIC = 95.51		% ISOINETIC = 97.64		% ISOINETIC = 95.30		% ISOINETIC = 95.30		% ISOINETIC = 95.30	

BOILER 3, 19 JULY

XROM "METH 5"

RUN NUMBER

B3 R1 19 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.3700 RUN

BAR PRESS ? RUN

29.6280 RUN

METER VOL ? RUN

52.2720 RUN

MTR TEMP F? RUN

108.0000 RUN

% OTHER GAS RUN

REMOVED BEFORE RUN

DRY GAS METER ? RUN

STATIC HOH IN ? RUN

-1.0500 RUN

STACK TEMP. RUN

379.0000 RUN

ML. WATER ? RUN

100.3000 RUN

INF. % HOH = 8.5

% HOH = 8.5

% CO2 ? RUN

8.5000 RUN

% OXYGEN ? RUN

10.9000 RUN

% CO ? RUN

MOL WT OTHER ? RUN

MW = 29.80

MW MET = 28.80

XROM "MASSFLOW"

RUN NUMBER

B3 R2 19 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.6000 RUN

BAR PRESS ? RUN

29.6280 RUN

METER VOL ? RUN

52.2590 RUN

MTR TEMP F? RUN

112.0000 RUN

% OTHER GAS RUN

REMOVED BEFORE RUN

DRY GAS METER ? RUN

STATIC HOH IN ? RUN

-1.0500 RUN

STACK TEMP. RUN

379.0000 RUN

ML. WATER ? RUN

87.9000 RUN

INF. % HOH = 7.4

% HOH = 7.4

% CO2 ? RUN

9.5000 RUN

% OXYGEN ? RUN

9.9000 RUN

% CO ? RUN

MOL WT OTHER ? RUN

MW = 29.90

MW MET = 28.80

XROM "MASSFLOW"

RUN NUMBER

B3 R3 19 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.4100 RUN

BAR PRESS ? RUN

29.6280 RUN

METER VOL ? RUN

52.4960 RUN

MTR TEMP F? RUN

108.0000 RUN

% OTHER GAS RUN

REMOVED BEFORE RUN

DRY GAS METER ? RUN

STATIC HOH IN ? RUN

-1.0500 RUN

STACK TEMP. RUN

378.0000 RUN

ML. WATER ? RUN

107.6000 RUN

INF. % HOH = 8.8

% HOH = 8.8

% CO2 ? RUN

7.3000 RUN

% OXYGEN ? RUN

12.3000 RUN

% CO ? RUN

MOL WT OTHER ? RUN

MW = 29.60

MW MET = 28.67

XROM "MASSFLOW"

RUN NUMBER

B3 R3 19 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.4100 RUN

BAR PRESS ? RUN

29.6280 RUN

METER VOL ? RUN

52.4960 RUN

MTR TEMP F? RUN

108.0000 RUN

% OTHER GAS RUN

REMOVED BEFORE RUN

DRY GAS METER ? RUN

STATIC HOH IN ? RUN

-1.0500 RUN

STACK TEMP. RUN

378.0000 RUN

ML. WATER ? RUN

107.6000 RUN

INF. % HOH = 8.8

% HOH = 8.8

% CO2 ? RUN

7.3000 RUN

% OXYGEN ? RUN

12.3000 RUN

% CO ? RUN

MOL WT OTHER ? RUN

MW = 29.60

MW MET = 28.67

XROM "MASSFLOW"

RUN NUMBER

B3 R3 19 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.4100 RUN

BAR PRESS ? RUN

29.6280 RUN

METER VOL ? RUN

52.4960 RUN

MTR TEMP F? RUN

108.0000 RUN

% OTHER GAS RUN

REMOVED BEFORE RUN

DRY GAS METER ? RUN

STATIC HOH IN ? RUN

-1.0500 RUN

STACK TEMP. RUN

378.0000 RUN

ML. WATER ? RUN

107.6000 RUN

INF. % HOH = 8.8

% HOH = 8.8

% CO2 ? RUN

7.3000 RUN

% OXYGEN ? RUN

12.3000 RUN

% CO ? RUN

MOL WT OTHER ? RUN

MW = 29.60

MW MET = 28.67

XROM "MASSFLOW"

