AP-42 Section Number: 9.10.1.2

Reference Number: 16

Title: Results of the February 22-24, 1994, Air Emission Compliance Testing of Process Sources at the American Crystal Sugar East Grand Forks Plnnt

Interpoll Laboratories, Inc.

Interpoll Laboratories, Inc.

March 1994

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

RESULTS OF THE FEBRUARY 22 - 24, 1994 AIR EMISSION COMPLIANCE TESTING OF PROCESS SOURCES AT THE AMERICAN CRYSTAL SUGAR EAST GRAND FORKS PLANT

Submitted to:

AMERICAN CRYSTAL SUGAR COMPANY
Business Highway 220
P.O. Box 357
East Grand Forks, Minnesota 56721

Attention:

Bruce Keifenheim

Approved by:

Daniel Despen
Manager
Stationary Source Testing Department

Report Number 4-2326
March 21, 1994
SP/slp

TABLE OF CONTENTS

ABBREVIATIONS

ACFM	actual cubic feet per minute
cc (ml)	cubic centimeter (milliliter)
DSCFM	dry standard cubic foot of dry gas per minute
DSML	dry standard milliliter
DEG-F (°F)	degrees Fahrenheit
DIA.	diameter
FP	finished product for plant
FT/SEC	feet per second
g	gram
GPM	gallons per minute
GR/ACF	grains per actual cubic foot
GR/DSCF	grains per dry standard cubic foot
g/dscm	grams per dry standard cubic meter
HP	horsepower
HRS	hours
IN.	inches
IN.HG.	inches of mercury
IN.WC.	inches of water
LB	pound
LB/DSCF	pounds per dry standard cubic foot
LB/HR	pounds per hour
LB/10^6BTU	pounds per million British Thermal Units heat input
LB/MMBTU	pounds per million British Thermal Units heat input
LTPD	long tons per day
MW	megawatt
mg/Nm^3	milligrams per dry standard cubic meter
ug/Nm^3	micrograms per dry standard cubic meter
microns (um)	micrometer
MIN.	minutes
ng	nanograms
ohm-cm	ohm-centimeter
PM	particulate matter
PPH	pounds per hour
PPM	parts per million
ppmC	parts per million carbon
ppm,d	parts per million, dry
ppm,w	parts per million, wet
ppt	parts per trillion
PSI	pounds per square inch
SQ.FT.	square feet
TPD	tons per day
ug	micrograms
v/v	percent by volume
w/w	percent by weight
<	≤ (when following a number)

Standard conditions are defined as 68°F (20°C) and 29.92 IN. of mercury pressure.

g:\stack\wp\misc\abbrev.frm

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Certifications Required For Performance Test Reports

Note: All performance test reports must contain a certification by the responsible parties that the test results have been reported accurately, that the field data is a true representation of the sampling procedures, and that the process data is a true indicator of the operating parameters of the emissions unit at the time of the performance test. (Ref. Minn. Rules pt. 7017.2040). Performance test results will not be accepted without certification of the report.

1. **Certification of sampling procedures by the team leader of the personnel conducting the sampling procedures:**

"I certify under penalty of law that the sampling procedures were performed in accordance with the approved test plan and that the data presented in this test report are, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: Diane Van Hoeven Printed Name of Person Signing: Diane Van Hoeven
Title: Supervisor Date: 2/24/94

2. **Certification of analytical procedures by the person responsible for the laboratory analysis of field samples:**

"I certify under penalty of law that the analytical procedures were performed in accordance with the requirements of the test methods and that the data presented for use in the test report were, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: David J Schneider Printed Name of Person Signing: David J Schneider
Title: QA Officer Date: 3/23/94

3. **Certification of test report by the senior staff person at the testing company who is responsible for compiling and checking the test report:**

"I certify under penalty of law that this test report and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed sampling and analysis relating to the performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: Daniel J. Despe Printed Name of Person Signing: Daniel J. Despe
Title: Mgr Stationary Source Date: 3/23/94

4. **Certification of test report by owner or operator of the emission facility:**

"I certify under penalty of law that the information submitted in this test report accurately reflects the operating conditions at the emission facility during this performance test and describes the date and nature of all operational and maintenance activities that were performed on process and control equipment during the month prior to the performance test. Based on my inquiry of the person or persons who performed the operational and maintenance activities, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: _____ Printed Name of Person Signing: _____
Title: _____ Date: _____

1-5-94-G:\STACK\WP\FORMS\S-480

INTERPOLL LABORATORIES, INC.
(612) 786-6020

Certifications Required For Performance Test Reports

Note: All performance test reports must contain a certification by the responsible parties that the test results have been reported accurately, that the field data is a true representation of the sampling procedures, and that the process data is a true indicator of the operating parameters of the emissions unit at the time of the performance test. (Ref. Minn. Rules pt. 7017.2040). Performance test results will not be accepted without certification of the report.

1. **Certification of sampling procedures by the team leader of the personnel conducting the sampling procedures:**

"I certify under penalty of law that the sampling procedures were performed in accordance with the approved test plan and that the data presented in this test report are, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: Scott Lloyd Bainville Printed Name of Person Signing: Scott Lloyd Bainville
Title: Field Engineer Date: 2-23-94

2. **Certification of analytical procedures by the person responsible for the laboratory analysis of field samples:**

"I certify under penalty of law that the analytical procedures were performed in accordance with the requirements of the test methods and that the data presented for use in the test report were, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: David J Schneider Printed Name of Person Signing: David J Schneider
Title: QA Officer Date: 3/24/94

3. **Certification of test report by the senior staff person at the testing company who is responsible for compiling and checking the test report:**

"I certify under penalty of law that this test report and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the test information submitted. Based on my inquiry of the person or persons who performed sampling and analysis relating to the performance test, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: Daniel J Despen Printed Name of Person Signing: Daniel J. Despen
Title: Mgr Stationary Source Date: 3/23/94

4. **Certification of test report by owner or operator of the emission facility:**

"I certify under penalty of law that the information submitted in this test report accurately reflects the operating conditions at the emission facility during this performance test and describes the date and nature of all operational and maintenance activities that were performed on process and control equipment during the month prior to the performance test. Based on my inquiry of the person or persons who performed the operational and maintenance activities, the information submitted in this test report is, to the best of my knowledge and belief, true, accurate, and complete. All exceptions are listed and explained below."

Signature: ____________ Printed Name of Person Signing: ____________
Title: ____________ Date: ____________

1-5-94-G:\STACK\WP\FORMS\S-480

1 INTRODUCTION

During February 22 - 24, 1994 Interpoll Laboratories Personnel conducted State Air Emission Compliance Tests on the following sources at the American Crystal Sugar (ACS) Plant in East Grand Forks, Minnesota:

SOURCE	POLLUTANT	EMISSION POINT NO.
"A" Pulp Dryer Stack	PM,NO_x	3
"B" Pulp Dryer Stack	PM,NOx,Cascade Impactor	4
"C" Pulp Dryer Stack	PM,NO_x	5
No. 1 Boiler Stack	PM,CO	1
No. 2 Boiler Stack	PM,CO	2

Scott Bainville, Duane Van Hoever, Dave Vaaler, Ed Juers, and Ken Nuessmeier performed the on-site portion of the test. Coordination between testing activities and plant operation was provided by Bruce Keifenheim, Stuart Eickhoff, and Doug Ransdell of ACS. A member of the Minnesota Pollution Control Agency did not witness the test.

Particulate evaluations were performed in accordance with EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1992). Preliminary determinations of the gas linear velocity profile was made before the first particulate determination at each site to allow selection of the appropriate nozzle diameter required for isokinetic sample withdrawal. An Interpoll Labs sampling train which meets or exceeds specifications in the above-cited reference was used to extract particulate samples by means of a glass-lined probe. Wet catch samples were collected in the back half of the Method 5 sampling train and analyzed as per Minnesota Rules, Part 7005.0500.

The oxides of nitrogen samples were collected during the particulate determinations using an all-glass Method 7 sampling train. A heated stainless steel probe was used to extract the samples from the exhaust stream. A plug of glass-wool was used in the end of the probe to remove particulate material.

The NO_x samples were collected in volume-calibrated two-liter all-glass flasks. An aliquot of 25 cc of absorbing solution was added to each flask on-site; the flask was closed; inserted into the sampling train; and evacuated. The probe was then purged and the sample collected over a 15 second interval. The flask was then closed; the flask removed from the sampling train; shook for two minutes and then secured for transport to the laboratory.

Upon arrival at the laboratory, the NO_x samples are logged in, placed in a designated area and maintained at 72 °F for 24 hours to allow completion of the conversion of NO to NO_2 and absorption in the acidified peroxide reagent. The flasks are then shook to complete absorption; attached to a mercury manometer and the static pressure and temperature recorded. The samples are then recovered and analyzed by ion chromatography.

An integrated flue gas sample was extracted simultaneously with each particulate sample using a specially designed gas sampling system. Integrated flue gas samples were collected in 44-liter Tedlar bags housed in a protective aluminum container. After sampling was complete, the bags were sealed and returned to the laboratory for Orsat analysis. Prior to sampling, the Tedlar bags are leak checked at 15 IN.HG. vacuum with an in-line rotameter. Bags with any detectable inleakage are discarded. The integrated flue gas samples on the No. 1 and 2 Boilers were also analyzed for carbon monoxide in accordance with EPA Method 10 (NDIR).

Testing on the "A" Pulp Dryer Stack was conducted from 2 test ports oriented at 90 degrees on the stack. The test ports are located diameters 2 downstream and 5.5 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run. Visible emission determinations were unable to be performed due to converging plumes.

Testing on the "B" Pulp Dryer Stack was conducted from 2 test ports oriented at 90 degrees on the stack. The test ports are located 2 diameters downstream of a flow straightener and 2 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run. Visible emission determinations were unable to be performed due to converging plumes.

Testing on the "C" Pulp Dryer Stack was conducted from 2 test ports oriented at 90 degrees on the stack. The test ports are located 2 diameters downstream and 2 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run. Visible emission determinations were unable to be performed due to converging plumes.

Testing on the No. 1 Boiler Stack was conducted from 4 test ports oriented at 90 degrees on the stack. The test ports are located 4.5 diameters downstream and 2.4 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run.

Testing on the No. 2 Boiler Stack was conducted from 4 test ports oriented at 90 degrees on the stack. The test ports are located 4.5 diameters downstream and 2.4 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run.

The important results of the test are summarized in Section 2. Detailed results are presented in Section 3. Field data and all other supporting information are presented in the appendices.

2 SUMMARY AND DISCUSSION

The results of the air emission tests are summarized in Tables 1 - 13. The compliance status of each source in each parameter is presented in the tables below.

PARTICULATE COMPLIANCE STATUS

EMISSION POINT Number	SOURCE NAME	*PM Emission Limit* (LB/HR)	PM Emission Rate (LB/HR)
3	"A" Pulp Dryer	15.94	10.1
4	"B" Pulp Dryer	17.94	17.1
5	"C" Pulp Dryer	14.62	13.0
1	No. 1 Boiler	14.6	8.29
2	No. 2 Boiler	14.6	6.87

OXIDES OF NITROGEN COMPLIANCE STATUS

EMISSION POINT Number	SOURCE NAME	*NO_x Emission Limit* (LB/HR)	NO_x Emission Rate (LB/HR)
3	"A" Pulp Dryer	13.04	11.4
4	"B" Pulp Dryer	14.79	16.0
5	"C" Pulp Dryer	13.04	15.2

Note that the average NO_x emissions for the B and C Dryers are based upon six NO_x samples each as an error in the field resulted in double sampling of NO_x flasks 43-48, which includes all of Run 1 on the B Pulp Dryer and Run 3 on the C Pulp Dryer. No other difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of these facts and a complete review of the data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values which existed at the time the test was performed.

Table 1a. Summary of the Results of the February 24, 1994 Particulate Emission Compliance Test on the A Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-24-94	02-24-94	02-24-94
Time runs were done	(HRS)	930/1134	1200/1405	1425/1625
* Process rate				
Volumetric flow				
actual	(ACFM)	44409	43415	43154
standard	(DSCFM)	23522	23490	23462
Gas temperature	(DEG-F)	208	204	203
Moisture content	(%V/V)	31.36	30.37	30.12
Gas composition	(%V/V,dry)			
carbon dioxide		4.40	4.30	4.30
oxygen		15.90	16.00	16.00
nitrogen		79.70	79.70	79.70
Isokinetic variation	(%)	99.3	98.2	99.2
Particulate concentration				
actual	(GR/ACF)	.0292	.0251	.0269
standard	(GR/DSCF)	.0552	.0465	.0495
Part. emission rate	(LB/HR)	11.13	9.35	9.96

Note: Dry + Organic Wet Catch

* For process information - see Appendix E.

Table 1b. Summary of the Results of the February 24, 1994 Particulate Emission Compliance Test on the A Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-24-94	02-24-94	02-24-94
Time runs were done	(HRS)	930/1134	1200/1405	1425/1625
* Process rate				
Volumetric flow				
actual	(ACFM)	44409	43415	43154
standard	(DSCFM)	23522	23490	23462
Gas temperature	(DEG-F)	208	204	203
Moisture content	(%V/V)	31.36	30.37	30.12
Gas composition	(%V/V,dry)			
carbon dioxide		4.40	4.30	4.30
oxygen		15.90	16.00	16.00
nitrogen		79.70	79.70	79.70
Isokinetic variation	(%)	99.3	98.2	99.2
Particulate concentration				
actual	(GR/ACF)	.0264	.0220	.0238
standard	(GR/DSCF)	.0498	.0407	.0438
Part. emission rate	(LB/HR)	10.04	8.19	8.81

Note: Dry Catch Only

* For process information - see Appendix E.

Table 2a. Summary of the Results of the February 23, 1994 Particulate Emission Compliance Test on the B Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-23-94	02-23-94	02-23-94
Time runs were done	(HRS)	1021/1225	1300/1503	1543/1744
* Process rate				
Volumetric flow				
actual	(ACFM)	68268	68024	68536
standard	(DSCFM)	36779	36865	37205
Gas temperature	(DEG-F)	239	237	236
Moisture content	(%V/V)	27.37	27.13	27.14
Gas composition	(%V/V,dry)			
carbon dioxide		3.90	3.90	3.90
oxygen		16.50	16.50	16.50
nitrogen		79.60	79.60	79.60
Isokinetic variation	(%)	91.3	96.3	98.6
Particulate concentration				
actual	(GR/ACF)	.0306	.0289	.0279
standard	(GR/DSCF)	.0569	.0533	.0515
Part. emission rate	(LB/HR)	17.93	16.84	16.41

Note: Dry + Organic Wet Catch

* For process information - see Appendix E.

Table 2b. Summary of the Results of the February 23, 1994 Particulate Emission Compliance Test on the B Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	02-23-94	02-23-94	02-23-94
Time runs were done (HRS)	1021/1225	1300/1503	1543/1744
*Process rate			
Volumetric flow			
actual (ACFM)	68268	68024	68536
standard (DSCFM)	36779	36865	37205
Gas temperature (DEG-F)	239	237	236
Moisture content (%V/V)	27.37	27.13	27.14
Gas composition (%V/V,dry)			
carbon dioxide	3.90	3.90	3.90
oxygen	16.50	16.50	16.50
nitrogen	79.60	79.60	79.60
Isokinetic variation (%)	91.3	96.3	98.6
Particulate concentration			
actual (GR/ACF)	.0290	.0273	.0266
standard (GR/DSCF)	.0539	.0504	.0491
Part. emission rate (LB/HR)	16.99	15.93	15.64

Note: Dry Catch Only

* For process information - see Appendix E.

Table 3a. Summary of the Results of the February 22, 1994 Particulate Emission Compliance Test on the C Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-22-94	02-22-94	02-22-94
Time runs were done	(HRS)	1418/1622	1705/1911	1940/2146
*Process rate				
Volumetric flow				
actual	(ACFM)	46487	47360	47936
standard	(DSCFM)	24316	24619	25136
Gas temperature	(DEG-F)	212	213	215
Moisture content	(%V/V)	33.27	33.65	32.89
Gas composition	(%V/V,dry)			
carbon dioxide		4.80	5.20	4.80
oxygen		15.50	15.00	15.40
nitrogen		79.70	79.80	79.80
Isokinetic variation	(%)	102.2	100.9	99.7
Particulate concentration				
actual	(GR/ACF)	.0322	.0367	.0276
standard	(GR/DSCF)	.0616	.0706	.0526
Part. emission rate	(LB/HR)	12.84	14.91	11.34

Note: Dry + Organic Wet Catch

* For process information - see Appendix E.

Table 3b. Summary of the Results of the February 22, 1994 Particulate Emission Compliance Test on the C Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-22-94	02-22-94	02-22-94
Time runs were done	(HRS)	1418/1622	1705/1911	1940/2146
*Process rate				
Volumetric flow				
actual	(ACFM)	46487	47360	47936
standard	(DSCFM)	24316	24619	25136
Gas temperature	(DEG-F)	212	213	215
Moisture content	(%V/V)	33.27	33.65	32.89
Gas composition	(%V/V,dry)			
carbon dioxide		4.80	5.20	4.80
oxygen		15.50	15.00	15.40
nitrogen		79.70	79.80	79.80
Isokinetic variation	(%)	102.2	100.9	99.7
Particulate concentration				
actual	(GR/ACF)	.0301	.0348	.0255
standard	(GR/DSCF)	.0575	.0669	.0487
Part. emission rate	(LB/HR)	11.99	14.13	10.49

Note: Dry Catch Only

* For process information - see Appendix E.

Table 4a. Summary of the Results of the February 22, 1994 Particulate Emission Test on the No. 1 Boiler Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-22-94	02-22-94	02-22-94
Time runs were done	(HRS)	1220/1330	1430/1532	1610/1715
Steam flow	(KLB/HR)	242.0	248.0	239.0
Volumetric flow				
actual	(ACFM)	174096	168646	175764
standard	(DSCFM)	93492	92871	96705
Gas temperature	(DEG-F)	412	408	407
Moisture content	(%V/V)	10.68	9.45	9.00
Gas composition	(%V/V,dry)			
carbon dioxide		11.20	11.60	11.60
oxygen		8.50	8.10	8.10
nitrogen		80.30	80.30	80.30
Isokinetic variation	(%)	101.0	99.6	99.0
Particulate concentration				
actual	(GR/ACF)	.00679	.00585	.00416
standard	(GR/DSCF)	.0127	.0106	.00757
Part. emission rate	(LB/HR)	10.14	8.46	6.27
Emission factor	(LB/MMBTU)	0.030	0.024	0.017

Note: Dry + Organic Wet Catch

Table 4b. Summary of the Results of the February 22, 1994 Particulate Emission Test on the No. 1 Boiler Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM		Run 1	Run 2	Run 3
Date of test		02-22-94	02-22-94	02-22-94
Time runs were done	(HRS)	1220/1330	1430/1532	1610/1715
Steam flow	(KLB/HR)	242.0	248.0	239.0
Volumetric flow				
actual	(ACFM)	174096	168646	175764
standard	(DSCFM)	93492	92871	96705
Gas temperature	(DEG-F)	412	408	407
Moisture content	(%V/V)	10.68	9.45	9.00
Gas composition	(%V/V,dry)			
carbon dioxide		11.20	11.60	11.60
oxygen		8.50	8.10	8.10
nitrogen		80.30	80.30	80.30
Isokinetic variation	(%)	101.0	99.6	99.0
Particulate concentration				
actual	(GR/ACF)	.00618	.00539	.00396
standard	(GR/DSCF)	.0115	.00979	.00719
Part. emission rate	(LB/HR)	9.23	7.79	5.96
Emission factor	(LB/MMBTU)	0.027	0.022	0.016

Note: Dry Catch Only

Table 5a. Summary of the Results of the February 23, 1994 Particulate Emission Compliance Test on the No. 2 Boiler Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	02-23-94	02-23-94	02-23-94
Time runs were done (HRS)	1105/1210	1250/1353	1415/1518
Steam flow (KLB/HR)	240.0	238.0	243.0
Volumetric flow			
actual (ACFM)	149886	147699	141763
standard (DSCFM)	82214	81536	78612
Gas temperature (DEG-F)	387	391	392
Moisture content (%V/V)	10.28	9.21	8.72
Gas composition (%V/V,dry)			
carbon dioxide	12.10	12.20	12.40
oxygen	7.40	7.30	7.10
nitrogen	80.50	80.50	80.50
Isokinetic variation (%)	100.5	99.0	99.4
Particulate concentration			
actual (GR/ACF)	.00625	.00605	.00404
standard (GR/DSCF)	.0114	.0110	.00728
Part. emission rate (LB/HR)	8.03	7.66	4.91
Emission factor (LB/MMBTU)	0.025	0.024	0.015

Note: Dry + Organic Wet Catch

Table 5b. Summary of the Results of the February 23, 1994 Particulate Emission Compliance Test on the No. 2 Boiler Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	02-23-94	02-23-94	02-23-94
Time runs were done (HRS)	1105/1210	1250/1353	1415/1518
Steam flow (KLB/HR)	240.0	238.0	243.0
Volumetric flow			
actual (ACFM)	149886	147699	141763
standard (DSCFM)	82214	81536	78612
Gas temperature (DEG-F)	387	391	392
Moisture content (%V/V)	10.28	9.21	8.72
Gas composition (%V/V,dry)			
carbon dioxide	12.10	12.20	12.40
oxygen	7.40	7.30	7.10
nitrogen	80.50	80.50	80.50
Isokinetic variation (%)	100.5	99.0	99.4
Particulate concentration			
actual (GR/ACF)	.00603	.00570	.00387
standard (GR/DSCF)	.0110	.0103	.00698
Part. emission rate (LB/HR)	7.75	7.22	4.70
Emission factor (LB/MMBTU)	0.024	0.022	0.015

Note: Dry Catch Only

Table 6. Summary of the Results of the February 23 & 24, 1994 **Oxides of Nitrogen** Emission Compliance Tests at the American Crystal Sugar Plant in East Grand Forks, Minnesota.

Date	Time	Emission Rate (LB/HR)	Emission Factor (LB/10^6BTU)
(A - Pulp Dryer Stack)			
2-24-94	0915-1015	11.1	0.32
2-24-94	1030-1130	10.2	0.30
2-24-94	1145-1245	13.0	0.38
Average		11.4	0.33
(B - Pulp Dryer Stack)			
2-23-94	1630-1730	n/a	n/a
2-23-94	1730-1910	14.0	0.29
2-23-94	1940-2040	17.9	0.37
Average		16.0	0.33
(C - Pulp Dryer Stack)			
2-24-94	0830-0930	16.3	1.0
2-24-94	0940-1040	14.1	1.4
2-24-94	1045-1145	n/a	n/a
Average		15.2	1.2

n/a - Not available, an error in the field resulted in double sampling of NO_x flasks 43-48, which includes all of Run 1 on the B Pulp Dryer and Run 3 on the C Pulp Dryer.

Table 7. Summary of the Results of the February 22 & 23, 1994 **Carbon Monoxide** Emission Compliance Tests at the American Crystal Sugar Plant in East Grand Forks, Minnesota.

Date	Time	Emission Rate (LB/HR)	Emission Factor (LB/10^6BTU)
(No. 1 Boiler Stack)			
2-22-94	1220-1330	167	0.49
2-22-94	1430-1532	154	0.44
2-22-94	1610-1715	156	0.43
Average		159	0.45
(No. 2 Boiler Stack)			
2-23-94	1105-1210	75	0.23
2-23-94	1250-1353	64	0.20
2-23-94	1415-1518	69	0.22
Average		69	0.22

3 RESULTS

The results of all field and laboratory evaluations are presented in this section. Gas moisture is presented first followed by the computer printout of the particulate, oxides of nitrogen, carbon monoxide, and particle size distribution results. Preliminary measurements including test port locations are given in the appendices.