RUN NUMBER

B3 R3 19 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.4100 RUN

BAR PRESS ? RUN

29.6280 RUN

METER VOL ? RUN

52.4960 RUN

MTR TEMP F? RUN

108.0000 RUN

% OTHER GAS RUN

REMOVED BEFORE RUN

DRY GAS METER ? RUN

STATIC HOH IN ? RUN

-1.0500 RUN

STACK TEMP. RUN

378.0000 RUN

ML. WATER ? RUN

107.6000 RUN

INF. % HOH = 8.8

% HOH = 8.8

% CO2 ? RUN

7.3000 RUN

% OXYGEN ? RUN

12.3000 RUN

% CO ? RUN

MOL WT OTHER ? RUN

MW = 29.60

MW MET = 28.67

XROM "MASSFLOW"

RUN NUMBER

B3 R3 19 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.4100 RUN

BAR PRESS ? RUN

29.6280 RUN

METER VOL ? RUN

52.4960 RUN

MTR TEMP F? RUN

108.0000 RUN

% OTHER GAS RUN

REMOVED BEFORE RUN

DRY GAS METER ? RUN

STATIC HOH IN ? RUN

-1.0500 RUN

STACK TEMP. RUN

378.0000 RUN

ML. WATER ? RUN

107.6000 RUN

INF. % HOH = 8.8

% HOH = 8.8

% CO2 ? RUN

7.3000 RUN

% OXYGEN ? RUN

12.3000 RUN

% CO ? RUN

MOL WT OTHER ? RUN

MW = 29.60

MW MET = 28.67

XROM "MASSFLOW"

RUN NUMBER

B3 R3 19 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.4100 RUN

BAR PRESS ? RUN

29.6280 RUN

METER VOL ? RUN

52.4960 RUN

MTR TEMP F? RUN

108.0000 RUN

% OTHER GAS RUN

REMOVED BEFORE RUN

DRY GAS METER ? RUN

STATIC HOH IN ? RUN

-1.0500 RUN

STACK TEMP. RUN

378.0000 RUN

ML. WATER ? RUN

107.6000 RUN

INF. % HOH = 8.8

% HOH = 8.8

% CO2 ? RUN

7.3000 RUN

% OXYGEN ? RUN

12.3000 RUN

% CO ? RUN

MOL WT OTHER ? RUN

MW = 29.60

MW MET = 28.67

XROM "MASSFLOW"

RUN NUMBER

B3 R3 19 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.4100 RUN

BAR PRESS ? RUN

29.6280 RUN

METER VOL ? RUN

52.4960 RUN

MTR TEMP F? RUN

108.0000 RUN

% OTHER GAS RUN

REMOVED BEFORE RUN

DRY GAS METER ? RUN

STATIC HOH IN ? RUN

-1.0500 RUN

STACK TEMP. RUN

378.0000 RUN

BOILER 3, 20 JULY

XROM "METH 5"

RUN NUMBER
B3 R1 20 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.1900 RUN

BAP PRESS ? RUN

29.2450 RUN

METER VOL ? RUN

49.0000 RUN

MTF TEMP F? RUN

104.0000 RUN

% OTHER GAS

REMOVED BEFORE

DRY GAS METER ? RUN

STATIC MOH IN ? RUN

-1.1000 RUN

STACK TEMP. RUN

373.0000 RUN

ML. WATER ? RUN

117.9000 RUN

INF. % MOH = 10.1

% MOH=10.1

% CO2? RUN

9.7000 RUN

% OXYGEN? RUN

9.3000 RUN

% CO ? RUN

MOL WT OTHER? RUN

MWD = 24.92

MW MET = 26.72

SOFT PSTS ? RUN

30.4430 RUN

TIME MIN ? RUN

60.0000 RUN

NOZZLE DIA ? RUN

.2500 RUN

STK DIA INCH ? RUN

52.5000 RUN

• VOL MTR STD = 49.401

STK PRES REQ = 24.14

VOL HOH GAS = 5.44

% MOISTURE = 9.74

MOL DRY GAS = 0.901

% NITROGEN = 80.84

MOL WT DRY = 30.86

MOL WT MET = 26.67

VELOCITY FPS = 75.54

STACK AREA = 15.07

STACK ACFM = 68.130

• STACK BSCFM = 37.850

% ISOINETIC = 96.14

XROM "MASSFLG"

RUN NUMBER
B3 R1 20 JULY

VOL MTR STD ? RUN

49.401 RUN

STACK BSCFM ? RUN

37.850000 RUN

FRONT 1 1/2 MO ? RUN

359.400 RUN

BACK 1/2 MO ? RUN

0.000 RUN

F GR/BSCF = 0.112

F MG/MMH = 256.490

F LB/HF = 36.365

F KG/HF = 16.495

F GR/BSCF = 0.112

F MG/MMH = 256.490

F LB/HF = 36.365

F KG/HF = 16.495

F GR/BSCF = 0.112

F MG/MMH = 256.490

F LB/HF = 36.365

F KG/HF = 16.495

F GR/BSCF = 0.112

F MG/MMH = 256.490

F LB/HF = 36.365

F KG/HF = 16.495

F GR/BSCF = 0.112

F MG/MMH = 256.490

F LB/HF = 36.365

F KG/HF = 16.495

F GR/BSCF = 0.112

F MG/MMH = 256.490

F LB/HF = 36.365

F KG/HF = 16.495

F GR/BSCF = 0.112

F MG/MMH = 256.490

F LB/HF = 36.365

F KG/HF = 16.495

F GR/BSCF = 0.112

F MG/MMH = 256.490

F LB/HF = 36.365

F KG/HF = 16.495

F GR/BSCF = 0.112

F MG/MMH = 256.490

F LB/HF = 36.365

F KG/HF = 16.495

F GR/BSCF = 0.112

F MG/MMH = 256.490

F LB/HF = 36.365

F KG/HF = 16.495

XROM "METH 5"

RUN NUMBER
B3 R2 20 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.1300 RUN

BAP PRESS ? RUN

29.2300 RUN

METER VOL ? RUN

50.7750 RUN

MTF TEMP F? RUN

107.0000 RUN

% OTHER GAS

REMOVED BEFORE

DRY GAS METER ? RUN

STATIC MOH IN ? RUN

-1.1000 RUN

STACK TEMP. RUN

373.0000 RUN

ML. WATER ? RUN

115.6000 RUN

INF. % MOH = 9.8

% MOH=9.8

% CO2? RUN

10.3000 RUN

% OXYGEN? RUN

8.9000 RUN

% CO ? RUN

MOL WT OTHER? RUN

MWD = 30.00

MW MET = 26.87

SOFT PSTS ? RUN

30.1990 RUN

TIME MIN ? RUN

60.0000 RUN

NOZZLE DIA ? RUN

.2500 RUN

STK DIA INCH ? RUN

52.5000 RUN

• VOL MTR STD = 50.154

STK PRES REQ = 24.14

VOL HOH GAS = 5.44

% MOISTURE = 9.74

MOL DRY GAS = 0.901

% NITROGEN = 80.84

MOL WT DRY = 30.86

MOL WT MET = 26.67

VELOCITY FPS = 74.80

STACK AREA = 15.07

STACK ACFM = 67.449

• STACK BSCFM = 37.590

% ISOINETIC = 95.11

XROM "METH 5"

RUN NUMBER
B3 R3 20 JULY

METER BOX Y? RUN

1.0770 RUN

DELTA H? RUN

3.1900 RUN

BAP PRESS ? RUN

29.2300 RUN

METER VOL ? RUN

51.2550 RUN

MTF TEMP F? RUN

110.0000 RUN

% OTHER GAS

REMOVED BEFORE

DRY GAS METER ? RUN

STATIC MOH IN ? RUN

-1.1000 RUN

STACK TEMP. RUN

372.0000 RUN

ML. WATER ? RUN

114.6000 RUN

INF. % MOH = 9.7

% MOH=9.7

% CO2? RUN

10.3000 RUN

% OXYGEN? RUN

9.3000 RUN

% CO ? RUN

MOL WT OTHER? RUN

MWD = 30.00

MW MET = 26.87

SOFT PSTS ? RUN

30.4120 RUN

TIME MIN ? RUN

60.0000 RUN

NOZZLE DIA ? RUN

.2500 RUN

STK DIA INCH ? RUN

52.5000 RUN

• VOL MTR STD = 50.750

STK PRES REQ = 24.14

VOL HOH GAS = 5.44

% MOISTURE = 9.74

MOL DRY GAS = 0.901

% NITROGEN = 80.84

MOL WT DRY = 30.86

MOL WT MET = 26.67

VELOCITY FPS = 75.70

STACK AREA = 15.07

STACK ACFM = 67.921

• STACK BSCFM = 37.930

% ISOINETIC = 95.14

XROM "MASSFLG"