The results have been calculated on a personal computer using programs written in Extended BASIC specifically for source testing calculations. EPA-published equations have been used as the basis of the calculation techniques in these programs. The particulate emission rate has been calculated using the product of the concentration times flow method.

3.1 Results of Volumetric Flow Rate Determinations

Test No. 1
C Pulp Dryer Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-22-94
Time of Determination.....(HRS)	1250
Barometric pressure.....(IN.HG)	29.94
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	48
Duct area.....(SQ.FT)	12.57
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.95
Avg. gas temp.....(DEG-F)	210
Moisture content.....(% V/V)	33.27
Avg. linear velocity.....(FT/SEC)	61.4
Gas density.....(LB/ACF)	.05230
Molecular weight.....(LB/LBMOLE)	29.39
Mass flow of gas.....(LB/HR)	145175
Volumetric flow rate.....	
actual.....(ACFM)	46262
dry standard.....(DSCFM)	24288

Test No. 2
B Pulp Dryer Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-23-94
Time of Determination.....(HRS)	845
Barometric pressure.....(IN.HG)	29.43
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	59
Duct area.....(SQ.FT)	18.99
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.79
Avg. gas temp.....(DEG-F)	237
Moisture content.....(% V/V)	27.37
Avg. linear velocity.....(FT/SEC)	60.3
Gas density.....(LB/ACF)	.05059
Molecular weight.....(LB/LBMOLE)	29.28
Mass flow of gas.....(LB/HR)	208383
Volumetric flow rate.....	
actual.....(ACFM)	68652
dry standard.....(DSCFM)	37082

Test No. 4
A Pulp Dryer Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-24-94
Time of Determination.....(HRS)	749
Barometric pressure.....(IN.HG)	29.28
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	47
Duct area.....(SQ.FT)	12.05
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.78
Avg. gas temp.....(DEG-F)	209
Moisture content.....(% V/V)	31.36
Avg. linear velocity.....(FT/SEC)	60.2
Gas density.....(LB/ACF)	.05161
Molecular weight.....(LB/LBMOLE)	29.34
Mass flow of gas.....(LB/HR)	134810
Volumetric flow rate.....	
actual.....(ACFM)	43532
dry standard.....(DSCFM)	23032

Test No. 5
C Pulp Dryer Stack

Results of Volumetric Flow Rate Determination-------Method 2

Date of Determination.....	02-24-94
Time of Determination.....(HRS)	1021
Barometric pressure.....(IN.HG)	29.28
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	48
Duct area.....(SQ.FT)	12.57
Direction of flow.....	UP
Static pressure.....(IN.WC)	-1.2
Avg. gas temp.....(DEG-F)	214
Moisture content.....(% V/V)	28.67
Avg. linear velocity.....(FT/SEC)	61.1
Gas density.....(LB/ACF)	.04989
Molecular weight.....(LB/LBMOLE)	28.00
Mass flow of gas.....(LB/HR)	137911
Volumetric flow rate.....	
actual.....(ACFM)	46076
dry standard.....(DSCFM)	25121

3.2 Results of the Orsat & Moisture Analyses

Test No. 1
No. 1 Boiler Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-22-94	02-22-94	02-22-94
Dry basis (orsat)			
carbon dioxide.....	11.20	11.60	11.60
oxygen.....	8.50	8.10	8.10
nitrogen.....	80.30	80.30	80.30
Wet basis (orsat)			
carbon dioxide.....	10.00	10.50	10.56
oxygen.....	7.59	7.33	7.37
nitrogen.....	71.73	72.71	73.07
water vapor.....	10.68	9.45	9.00
Dry molecular weight.....	30.13	30.18	30.18
Wet molecular weight.....	28.84	29.03	29.08
Specific gravity.....	0.996	1.003	1.005
Water mass flow.....(LB/HR)	31348	27175	26842
FO	1.107	1.103	1.103

Test No. 1
C Pulp Dryer Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-22-94	02-22-94	02-22-94
Dry basis (orsat)			
carbon dioxide.....	4.80	5.20	4.80
oxygen.....	15.50	15.00	15.40 (15.3)
nitrogen.....	79.70	79.80	79.80
Wet basis (orsat)			
carbon dioxide.....	3.20	3.45	3.22
oxygen.....	10.34	9.95	10.34
nitrogen.....	53.18	52.95	53.56
water vapor.....	33.27	33.65	32.89
Dry molecular weight.....	29.39	29.43	29.38
Wet molecular weight.....	25.60	25.59	25.64
Specific gravity.....	0.884	0.884	0.886
Water mass flow.....(LB/HR)	34007	35018	34548
FO	1.125	1.135	1.146

Test No. 2
No. 2 Boiler Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-23-94	02-23-94	02-23-94
Dry basis (orsat)			
carbon dioxide.....	12.10	12.20	12.40
oxygen.....	7.40	7.30	7.10
nitrogen.....	80.50	80.50	80.50
Wet basis (orsat)			
carbon dioxide.....	10.86	11.08	11.32
oxygen.....	6.64	6.63	6.48
nitrogen.....	72.22	73.08	73.48
water vapor.....	10.28	9.21	8.72
Dry molecular weight.....	30.23	30.24	30.27
Wet molecular weight.....	28.97	29.12	29.20
Specific gravity.....	1.001	1.006	1.009
Water mass flow.....(LB/HR)	26422	23211	21064
FO	1.116	1.115	1.113

Test No. 2
B Pulp Dryer Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-23-94	02-23-94	02-23-94
Dry basis (orsat)			
carbon dioxide.....	3.90	3.90	3.90
oxygen.....	16.50	16.50	16.50
nitrogen.....	79.60	79.60	79.60
Wet basis (orsat)			
carbon dioxide.....	2.83	2.84	2.84
oxygen.....	11.98	12.02	12.02
nitrogen.....	57.82	58.00	58.00
water vapor.....	27.37	27.13	27.14
Dry molecular weight.....	29.28	29.28	29.28
Wet molecular weight.....	26.20	26.22	26.22
Specific gravity.....	0.905	0.906	0.906
Water mass flow.....(LB/HR)	38867	38505	38876
FO	1.128	1.128	1.128

Test No. 3
8 Pulp Dryer Stack

(CASCADE IMPACTOR)

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1
Date of run	02-23-94
Dry basis (orsat)	
carbon dioxide.....	3.90
oxygen.....	16.50
carbon monoxide.....	0.00
nitrogen.....	79.60
Wet basis (orsat)	
carbon dioxide.....	2.86
oxygen.....	12.12
carbon monoxide.....	0.00
nitrogen.....	58.45
water vapor.....	26.56
Dry molecular weight.....	29.28
Wet molecular weight.....	26.29
Specific gravity.....	0.908
Water mass flow.....(LB/HR)	0.00

FO 1.128

Test No. 5
C Pulp Dryer Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-24-94	02-24-94	02-24-94
Dry basis (orsat)			
carbon dioxide.....	2.00	1.30	4.20
oxygen.....	18.70	19.60	16.30
nitrogen.....	79.30	79.10	79.50
Wet basis (orsat)			
carbon dioxide.....	1.43	0.93	3.00
oxygen.....	13.34	13.98	11.63
nitrogen.....	56.56	56.42	56.71
water vapor.....	28.67	28.67	28.67
Dry molecular weight.....	29.07	28.99	29.32
Wet molecular weight.....	25.89	25.84	26.08
Specific gravity.....	0.894	0.893	0.901
FO	1.100	1.000	1.095

Test No. 4
A Pulp Dryer Stack

Results of Orsat & Moisture Analyses-----Methods 3 & 4(%v/v)

	Run 1	Run 2	Run 3
Date of run	02-24-94	02-24-94	02-24-94
Dry basis (orsat)			
carbon dioxide.....	4.40	4.30	4.30
oxygen.....	15.90	16.00	16.00 16.0
nitrogen.....	79.70	79.70	79.70
Wet basis (orsat)			
carbon dioxide.....	3.02	2.99	3.00
oxygen.....	10.91	11.14	11.18
nitrogen.....	54.70	55.50	55.69
water vapor.....	31.36	30.37	30.12
Dry molecular weight.....	29.34	29.33	29.33
Wet molecular weight.....	25.78	25.89	25.92
Specific gravity.....	0.891	0.894	0.895
Water mass flow.....(LB/HR)	30149	28733	28372
FO	1.136	1.140	1.140

3.3 Results of Particulate Loading Determinations

Test No. 1
No. 1 Boiler Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	02-22-94	02-22-94	02-22-94
Time run start/end.....(HRS)	1220/1330	1430/1532	1610/1715
Static pressure.....(IN.WC)	-0.44	-0.44	-0.44
Cross sectional area (SQ.FT)	60.71	60.71	60.71
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	108.0	94.0	93.0
desiccant.....(GRAMS)	16.0	12.0	11.0
total.....(GRAMS)	124.0	106.0	104.0
Total particulate material..			
.....collected(grams)	0.0401	0.0330	0.0243
Gas meter coefficient.....	1.0027	1.0027	1.0027
Barometric pressure..(IN.HG)	29.73	29.93	29.73
Avg. orif.pres.drop..(IN.WC)	2.15	2.06	2.22
Avg. gas meter temp..(DEF-F)	80.1	88.6	87.9
Volume through gas meter....			
at meter conditions...(CF)	49.97	49.40	51.35
standard conditions.(DSCF)	48.91	47.91	49.55
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.310	.310	.310
Avg.stack gas temp ..(DEG-F)	412	408	407
Volumetric flow rate.....			
actual.....(ACFM)	174096	168646	175764
dry standard.....(DSCFM)	93492	92871	96705
Isokinetic variation.....(%)	101.0	99.6	99.0
Particulate concentration...			
actual.....(GR/ACF)	0.00679	0.00585	0.00416
dry standard.....(GR/DSCF)	0.01265	0.01063	0.00757
Particle mass rate...(LB/HR)	10.138	8.460	6.272
F-factor .....(DSCF/MMBTU)	9780	9780	9780
Emission factor...(LB/MMBTU)	0.030	0.024	0.017

Test No. 1
C Pulp Dryer Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	02-22-94	02-22-94	02-22-94
Time run start/end.....(HRS)	1418/1622	1705/1911	1940/2146
Static pressure.....(IN.WC)	-0.95	-0.95	-0.95
Cross sectional area (SQ.FT)	12.57	12.57	12.57
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	452.0	461.0	454.0
desiccant.....(GRAMS)	11.0	10.0	5.0
total.....(GRAMS)	463.0	471.0	459.0
Total particulate material..			
.....collected(grams)	0.1748	0.2005	0.1507
Gas meter coefficient.....	0.9976	0.9976	0.9976
Barometric pressure..(IN.HG)	29.94	29.94	29.94
Avg. orif.pres.drop..(IN.WC)	0.47	0.47	0.48
Avg. gas meter temp..(DEF-F)	85.0	85.0	84.6
Volume through gas meter....			
at meter conditions...(CF)	45.24	45.25	45.60
standard conditions.(DSCF)	43.79	43.80	44.17
Total sampling time....(MIN)	120.00	120.00	120.00
Nozzle diameter.....(IN)	.184	.184	.184
Avg.stack gas temp ..(DEG-F)	212	213	215
Volumetric flow rate.....			
actual.....(ACFM)	46487	47360	47936
dry standard.....(DSCFM)	24316	24619	25136
Isokinetic variation.....(%)	102.2	100.9	99.7
Particulate concentration...			
actual.....(GR/ACF)	0.03221	0.03671	0.02760
dry standard.....(GR/DSCF)	0.06160	0.07064	0.05265
Particle mass rate...(LB/HR)	12.839	14.907	11.343

Test No. 2
No. 2 Boiler Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	02-23-94	02-23-94	02-23-94
Time run start/end.....(HRS)	1105/1210	1250/1353	1415/1518
Static pressure.....(IN.WC)	-0.33	-0.33	-0.33
Cross sectional area (SQ.FT)	60.71	60.71	60.71
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	96.0	79.0	74.0
desiccant.....(GRAMS)	8.0	11.0	8.0
total.....(GRAMS)	104.0	90.0	82.0
Total particulate material..			
.....collected(grams)	0.0316	0.0297	0.0191
Gas meter coefficient.....	1.0027	1.0027	1.0027
Barometric pressure..(IN.HG)	29.36	29.36	29.36
Avg. orif.pres.drop..(IN.WC)	1.65	1.60	1.52
Avg. gas meter temp..(DEF-F)	72.2	83.3	89.3
Volume through gas meter....			
at meter conditions...(CF)	43.68	43.57	42.65
standard conditions.(DSCF)	42.80	41.81	40.47
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.310	.310	.310
Avg.stack gas temp ..(DEG-F)	387	391	392
Volumetric flow rate.....			
actual.....(ACFM)	149886	147699	141763
dry standard.....(DSCFM)	82214	81536	78612
Isokinetic variation.....(%)	100.5	99.0	99.4
Particulate concentration...			
actual.....(GR/ACF)	0.00625	0.00605	0.00404
dry standard.....(GR/DSCF)	0.01139	0.01096	0.00728
Particle mass rate...(LB/HR)	8.028	7.660	4.906
F-factor .....(DSCF/MMBTU)	9780	9780	9780
Emission factor...(LB/MMBTU)	0.025	0.024	0.015

Interpoll Labs Report No. 4-2326
American Crystal Sugar
East Grand Forks, MN

Test No. 2
B Pulp Dryer Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	02-23-94	02-23-94	02-23-94
Time run start/end.....(HRS)	1021/1225	1300/1503	1543/1744
Static pressure.....(IN.WC)	-0.79	-0.79	-0.79
Cross sectional area (SQ.FT)	18.99	18.99	18.99
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	305.0	322.0	331.0
desiccant.....(GRAMS)	8.0	5.0	7.0
total.....(GRAMS)	313.0	327.0	338.0
Total particulate material..			
.....collected(grams)	0.1444	0.1430	0.1427
Gas meter coefficient.....	0.9976	0.9976	0.9976
Barometric pressure..(IN.HG)	29.43	29.43	29.43
Avg. orif.pres.drop..(IN.WC)	0.43	0.43	0.46
Avg. gas meter temp..(DEF-F)	85.3	85.3	84.3
Volume through gas meter....			
at meter conditions...(CF)	41.20	43.55	44.91
standard conditions.(DSCF)	39.17	41.41	42.78
Total sampling time....(MIN)	120.00	120.00	120.00
Nozzle diameter.....(IN)	.184	.184	.184
Avg.stack gas temp ..(DEG-F)	239	237	236
Volumetric flow rate.....			
actual.....(ACFM)	68268	68024	68536
dry standard.....(DSCFM)	36779	36865	37205
Isokinetic variation.....(%)	91.3	96.3	98.6
Particulate concentration...			
actual.....(GR/ACF)	0.03063	0.02887	0.02793
dry standard.....(GR/DSCF)	0.05688	0.05329	0.05147
Particle mass rate...(LB/HR)	17.931	16.839	16.413

Test No. 4
A Pulp Dryer Stack

Results of Particulate Loading Determinations-------Method 5

	Run 1	Run 2	Run 3
Date of run	02-24-94	02-24-94	02-24-94
Time run start/end.....(HRS)	930/1134	1200/1405	1425/1625
Static pressure.....(IN.WC)	-0.78	-0.78	-0.78
Cross sectional area (SQ.FT)	12.05	12.05	12.05
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	403.0	380.0	380.0
desiccant.....(GRAMS)	13.0	12.0	11.0
total.....(GRAMS)	416.0	392.0	391.0
Total particulate material..			
.....collected(grams)	0.1536	0.1276	0.1372
Gas meter coefficient.....	1.0027	1.0027	1.0027
Barometric pressure..(IN.HG)	29.28	29.28	29.28
Avg. orif.pres.drop..(IN.WC)	0.41	0.41	0.42
Avg. gas meter temp..(DEF-F)	69.7	73.8	74.4
Volume through gas meter....			
at meter conditions...(CF)	43.86	43.64	44.08
standard conditions.(DSCF)	42.93	42.38	42.76
Total sampling time....(MIN)	120.00	120.00	120.00
Nozzle diameter.....(IN)	.184	.184	.184
Avg.stack gas temp ..(DEG-F)	208	204	203
Volumetric flow rate.....			
actual.....(ACFM)	44409	43415	43154
dry standard.....(DSCFM)	23522	23490	23462
Isokinetic variation.....(%)	99.3	98.2	99.2
Particulate concentration...			
actual.....(GR/ACF)	0.02923	0.02512	0.02690
dry standard.....(GR/DSCF)	0.05521	0.04645	0.04950
Particle mass rate...(LB/HR)	11.132	9.353	9.956

3.4 Results of Oxides of Nitrogen Determinations

Test No. 4
A Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	02-24-94	02-24-94	02-24-94	02-24-94
Time of run.....(HRS)	930	945	1000	1015
Flask number.....	61	62	63	64
Volume of flask.....(ML)	2100	2079	2067	2087
Data: time of sampling				
flask temperature..(DEG-F)	60.00	60.00	60.00	60.00
bar. press.....(IN.HG)	29.28	29.28	29.28	29.28
flask vacuum.....(IN.HG)	26.55	26.60	26.60	26.55
flask abs. press...(IN.HG)	2.73	2.68	2.68	2.73
Data: Time of Flask Opening				
flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.10	29.10	29.10	29.10
flask static press.(IN.HG)	-0.25	-0.10	-0.70	0.90
flask abs. press...(IN.HG)	28.85	29.00	28.40	30.00
Volume gas sampled....(DSML)	1800	1796	1745	1868
Moisture content.....(%V/V)	30.55	30.55	30.55	30.55
Nitrate in gas sample...(JG)	284.0	273.0	318.0	350.0
NO2 in gas sample.....(JG)	210.7	202.6	235.9	259.7
NOx Concentration				
(GR/DSCF).....	0.0512	0.0493	0.0591	0.0608
(MG/DSCM).....	117	113	135	139
(PPM-DRY).....	61	59	71	73
(PPM-WET).....	43	41	49	50
NOX Emission rate....(LB/HR)	10.30	9.93	11.91	12.24

Test No. 4
A Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	02-24-94	02-24-94	02-24-94	02-24-94
Time of run.....(HRS)	1030	1045	1100	1115
Flask number.....	65	66	19	20
Volume of flask.....(ML)	2068	2096	2069	2060
Data: time of sampling				
flask temperature..(DEG-F)	60.00	60.00	60.00	60.00
bar. press.....(IN.HG)	29.28	29.28	29.28	29.28
flask vacuum.....(IN.HG)	26.65	26.65	26.65	26.60
flask abs. press...(IN.HG)	2.63	2.63	2.63	2.68
Data: Time of Flask Opening				
flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.10	29.10	29.10	29.10
flask static press.(IN.HG)	-0.30	-0.90	0.70	-1.00
flask abs. press...(IN.HG)	28.80	28.20	29.80	28.10
Volume gas sampled....(DSML)	1776	1759	1845	1718
Moisture content.....(%V/V)	30.55	30.55	30.55	30.55
Nitrate in gas sample...(JG)	324.0	274.0	251.0	261.0
NO2 in gas sample.....(JG)	240.4	203.3	186.2	193.7
NOx Concentration				
(GR/DSCF).....	0.0592	0.0505	0.0441	0.0493
(MG/DSCM).....	135	116	101	113
(PPM-DRY).....	71	60	53	59
(PPM-WET).....	49	42	37	41
NOX Emission rate....(LB/HR)	11.91	10.17	8.89	9.92

Test No. 4
A Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	02-24-94	02-24-94	02-24-94	02-24-94
Time of run.....(HRS)	1200	1215	1230	1245
Flask number.....	21	22	23	24
Volume of flask.....(ML)	2068	2031	2056	2031
Data: time of sampling				
flask temperature..(DEG-F)	60.00	60.00	60.00	60.00
bar. press.....(IN.HG)	29.28	29.28	29.28	29.28
flask vacuum.....(IN.HG)	26.70	26.70	26.70	26.70
flask abs. press...(IN.HG)	2.58	2.58	2.58	2.58
Data: Time of Flask Opening				
flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.10	29.10	29.10	29.10
flask static press.(IN.HG)	-1.90	-0.30	-1.25	1.70
flask abs. press...(IN.HG)	27.20	28.80	27.85	30.80
Volume gas sampled....(DSML)	1671	1747	1705	1881
Moisture content.....(%V/V)	30.55	30.55	30.55	30.55
Nitrate in gas sample...(JG)	368.0	335.0	342.0	349.0
NO2 in gas sample.....(JG)	273.0	248.6	253.8	259.0
NOx Concentration				
(GR/DSCF).....	0.0714	0.0622	0.0650	0.0602
(MG/DSCM).....	163	142	149	138
(PPM-DRY).....	85	74	78	72
(PPM-WET).....	59	52	54	50
NOX Emission rate....(LB/HR)	14.39	12.52	13.10	12.12

Test No. 2
B Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	02-23-94	02-23-94	02-23-94	02-23-94
Time of run.....(HRS)	1645	1700	1715	1730
Flask number.....	43	44	46	45
Volume of flask.....(ML)	2088	2090	2090	2086
Data: time of sampling				
flask temperature..(DEG-F)	60.00	60.00	60.00	60.00
bar. press.....(IN.HG)	29.43	29.43	29.43	29.43
flask vacuum.....(IN.HG)	26.80	26.80	26.85	26.90
flask abs. press...(IN.HG)	2.63	2.63	2.58	2.53
Data: Time of Flask Opening				
flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	-5.65	0.70	-6.00	-5.00
flask abs. press...(IN.HG)	23.46	29.81	23.11	24.11
Volume gas sampled....(DSML)	1427	1864	1407	1477
Moisture content.....(%V/V)	27.68	27.68	27.68	27.68
Nitrate in gas sample...(JG)				
NO2 in gas sample.....(JG)				
<u>NOx Concentration</u>				
(GR/DSCF).....				
(MG/DSCM).....				
(PPM-DRY).....				
(PPM-WET).....				
NOX Emission rate....(LB/HR)				

Test No. 2
B Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	02-23-94	02-23-94	02-23-94	02-23-94
Time of run.....(HRS)	1745	1835	1850	1910
Flask number.....	47	48	67	68
Volume of flask.....(ML)	2074	2102	2073	2101
Data: time of sampling				
flask temperature..(DEG-F)	60.00	60.00	60.00	60.00
bar. press.....(IN.HG)	29.43	29.43	29.43	29.43
flask vacuum.....(IN.HG)	26.95	26.85	26.95	27.00
flask abs. press...(IN.HG)	2.48	2.58	2.48	2.43
Data: Time of Flask Opening				
flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	0.50	-3.35	0.60	0.50
flask abs. press...(IN.HG)	29.61	25.76	29.71	29.61
Volume gas sampled....(DSML)	1847	1599	1853	1875
Moisture content.....(%V/V)	27.68	27.68	27.68	27.68
Nitrate in gas sample...(JG)			259.0	243.0
NO2 in gas sample.....(JG)			192.2	180.3
NOx Concentration				
(GR/DSCF).....			0.0453	0.0420
(MG/DSCM).....			104	96
(PPM-DRY).....			54	50
(PPM-WET).....			39	36
NOX Emission rate....(LB/HR)			14.53	13.47