RUN NUMBER
B3 R3 20 JULY

VOL MTR STD ? RUN

50.750 RUN

STACK BSCFM ? RUN

37.930000 RUN

FRONT 1 1/2 MO ? RUN

430.500 RUN

BACK 1/2 MO ? RUN

0.000 RUN

F GR/BSCF = 0.122

F MG/MMH = 300.900

F LB/HF = 42.807

F KG/HF = 19.451

F GR/BSCF = 0.122

F MG/MMH = 300.900

F LB/HF = 42.807

F KG/HF = 19.451

F GR/BSCF = 0.122

F MG/MMH = 300.900

F LB/HF = 42.807

F KG/HF = 19.451

F GR/BSCF = 0.122

F MG/MMH = 300.900

F LB/HF = 42.807

F KG/HF = 19.451

F GR/BSCF = 0.122

F MG/MMH = 300.900

F LB/HF = 42.807

F KG/HF = 19.451

F GR/BSCF = 0.122

F MG/MMH = 300.900

F LB/HF = 42.807

F KG/HF = 19.451

F GR/BSCF = 0.122

F MG/MMH = 300.900

F LB/HF = 42.807

F KG/HF = 19.451

F GR/BSCF = 0.122

F MG/MMH = 300.900

F LB/HF = 42.807

F KG/HF = 19.451

F GR/BSCF = 0.122

F MG/MMH = 300.900

F LB/HF = 42.807

F KG/HF = 19.451

F GR/BSCF = 0.122

F MG/MMH = 300.900

F LB/HF = 42.807

F KG/HF = 19.451

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APPENDIX K
Calibration Data

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METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 12 Jul 88

Meter box number 200 NUSECH

Barometric pressure, $P_b =$ 29.119 in. Hg Calibrated by Fagin & Scott

Orifice manometer setting (ΔH), in. H_2O	Gas volume		Temperature				Time (θ), min	Y_i	ΔH_{Ci} in. H_2O
	Wet test meter (V_w), ft ³	Dry gas meter (V_d), ft ³	Wet test meter (t_w), °F/R	Dry gas meter					
				Inlet (t_{di}), °F/R	Outlet (t_{do}), °F/R	Avg ^a (t_d), °F/R			
0.5	5	4.668	78 79 538	76 83 539.5	78 78 536.5	538	13.1	1.070	2.010
1.0	5	4.670	78 78 538	81 81 546.5	78 81 539.5	543	9.3	1.078	2.008
1.5	10	9.390	78 78 538	90 96 553	82 86 544	548.5	15.5	1.082	2.070
2.0	10	9.455	79 80 539.5	96 101 558.5	87 90 548.5	553.5	13.5	1.070	2.087
3.0	10	9.470	80 81 540.5	101 106 563.5	90 93 551.5	557.5	11.1	1.081	2.109
4.0	10.1	9.590	81 81 541	106 109 567.5	94 96 555	561.3	9.8	1.082	2.138
Avg								1.077	2.070