Test No. 2
B Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	02-23-94	02-23-94	02-23-94	02-23-94
Time of run.....(HRS)	1945	2013	2029	2040
Flask number.....	69	70	71	72
Volume of flask.....(ML)	2069	2071	2038	2092
Data: time of sampling				
flask temperature..(DEG-F)	60.00	60.00	60.00	60.00
bar. press.....(IN.HG)	29.43	29.43	29.43	29.43
flask vacuum.....(IN.HG)	26.85	26.80	26.80	26.80
flask abs. press...(IN.HG)	2.58	2.63	2.63	2.63
Data: Time of Flask Opening				
flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	0.10	-0.10	-6.50	-4.30
flask abs. press...(IN.HG)	29.21	29.01	22.61	24.81
Volume gas sampled....(DSML)	1808	1793	1335	1522
Moisture content.....(%V/V)	27.68	27.68	27.68	27.68
Nitrate in gas sample...(JG)	276.0	307.0	253.0	270.0
NO2 in gas sample.....(JG)	204.8	227.8	187.7	200.3
NOx Concentration				
(GR/DSCF).....	0.0495	0.0555	0.0614	0.0575
(MG/DSCM).....	113	127	141	132
(PPM-DRY).....	59	66	74	69
(PPM-WET).....	43	48	53	50
NOX Emission rate....(LB/HR)	15.87	17.80	19.70	18.44

Test No. 5
C Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	02-24-94	02-24-94	02-24-94	02-24-94
Time of run.....(HRS)	832	847	914	929
Flask number.....	13	14	15	16
Volume of flask.....(ML)	2060	2048	2045	2067
Data: time of sampling				
flask temperature..(DEG-F)	50.00	50.00	50.00	50.00
bar. press.....(IN.HG)	29.24	29.24	29.24	29.24
flask vacuum.....(IN.HG)	26.70	26.90	26.80	26.85
flask abs. press...(IN.HG)	2.54	2.34	2.44	2.39
Data: Time of Flask Opening				
flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.10	29.10	29.10	29.10
flask static press.(IN.HG)	1.10	6.35	5.75	-0.40
flask abs. press...(IN.HG)	30.20	35.45	34.85	28.70
Volume gas sampled....(DSML)	1867	2223	2173	1782
Moisture content.....(%V/V)	28.69	28.69	28.69	28.69
Nitrate in gas sample...(JG)	525.0	454.0	436.0	438.0
NO2 in gas sample.....(JG)	389.5	336.9	323.5	325.0
NOx Concentration				
(GR/DSCF).....	0.0912	0.0662	0.0651	0.0797
(MG/DSCM).....	209	152	149	182
(PPM-DRY).....	109	79	78	95
(PPM-WET).....	78	56	56	68
NOX Emission rate....(LB/HR)	19.62	14.25	14.00	17.15

Test No. 5
C Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	02-24-94	02-24-94	02-24-94	02-24-94
Time of run.....(HRS)	945	958	1014	1030
Flask number.....	17	18	43	44
Volume of flask.....(ML)	2054	2045	2088	2090
Data: time of sampling				
flask temperature..(DEG-F)	45.00	40.00	40.00	40.00
bar. press.....(IN.HG)	29.24	29.24	29.24	29.24
flask vacuum.....(IN.HG)	26.90	26.60	27.10	27.10
flask abs. press...(IN.HG)	2.34	2.64	2.14	2.14
Data: Time of Flask Opening				
flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.10	29.10	29.10	29.10
flask static press.(IN.HG)	1.60	-5.00	-5.65	0.70
flask abs. press...(IN.HG)	30.70	24.10	23.45	29.80
Volume gas sampled....(DSML)	1907	1432	1454	1892
Moisture content.....(%V/V)	28.69	28.69	28.69	28.69
Nitrate in gas sample...(JG)	333.0	327.0		
NO2 in gas sample.....(JG)	247.1	242.6		
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0566	0.0740		
(MG/DSCM).....	130	169		
(PPM-DRY).....	68	89		
(PPM-WET).....	48	63		
NOX Emission rate....(LB/HR)	12.18	15.93		

Test No. 5
C Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations---------Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	02-24-94	02-24-94	02-24-94	02-24-94
Time of run.....(HRS)	1048	1108	1120	1135
Flask number.....	45	46	47	48
Volume of flask.....(ML)	2086	2090	2074	2102
Data: time of sampling				
flask temperature..(DEG-F)	40.00	40.00	35.00	36.00
bar. press.....(IN.HG)	29.24	29.24	29.24	29.24
flask vacuum.....(IN.HG)	27.10	26.90	27.40	27.80
flask abs. press...(IN.HG)	2.14	2.34	1.84	1.44
Data: Time of Flask Opening				
flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.10	29.10	29.10	29.10
flask static press.(IN.HG)	5.00	6.00	0.50	-3.35
flask abs. press...(IN.HG)	34.10	35.10	29.60	25.75
Volume gas sampled....(DSML)	2184	2242	1884	1674
Moisture content.....(%V/V)	28.69	28.69	28.69	28.69
Nitrate in gas sample...(JG)				
NO2 in gas sample.....(JG)				
<u>NOx Concentration</u>				
(GR/DSCF).....				
(MG/DSCM).....				
(PPM-DRY).....				
(PPM-WET).....				
NOX Emission rate....(LB/HR)				

3.5 Results of Carbon Monoxide Determinations

Test No. 1
No. 1 Boiler Stack

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	02-22-94	02-22-94	02-22-94
Time run start/end.....(HRS)	1220/1330	1430/1532	1610/1715
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	10.68	9.45	9.00
O2 Concentration.....(%V/V)	8.50	8.10	8.10
Volumetric flow rate (DSCFM)	93492	92871	96705
CO concentration.....			
(GR/DSCF).....	0.2086	0.1934	0.1883
(MG/DSCM).....	477.65	442.70	431.05
(PPM-WET).....	366.21	344.09	336.70
(PPM-DRY).....	410.00	380.00	370.00
(PPM-DRY @ 7% O2).....	459.20	412.40	401.55
CO emission rate.....(LB/HR)	167.178	153.916	156.053

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

Interpoll Labs Report No. 4-2326
American Crystal Sugar
East Grand Forks, Minnesota

Test No. 2
No. 2 Boiler Stack

Results of CO Determinations ----------Method 10

	Run 1	Run 2	Run 3
Date of run	02-23-94	02-23-94	02-23-94
Time run start/end.....(HRS)	1105/1210	1250/1353	1415/1518
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	10.28	9.21	8.72
O2 Concentration.....(%V/V)	7.40	7.30	7.10
Volumetric flow rate (DSCFM)	82214	81536	78612
CO concentration.....			
(GR/DSCF).....	0.1069	0.0916	0.1018
(MG/DSCM).....	244.65	209.70	233.00
(PPM-WET).....	188.41	163.42	182.56
(PPM-DRY).....	210.00	180.00	200.00
(PPM-DRY @ 7% O2).....	216.18	183.94	201.44
CO emission rate.....(LB/HR)	75.298	64.009	68.571

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value is less than or equal to the reported value

3.6 Results of Opacity Observations

Interpoll Labs Report No. 4-2326
American Crystal Sugar
East Grand Forks, Minnesota

Test No. 4
A Pulp Dryer Stack

Results of Opacity Observations ---------- EPA Method 9*

Percent Opacity	Optical Density	Relative Frequency(%)
0	.0000	
5	.0223	
10	.0458	
15	.0706	
20	.0969	
25	.1249	
30	.1549	
35	.1871	
40	.2219	
45	.2596	
50	.3010	
55	.3468	
60	.3979	
65	.4559	
70	.5229	
75	.6021	
80	.6990	
85	.8239	
90	1.0000	
95	1.3010	
99	2.0000	

Observer: Rick Eidem
Cert. Date: 10-6-93
Date of Observation: 2-22-94
Time of Observation: 0930-

* Could not read due to cloud cover and plumes intermixing.

Interpoll Labs Report No. 4-2326
American Crystal Sugar
East Grand Forks, Minnesota

Test No. 2
B Pulp Dryer Stack

Results of Opacity Observations ---------- EPA Method 9*

Percent Opacity	Optical Density	Relative Frequency(%)
0	.0000	
5	.0223	
10	.0458	
15	.0706	
20	.0969	
25	.1249	
30	.1549	
35	.1871	
40	.2219	
45	.2596	
50	.3010	
55	.3468	
60	.3979	
65	.4559	
70	.5229	
75	.6021	
80	.6990	
85	.8239	
90	1.0000	
95	1.3010	
99	2.0000	

Observer: Rick Eidem
Cert. Date: 10-6-93
Date of Observation: 2-22-94
Time of Observation: 1000-

* Could not read due to cloud cover and plumes intermixing.

Interpoll Labs Report No. 4-2326
American Crystal Sugar
East Grand Forks, Minnesota

Test No. 1
C Pulp Dryer Stack

Results of Opacity Observations ---------- EPA Method 9*

Percent Opacity	Optical Density	Relative Frequency(%)
0	.0000	
5	.0223	
10	.0458	
15	.0706	
20	.0969	
25	.1249	
30	.1549	
35	.1871	
40	.2219	
45	.2596	
50	.3010	
55	.3468	
60	.3979	
65	.4559	
70	.5229	
75	.6021	
80	.6990	
85	.8239	
90	1.0000	
95	1.3010	
99	2.0000	

Observer: Rick Eidem
Cert. Date: 10-6-93
Date of Observation: 2-22-94
Time of Observation: 1400-

* Could not read due to cloud cover and plumes intermixing.

3.7 Results of Particle Size Distribution

Interpoll Labs Report No. 3-1638
American Crystal Suger
East Grand Forks, Minnesota

Test No. 3

Results of the Particle Size Distribution Determination

Sample Identification: B Pulp Dyrer Stack - February 23, 1994
Cascade Impactor Sampling

Assigned Density: 1.00 g/cc

	Run 1	
Stage	um	% ≥
Preimpactor	10.0	10.9
1	6.1	18.0
2	4.0	23.0
3	2.5	29.8
4	1.5	33.2
5	0.98	36.0
6	0.61	39.5
7	0.35	45.6

um — Aerodynamic equivalent diameter in microns
% ≥ — Relative cumulative frequency - percent by mass of aerosol with diameters greater than stated size

Test No. 3
B Pulp Dryer Stack
(CASCACE IMPACTOR)

Results of Particulate Loading Determinations-------Method 5

	Run 1
Date of run	02-23-94
Time run start/end.....(HRS)	1833/1940
Static pressure.....(IN.WC)	-0.79
Cross sectional area (SQ.FT)	18.99
Pitot tube coefficient.....	.840
Water in sample gas	
condenser.....(ML)	0.0
impingers.....(GRAMS)	201.0
desiccant.....(GRAMS)	5.0
total.....(GRAMS)	206.0
Total particulate material..	
.....collected(grams)	0.0697
Gas meter coefficient.....	0.9976
Barometric pressure..(IN.HG)	29.43
Avg. orif.pres.drop..(IN.WC)	0.71
Avg. gas meter temp..(DEF-F)	82.0
Volume through gas meter....	
at meter conditions...(CF)	28.05
standard conditions.(DSCF)	26.85
Total sampling time....(MIN)	60.00
Nozzle diameter.....(IN)	.206
Avg.stack gas temp ..(DEG-F)	236
Volumetric flow rate.....	
actual.....(ACFM)	68604
dry standard.....(DSCFM)	37510
Isokinetic variation.....(%)	97.9
Particulate concentration...	
actual.....(GR/ACF)	0.02189
dry standard.....(GR/DSCF)	0.04004
Particle mass rate...(LB/HR)	12.87

4 RESULTS OF FUEL ANALYSES

INTERPOLL LABORATORIES, INC.
Fuel Laboratory
(612) 786-6020

3/11/94

Client: AMERICAN CRYSTAL SUGAR, EAST GRAND FORKS

Laboratory Log Number: 2326-85-7242

Source: A PULP DRYER

Sample Identification: COAL, 2/24/94

Proximate and Ultimate Analysis WT %

Proximate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			24.97
Ash		3.73	2.79
Volatile Matter	42.55	40.96	30.73
Fixed Carbon (calculation)	57.45	55.31	41.50
Sulfur	0.37	0.35	0.26
Heating Value, BTU/LB.	13028	12542	9410