ΔH , in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H_{Ci} = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460) \theta}{V_w} \right]^2$
0.5	0.0368	$Y_1 = \frac{(5)(29.119)(538)}{(4.668)(29.119 + \frac{0.0368}{13.6})(538)}$	$H_{C1} = \frac{(0.0317)(0.5)}{(29.119)(538)} \left[\frac{(538)(13.1)}{5} \right]^2$
1.0	0.0737	$Y_2 = \frac{(5)(29.119)(543)}{(4.67)(29.119 + \frac{0.0737}{13.6})(538)}$	$H_{C2} = \frac{(0.0317)(1)}{(29.119)(543)} \left[\frac{(538)(9.3)}{5} \right]^2$
1.5	0.110	$Y_3 = \frac{(10)(29.119)(548.5)}{(9.39)(29.119 + \frac{0.110}{13.6})(557.5)}$	$H_{C3} = \frac{(0.0317)(1.5)}{(29.119)(557.5)} \left[\frac{(557.5)(15.5)}{10} \right]^2$
2.0	0.147	$Y_4 = \frac{(10)(29.119)(553.5)}{(9.455)(29.119 + \frac{0.147}{13.6})(557.5)}$	$H_{C4} = \frac{(0.0317)(2.0)}{(29.119)(553.5)} \left[\frac{(553.5)(13.5)}{10} \right]^2$
3.0	0.221	$Y_5 = \frac{(10)(29.119)(557.5)}{(9.47)(29.119 + \frac{0.221}{13.6})(540.5)}$	$H_{C5} = \frac{(0.0317)(3)}{(29.119)(557.5)} \left[\frac{(540.5)(11.1)}{10} \right]^2$
4.0	0.294	$Y_6 = \frac{(10.1)(29.119)(561.3)}{(9.59)(29.119 + \frac{0.294}{13.6})(541)}$	$H_{C6} = \frac{(0.0317)(4)}{(29.119)(561.3)} \left[\frac{(541)(9.8)}{10.1} \right]^2$

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

POSITEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number 22 Date 4 Aug 88 Meter box number 22 Plant Shaw AF3

Barometric pressure, $P_b = 29.7$ in. Hg Dry gas meter number NOTECH Pretest $Y = 1.077$

Orifice manometer setting, (ΔH), in. H ₂ O	Gas volume		Temperature			Vacuum setting, in. Hg	Y_1	Y_1 $V_w P_b (t_d + 460)$ $V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)$
	Wet test meter (V_w), ft ³	Dry gas meter (V_d), ft ³	Wet test meter (t_w), °F	Inlet (t_d), °F	Outlet (t_o), °F			
2.0	10	9.327	79	84	80	-20.0	1.072	10829.76 X 542.25
2.5	10	9.336	79	84	80	-20.0	1.074	10829.76 X 544.0
2.5	10	9.328	79	84	80	-20.0	1.074	10829.76 X 546.25
							$Y = 1.073$	

^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, ft³.

V_d = Gas volume passing through the dry gas meter, ft³.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °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} , °F.

ΔH = Pressure differential across orifice, in. H₂O.

Y_1 = 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.

1.073 X 10000 = 10730
10730 X 1.073 = 11309

METER BOX CALIBRATION DATA AND CALCULATION FORM

(English units)

Date 12 Jul 88

Meter box number PAC

Barometric pressure, $P_b = 29.131$ in. Hg Calibrated by ELGIN ESCOTT *E. A. Scott*

Orifice manometer setting (ΔH), in. H ₂ O	Gas volume		Temperature				Time (θ), min	Y_i	$\Delta H \theta$ in. H ₂ O
	Wet test meter (V_w), ft ³	Dry gas meter (V_d), ft ³	Wet test meter (t_w), °R	Dry gas meter					
				Inlet (t_{d_i}), °R	Outlet (t_{d_o}), °R	Avg ^a (t_d), °R			
0.5	5	4.712	77 537.5	94 557.5	78 537	548.25	12.0	1.081	1.652
1.0	5.2	4.940	77 537.5	104 566.5	78 539	552.75	8.9	1.080	1.666
1.5	10	9.600	78 538	111 572	81 542.5	557.25	15.0	1.075	1.908
2.0	10	9.529	78 538.5	115 575.5	85 545.5	560.5	13.0	1.087	1.902
3.0	10	9.636	79 539	117 578.5	87 547.5	563.0	14.6	1.076	1.872
4.0	10	9.605	79 539	120 581	88 548.5	564.75	9.1	1.080	1.391
Avg							1.080	1.736	

ΔH , in. H ₂ O	$\frac{\Delta H}{13.6}$	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)}$	$\Delta H \theta_i = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460) \theta}{V_w} \right]^2$
0.5	0.0368	$Y_1 = \frac{(5 \times 29.131 \times 548.25)}{(4.712 \times 29.131 + \frac{5}{13.6} \times 537.5) (77.537.5 + 460)}$	$H_{0.1} = \frac{(0.0317 \times 0.5)}{(29.131 \times 548.25)} \left[\frac{(537.5)(12.0)}{5} \right]^2$
1.0	0.0737	$Y_2 = \frac{(5.2 \times 29.131 \times 552.75)}{(4.940 \times 29.131 + \frac{5.2}{13.6} \times 537.5) (77.537.5 + 460)}$	$H_{0.2} = \frac{(0.0317 \times 1.0)}{(29.131 \times 552.75)} \left[\frac{(537.5)(8.9)}{5.2} \right]^2$
1.5	0.110	$Y_3 = \frac{(10 \times 29.131 \times 557.25)}{(9.600 \times 29.131 + \frac{10}{13.6} \times 538) (78.538 + 460)}$	$H_{0.3} = \frac{(0.0317 \times 1.5)}{(29.131 \times 557.25)} \left[\frac{(538)(15.0)}{10} \right]^2$
2.0	0.147	$Y_4 = \frac{(10 \times 29.131 \times 560.5)}{(9.529 \times 29.131 + \frac{10}{13.6} \times 538.5) (79.538.5 + 460)}$	$H_{0.4} = \frac{(0.0317 \times 2.0)}{(29.131 \times 560.5)} \left[\frac{(538.5)(13.0)}{10} \right]^2$
3.0	0.221	$Y_5 = \frac{(10 \times 29.131 \times 563.0)}{(9.636 \times 29.131 + \frac{10}{13.6} \times 539) (79.539 + 460)}$	$H_{0.5} = \frac{(0.0317 \times 3.0)}{(29.131 \times 563.0)} \left[\frac{(539)(14.6)}{10} \right]^2$
4.0	0.294	$Y_6 = \frac{(10 \times 29.131 \times 564.75)}{(9.605 \times 29.131 + \frac{10}{13.6} \times 539) (79.539 + 460)}$	$H_{0.6} = \frac{(0.0317 \times 4.0)}{(29.131 \times 564.75)} \left[\frac{(539)(9.1)}{10} \right]^2$

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

Quality Assurance Handbook M4-2.3A (front side)

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Facility (Nat)
LABOR (Vic)

Test number #1 Date 9 Aug 58 Meter box number _____ Plant _____
Barometric pressure, $P_b =$ 30.00 in. Hg Dry gas meter number RAC Pretest Y 1.080

Orifice manometer setting, (ΔH), in. H_2O	Gas volume		Temperature				Time (θ), min	Vacuum setting, in. Hg	Y_1	$V_w P_b (t_d + 460)$ $V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)$
	Wet test meter (V_w), ft^3	Dry gas meter (V_d), ft^3	Wet test meter (t_w), $^{\circ}F$	Dry gas meter						
				Inlet (t_{d_i}), $^{\circ}F$	Outlet (t_{d_o}), $^{\circ}F$	Average (t_d), $^{\circ}F$				
2.5	10	9.401	540.5	58.5	53.95	56.1	11.44	20.0	1.097	$(10) \times 30.0 \times 561$ $9.401 \times 30.0 \times 540.5$
2.5	10	9.516	540.5	58.5	53.95	57.15	11.47	20.0	1.104	$(10) \times 30.0 \times 571.5$ $9.516 \times 30.0 \times 540.5$
2.5	10	9.646	541.5	58.5	53.95	57.85	11.50	20.0	1.101	$(10) \times 30.0 \times 578.5$ $9.646 \times 30.0 \times 540.5$
									$Y = 1.101$	

^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.

$$Y = \frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6}) (t_w + 460)} = 1.026 \rightarrow 1.134$$

APPENDIX L
EPA Method 9 Certification Documentation

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VISIBLE EMISSIONS EVALUATION

This is to certify that

Major James A. Harrison

did complete a course in the opacity method of determining visible emissions from sources as specified by Federal Reference Method 9 conducted by Eastern Technical Associates of Raleigh, North Carolina.

David Savage
Course Moderator

Jacksonville
Location

5 May 31 1988
Date

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Major James A. Harrison

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

Thomas H. Rose

President

Willie J. Lee

Vice President

David Savage

Program Manager

220573

Certificate Number

Jacksonville

Location

June 2, 1988

Date of Issue

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USAF Clinic Eielson/SGPB Eielson AFB AK 99702-5300	5