Ultimate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			24.97
Ash		3.73	2.79
Carbon	78.66	75.73	56.82
Hydrogen	4.32	4.16	3.12
Nitrogen	1.48	1.43	1.07
Oxygen (calculated)	15.17	14.60	10.96
Sulfur	0.37	0.35	0.26

Respectfully submitted,

Jeannie F. O'Neil, Manager
Inorganic Chemistry Group

9941

INTERPOLL LABORATORIES, INC.
Fuel Laboratory
(612) 786-6020

3/11/94

Client: AMERICAN CRYSTAL SUGAR, EAST GRAND FORKS

Laboratory Log Number: 2326-84-7241

Source: B PULP DRYER

Sample Identification: COAL, 2/23/94

Proximate and Ultimate Analysis WT %

Proximate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			25.55
Ash		4.51	3.36
Volatile Matter	43.70	41.73	31.07
Fixed Carbon (calculation)	56.30	53.76	40.03
Sulfur	0.45	0.43	0.32
Heating Value, BTU/LB.	13238	12641	9412

Ultimate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			25.55
Ash		4.51	3.36
Carbon	79.08	75.51	56.22
Hydrogen	4.53	4.33	3.22
Nitrogen	1.36	1.30	0.97
Oxygen (calculated)	14.58	13.92	10.37
Sulfur	0.45	0.43	0.32

Respectfully submitted,

Jeannie F. O'Neil, Manager
Inorganic Chemistry Group

9913

INTERPOLL LABORATORIES, INC.
Fuel Laboratory
(612) 786-6020

3/11/94

Client: AMERICAN CRYSTAL SUGAR, EAST GRAND FORKS

Laboratory Log Number: 2326-82-7239

Source: C PULP DRYER

Sample Identification: COAL, 2/22/94

Proximate and Ultimate Analysis WT %

Proximate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			24.90
Ash		4.91	3.69
Volatile Matter	43.53	41.39	31.09
Fixed Carbon (calculation)	56.47	53.69	40.33
Sulfur	0.47	0.45	0.34
Heating Value, BTU/LB.	13191	12543	9420

Ultimate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			24.90
Ash		4.91	3.69
Carbon	79.34	75.44	56.66
Hydrogen	4.87	4.63	3.47
Nitrogen	1.39	1.32	0.99
Oxygen (calculated)	13.93	13.25	9.95
Sulfur	0.47	0.45	0.34

Respectfully submitted,

Jeannie F. O'Neil, Manager
Inorganic Chemistry Group

10095

INTERPOLL LABORATORIES, INC.
Fuel Laboratory
(612) 786-6020

3/11/94

Client: AMERICAN CRYSTAL SUGAR, EAST GRAND FORKS

Laboratory Log Number: 2326-81-7238

Source: NO. 1 BOILER

Sample Identification: COAL, 2/22/94

Proximate and Ultimate Analysis WT %

Proximate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			24.52
Ash		4.24	3.20
Volatile Matter	44.45	42.56	32.13
Fixed Carbon (calculation)	55.55	53.19	40.15
Sulfur	0.47	0.45	0.34
Heating Value, BTU/LB.	13201	12641	9541

Ultimate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			24.52
Ash		4.24	3.20
Carbon	79.21	75.85	57.25
Hydrogen	4.99	4.78	3.61
Nitrogen	1.37	1.31	0.99
Oxygen (calculated)	13.96	13.36	10.09
Sulfur	0.47	0.45	0.34

Respectfully submitted,

Jeannie F. O'Neil, Manager
Inorganic Chemistry Group

10105

INTERPOLL LABORATORIES, INC.
Fuel Laboratory
(612) 786-6020

3/11/94

Client: AMERICAN CRYSTAL SUGAR, EAST GRAND FORKS

Laboratory Log Number: 2326-83-7240

Source: NO. 2 BOILER

Sample Identification: COAL, 2/23/94

Proximate and Ultimate Analysis WT %

Proximate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			24.67
Ash		4.06	3.06
Volatile Matter	44.16	42.37	31.92
Fixed Carbon (calculation)	55.84	53.57	40.36
Sulfur	0.42	0.40	0.30
Heating Value, BTU/LB.	13168	12633	9517

Ultimate Analysis WT %

Parameter	Moisture & Ash Free	Moisture Free	As Received
Moisture, Total			24.67
Ash		4.06	3.06
Carbon	78.43	75.25	56.69
Hydrogen	4.48	4.30	3.24
Nitrogen	1.35	1.30	0.98
Oxygen (calculated)	15.31	14.69	11.07
Sulfur	0.42	0.40	0.30

Respectfully submitted,

Jeannie F. O'Neil, Manager
Inorganic Chemistry Group

9850

APPENDIX A

SAMPLING TRAIN CALIBRATION DATA

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job ACS - EGF Date 2-23-94

Operator SLB Module No. 3

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 29.36 in. Hg. $_T$ = 1.0027 ^H@ 1.34 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(409.80)	[redacted]	
2.5	411.72	54	54
5.0	413.62	55	56
7.5	415.50	57	55
10	417.40	58	55
[redacted]	V_m= 7.60	Avg(t_m)= 55.5	°F

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{T\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(1.0027)(7.60)}\left[\frac{(55.5) + 460}{(29.36)}\right]^{0.5}$$

$$Y_{cn} = .9820$$

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job ACS - EGF Date 2-22-94

Operator SLB Module No. 3

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 29.73 in. Hg. Y_T = 1.0027 ^H@ 1.74 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(249.60)	[redacted]	
2.5	251.50	54	52
5.0	253.38	56	53
7.5	255.27	58	54
10	257.18	60	55
[redacted]	V_m=7.58	Avg(t_m)=55.25 °F	

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{Y_T V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(1.0027)(7.58)}\left[\frac{(55.25) + 460}{(29.73)}\right]^{0.5}$$

Y_{cn} = .9783

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432

INTERPOLL LABORATORIES
EPA Method 5 Gas Metering System
Quality Control Check Data Sheet

Job ACS - EGF Date 2-22-94

Operator SLB Module No. 7

Instructions: Operate the control module at a flow rate equal to ^H@ for 10 minutes before attaching the umbilical. Record the following data:

Bar press 29.93 in. Hg. $_T$ = .9976 ^H@ 1.93 in. W.C.

Time (min)	Volume (CF)	Meter Temp. (°F)	
		Inlet	Outlet
[redacted]	(918.80)	[redacted]	
2.5	920.66	67	64
5.0	922.52	68	65
7.5	924.40	70	66
10	926.25	70	66
[redacted]	V_m= 7.45	Avg(t_m)=67	°F

Calculate Y_{cn} as follows:

$$Y_{cn} = \frac{1.786}{T\ V_m}\left[\frac{(t_m + 460)}{P_b}\right]^{0.5}$$

$$Y_{cn} = \frac{1.786}{(.9976)(7.45)}\left[\frac{(67) + 460}{(29.93)}\right]^{0.5}$$

$$Y_{cn} = 1.0084$$

If Y_{cn} is not within the range of 0.97 to 1.03, "the volume metering system should be investigated before beginning."

CFR Title 40, Part 60, Appendix A, Method 5, Section 4.4.1

S-432

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: February 25, 1994

Meter Box No. : 3 (Rockwell Dry Test Meter Serial No. 35302)

Date of Last Calibration: February 11, 1994
Calibration Technician: E. Trowbridge
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
February 15, 1994	4-2283	965.85	1100.44	134.59	134.59
February 18, 1994	4-2201	158.20	249.30	91.10	225.69
February 22, 1994	4-2326	257.80	680.63	422.83	648.52

* Total volume through meter since last calibration.

Interpoll Laboratories, Inc.
(612) 786-6020

Meter Box Calibration and Usage Status

Date of Report: February 25, 1994

Meter Box No. : 7 (Rockwell Dry Test Meter Serial No. 965550)

Date of Last Calibration: February 11, 1994
Calibration Technician: E. Trowbridge
Wet Test Meter No.: American Meter AL-20

Date of Use	Report No.	Initial Meter Reading	Final Meter Reading	Volume/Job (cu. ft.)	Total Volume* (cu. ft.)
February 15, 1994	4-2283	807.32	918.03	110.71	110.71
February 22, 1994	4-2326	926.43	1222.13	295.70	406.41

* Total volume through meter since last calibration.

Date 2-11-94

Bar. Press. 29.22 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

Control Module No. 5
Serial No. DTM 35302
Wet Test Meter No. AL-20
Technician [signature]

ΔH (in. WC)		Gas Volume Wet Test Meter (ft^3)	* Cal. Index θ (%)	* Diff. Wet Test Meter ΔP_w (in. WC)	Gas Volume Dry test meter (ft^3)		Gas temperatures			Time θ min/sec	Meter Coeff. Y	Orifice Const. ΔH@	C_f
nominal	actual				V_{df}	V_{df}	Wet Test t_w (°F)	Dry Test t_{df} (°F)	Dry Test t_{do} (°F)				
0.6	.5	2	99.85	0.01	941.500	946.530	64	78	73	3/53	1.0040	1.66	
1.2	1.2	3	99.91	0.025	937.500	940.530	64	72	65	4/48	.9974	1.73	
2.0	2.0	3	99.93	0.055	941.000	944.050	64	77	71	3/46	.9965	1.76	
3.3	3.3	5	100.00	0.09	947.000	952.052	64	85	76	4/55	1.0062	1.76	
4.7	4.7	5	100.02	0.12	952.500	957.580	64	96	78	4/10	1.0077	1.79	
											1.0027	1.74	

Positive leak check performed by [signature]
Meter was in tolerance ☒
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by [signature] Date 2/14/94

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.

S0102RR 11/91

Date 2-11-94

Bar. Press. 29.22 in. Hg

INTERPOLL LABORATORIES, INC.
METER CALIBRATION SHEET
EPA METHOD 5

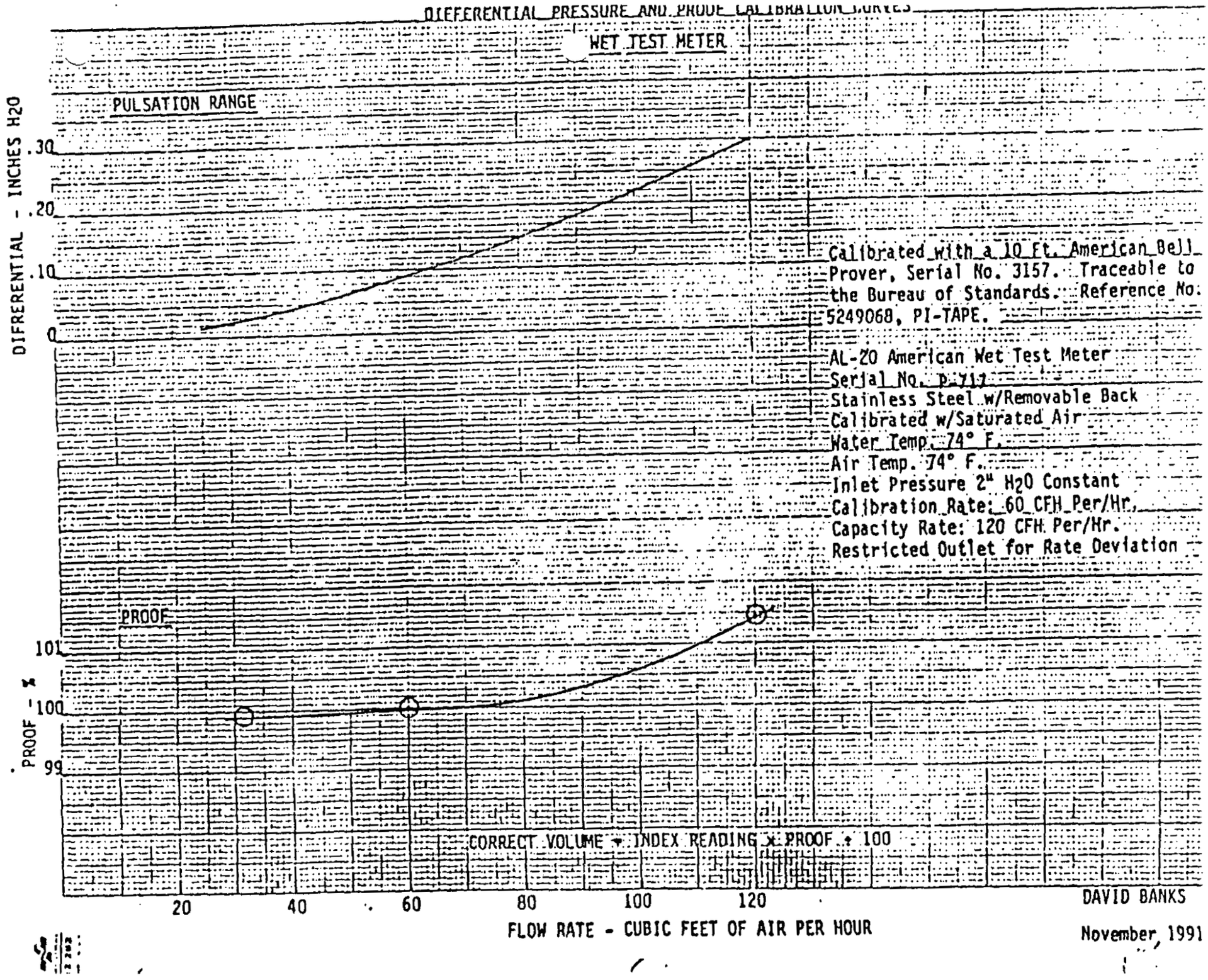
Control Module No. 7
Serial No. DTM 964550
Wet Test Meter No. AL-20
Technician [signature]

ΔH (in. WC)		Gas Volume Wet Test Meter (ft^3)	* Cal. Index Y (%)	* Diff. Wet Test Meter ΔP_w (in. WC)	Gas Volume Dry test meter (ft^3)		Gas temperatures			Time θ	Meter Coeff.	Orifice Const.	C_f
							Wet Test	Dry Test					
nominal	actual				V_{d1}	V_{df}	t_w (°F)	t_{d1} (°F)	t_{do} (°F)	(min/sec)	Y	ΔH@	
0.6	.5	2	99.85	0.01	785.000	787.047	65	78	70	5/07	.9910	1.84	
1.2	1.2	3	99.91	0.025	778.000	781.052	65	76	68	5/04	.9921	1.93	
2.0	2.0	3	99.93	0.055	751.500	784.554	65	80	70	3/58	.9951	1.96	
3.3	3.3	5	100.00	0.09	787.500	792.573	65	86	73	5/07	1.0042	1.92	
4.7	4.7	5	100.02	0.12	793.000	798.078	65	89	75	4/23	1.0057	1.99	
											.9976	1.93	

Positive leak check performed by [signature]
Meter was in tolerance ☒
Meter was not in tolerance ☐; readjusted linkage
Meter was not in tolerance ☐; changed dry test meters

Approved by [signature] Date 2/14/94

* Based on AL-20 wet test meter calibration in Nov. 1991 against Bell Prover (NBS Traceable) - Carl Poe Co.


DIFFERENTIAL PRESSURE AND PROOF CALIBRATION CURVES
WET TEST METER
PULSATION RANGE
DIFFERENTIAL - INCHES H2O
.30
.20
.10
0
Calibrated with a 10 Ft. American Bell Prover, Serial No. 3157. Traceable to the Bureau of Standards. Reference No. 5249068, PI-TAPE.
AL-20 American Wet Test Meter
Serial No. P-717
Stainless Steel w/Removable Back
Calibrated w/Saturated Air
Water Temp. 74° F.
Air Temp. 74° F.
Inlet Pressure 2" H2O Constant
Calibration Rate: 60 CFH Per/Hr.
Capacity Rate: 120 CFH Per/Hr.
Restricted Outlet for Rate Deviation
PROOF
101
100
99
PROOF - %
CORRECT VOLUME = INDEX READING x PROOF ÷ 100
20
40
60
80
100
120
FLOW RATE - CUBIC FEET OF AIR PER HOUR
DAVID BANKS
November, 1991

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 02-23-94 Nozzle Number Impact
Technician: Duane Van Hoever

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.207
2	.206
3	.205
Average:	.206

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 02-24-94 Nozzle Number 6-3
Technician: Scott Bainville

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.183
2	.184
3	.185
Average:	.184

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 02-22-94 Nozzle Number 7-5
Technician: Scott Bainville

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.310
2	.310
3	.311
Average:	.310

Interpoll Laboratories, Inc.
(612) 786-6020

Nozzle Calibration
Data Sheet

Date of Calibration: 02-23-94 Nozzle Number 7-5
Technician: Scott Bainville

The nozzle is rotated in 60 degree increments and the diameter at each point is measured to the nearest 0.001 inch. The observed readings and average are shown below.

Position	Diameter (inches)
1	.310
2	.309
3	.310
Average:	.310

Interboll Laboratories, Inc.

Temperature Measurement Device Calibration Sheet

Unit under test:

Vendor Beckman

Model HD110T — Serial Number PDT #18

Range -4°F — 1999 °F °F — Thermocouple Type K

Date of Calibration 2/16/94 — Technician D Van Hoeven

Method of Calibration:

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100 °F) ± 1 degree (for negative temperatures add ± 2 degrees. The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation Δt (°F)	Deviation (%)
0		0	0	0
100		96	4	.89
200		199	1	.15
300		298	2	.26
400		395	5	.58
500		495	5	.52
600		598	2	.19
700		698	2	.17
800		803	3	.24
900		906	6	.44
1000		1011	11	.75
1100		1114	14	.90
1200		1220	20	1.20
1300		1321	21	1.19
1400		1426	26	1.40
1500		1524	24	1.22
1600		1625	25	1.21
1700		1720	20	.92
1800		1819	19	.84
1900		1912	12	.51
2000		OL		
2100		OL		
		Averages:		.68

OF = off scale response by unit under test (°F)

% dev = 100 Δt / (460 + t)

☐ Unit in tolerance

☐ Unit was not in tolerance: recalibrated - See new calibration sheet.

S-433

Interpoll Laboratories, Inc.

Temperature Measurement Device Calibration Sheet

Unit under test:

Vendor OMEGA PDT-29

Model HH21 Serial Number T-97106

Range 0 - 2100 °F Thermocouple Type K

Date of Calibration 10-14-93 Technician SLB

Method of Calibration:

☐ Comparison against ASTM mercury in glass thermometer using a thermostatted and insulated aluminum block designed to provide uniform temperature. The temperature is adjusted by adjusting the voltage on the block heater cartridge.

☒ Omega Model CL-300 Type K Thermocouple Simulator which provides 22 precise temperature equivalent millivolt signals. The CL-300 is cold junction compensated. Calibration accuracy is ± 0.1% of span (2100 °F) ± 1 degree (for negative temperatures add ± 2 degrees. The CL-300 simulates exactly the millivoltage of a Type K thermocouple at the indicated temperature.

Desired Temp (°F) Nominal	Temperature of Standard or Simulated Temp (°F)	Response of Unit Under Test (°F)	Deviation Δt (°F)	Deviation (%)
0	0	-0.7	0.7	0.00
100	100	98.6	1.4	0.25
200	200	200.6	0.6	0.09
300	300	298.8	1.2	0.16
400	400	398.1	1.9	0.19
500	500	498.8	1.2	0.13
600	600	600.7	0.7	0.07
700	700	698.9	1.1	0.09
800	800	800.9	0.9	0.07
900	900	898.9	1.1	0.08
1000	1000	999.9	0.1	0.01
1100	1100	1098.6	1.4	0.09
1200	1200	1201.0	1.0	0.06
1300	1300	1298.7	1.3	0.07
1400	1400	1401.1	1.1	0.06
1500	1500	1498.4	1.6	0.08
1600	1600	1599.8	0.2	0.01
1700	1700	1697.8	2.2	0.10
1800	1800	1799.7	0.3	0.01
1900	1900	1897.0	3.0	0.13
2000	2000	1998.6	1.4	0.06
2100	2100	2097.0	3.0	0.12
		Averages:	1.22	0.09

OF = off scale response by unit under test (°F)

% dev = 100 Δt / (460 + t)

☐ Unit in tolerance

☐ Unit was not in tolerance: recalibrated - See new calibration sheet.

S-433

(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 22-6

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .462 IN.
3. Base to Side B opening plane (P_B) .462 IN.

Alignment:

4. α_1 <10° 0
5. α_2 <10° 0

6. B_1 <5° 1
7. B_2 < 5° 1

8. Z <.125" .02
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .760 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84

☐ Does not meet EPA design criteria - thus calibrate in wind tunnel
C_p = _____

Date of Inspection: 4-9-93

Inspected by: [signature]

CFR Title 40 Part 60 Appendix A Method 2

(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 23-4

Pitot tube dimensions:

1. External tubing diameter (D_t) .314 IN.
2. Base to Side A opening plane (P_A) .400 IN.
3. Base to Side B opening plane (P_B) .460 IN.

Alignment:

4. α_1 <10° 0
5. α_2 <10° 0

6. B_1 <5° 1
7. B_2 < 5° 1

8. Z <.125" .03
9. W <.0625" .03

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .755 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84

☐ Does not meet EPA design criteria - thus calibrate in wind tunnel
C_p = _____

Date of Inspection: 4-7-93

Inspected by: [signature]

CFR Title 40 Part 60 Appendix A Method 2

(612)786-6020

S-Type Pitot Tube Inspection Sheet

Pitobe No. 23-6

Pitot tube dimensions:

1. External tubing diameter (D_t) .316 IN.
2. Base to Side A opening plane (P_A) .460 IN.
3. Base to Side B opening plane (P_B) .461 IN.

Alignment:

4. α_1 <10° 1
5. α_2 <10° 1

6. B_1 <5° 1
7. B_2 < 5° 2

8. Z <.125" .02
9. W <.0625" .02

Distance from Pitot to Probe Components:

10. Pitot to 0.500 IN. nozzle .750 IN.
11. Pitot to probe sheath 3.00 IN.
12. Pitot to thermocouple (parallel to probe) 3.00 IN.
13. Pitot to thermocouple (perpendicular to probe) .760 IN.

☒ Meets all EPA design criteria thus C_p = 0.84

☐ Does not meet EPA design criteria - thus calibrate in wind tunnel
C_p = _____

Date of Inspection: 4-7-93

Inspected by: [signature]

CFR Title 40 Part 60 Appendix A Method 2

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 10-15-93

Technician SCOTT L BAINVILLE

Mercury Column Barometer No. 1

Aneroid Barometer No. S60209

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.10	76	.134	28.97	29.16	0.19
29.13	73	.124	29.01	29.19	0.18

Has this barometer shown any consistent problems with calibration? Yes/No. If yes, explain. NO

Has problem been alleviated? Yes/No. How? N/A

*Note

Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20-30 minutes before calibrating. Aneriod barometer will be calibrated to the adjusted mercury barometer readings.

S-312

INTERPOLL LABORATORIES
(612)786-6020

Stack Sampling Department - QA
Aneroid Barometer Calibration Sheet

Date 2/16/94

Technician D. Van Hoeven

Mercury Column Barometer No. 1

Aneroid Barometer No. _____

Actual Mercury Barometer Read	Ambient Temp.	Temperature Correction Factor	Adjsted Mercury Barometer Read	Initial Aneriod Barometer Read	Difference (P_{ba}-P_{bm})
29.23	76	.124	29.11	29.10	.01

Has this barometer shown any consistent problems with calibration? Yes/(No) If yes, explain. _____

Has problem been alleviated? Yes/No. How? _____

*Note

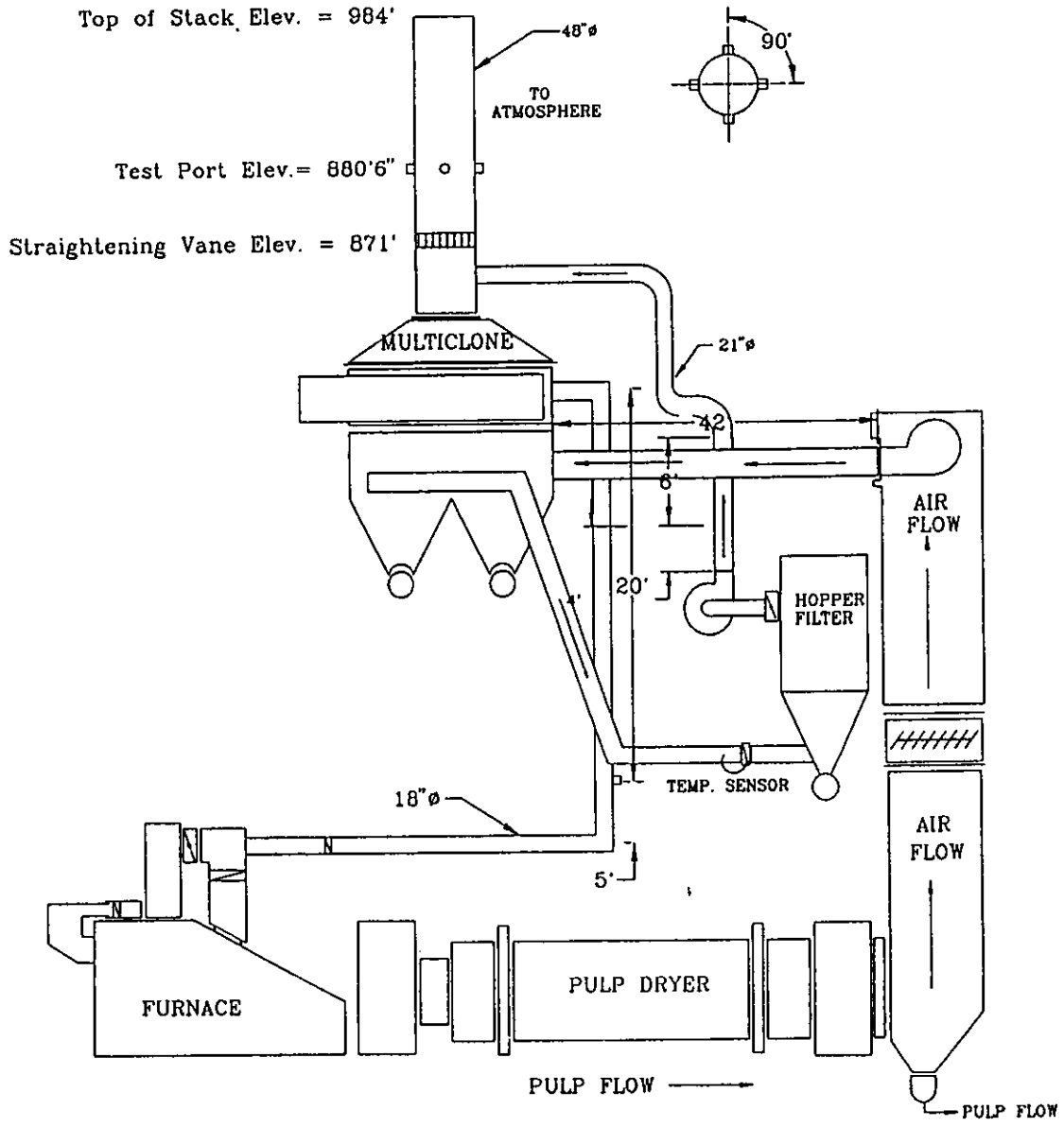
Aneroid barometers will be calibrated periodically against a mercury column barometer. The aneroid barometer to be calibrated should be placed in close proximity to the mercury barometer and left to equilibrate for 20-30 minutes before calibrating. Aneriod barometer will be calibrated to the adjusted mercury barometer readings.

S-312

APPENDIX B

LOCATION OF TEST PORTS

C0090103



Base Elev. 834'0"

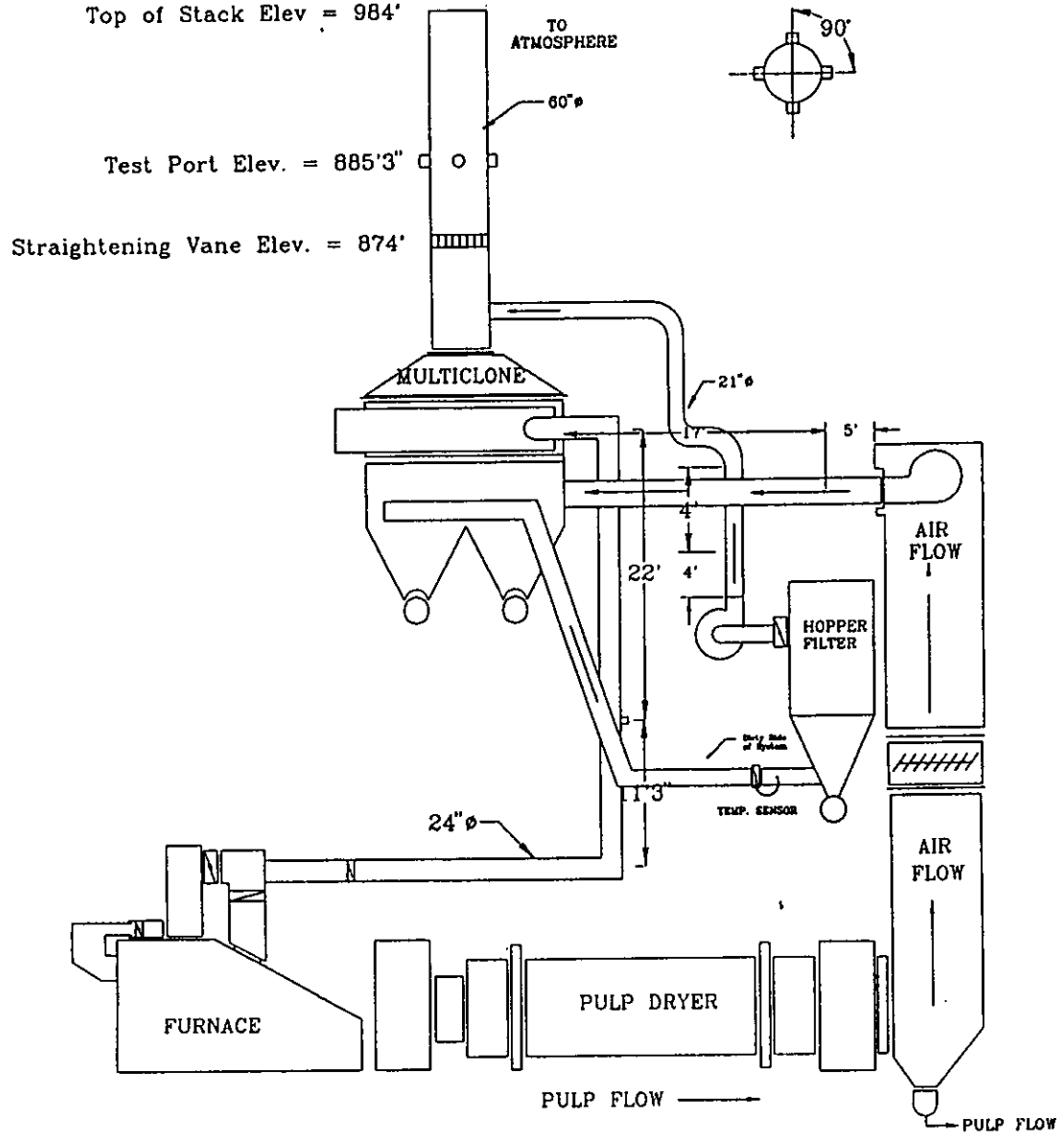
B-1

'A' Pulp Drier Pollution Control Equipment Flow Diagram.

American Crystal Sugar Co.

100 06/3
E0100903

20090102



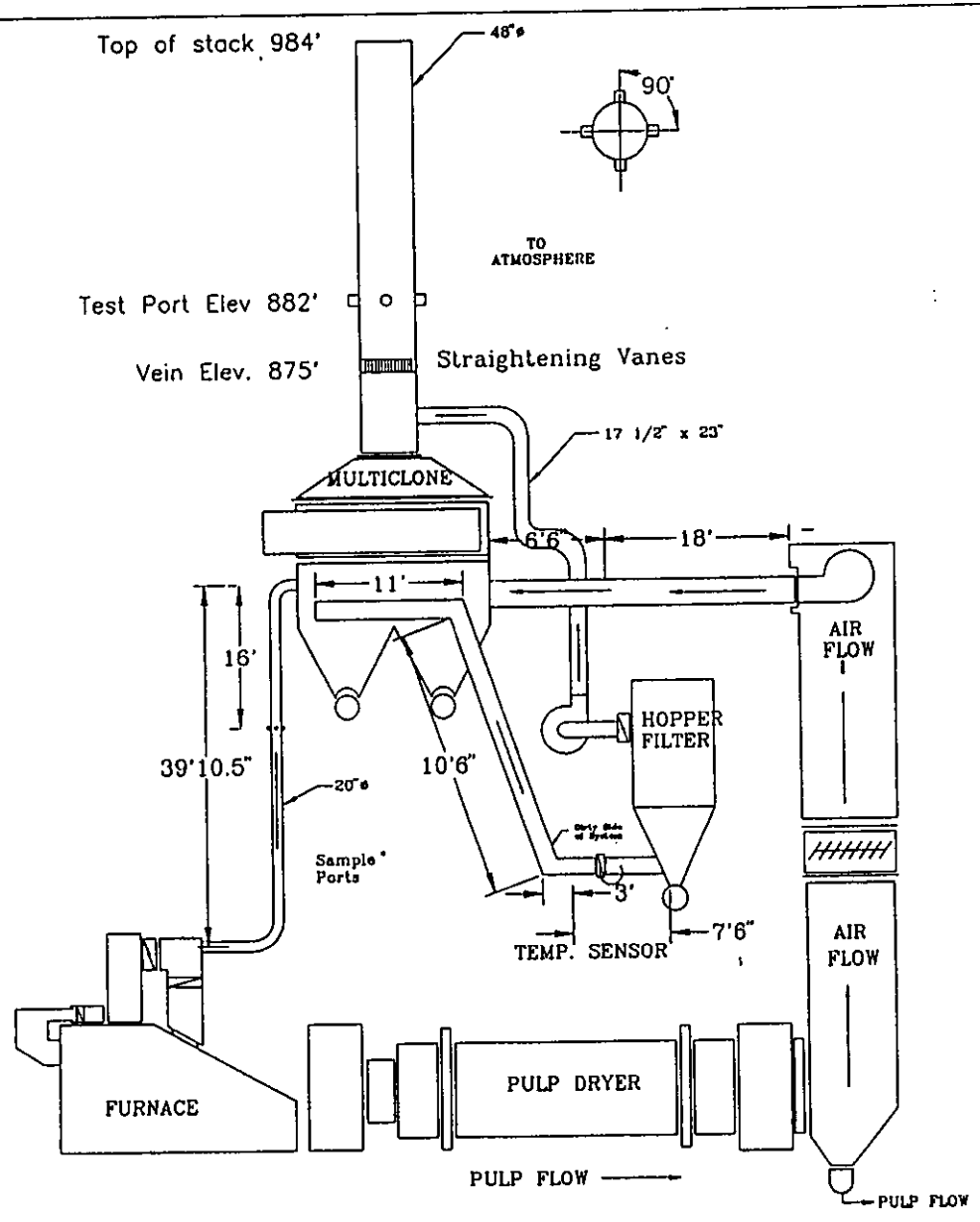
B-2

'B' Pulp Drier Pollution Control Equipment Flow Diagram.

American Crystal Sugar Co.

100 Q8/2
ED106002

10000103

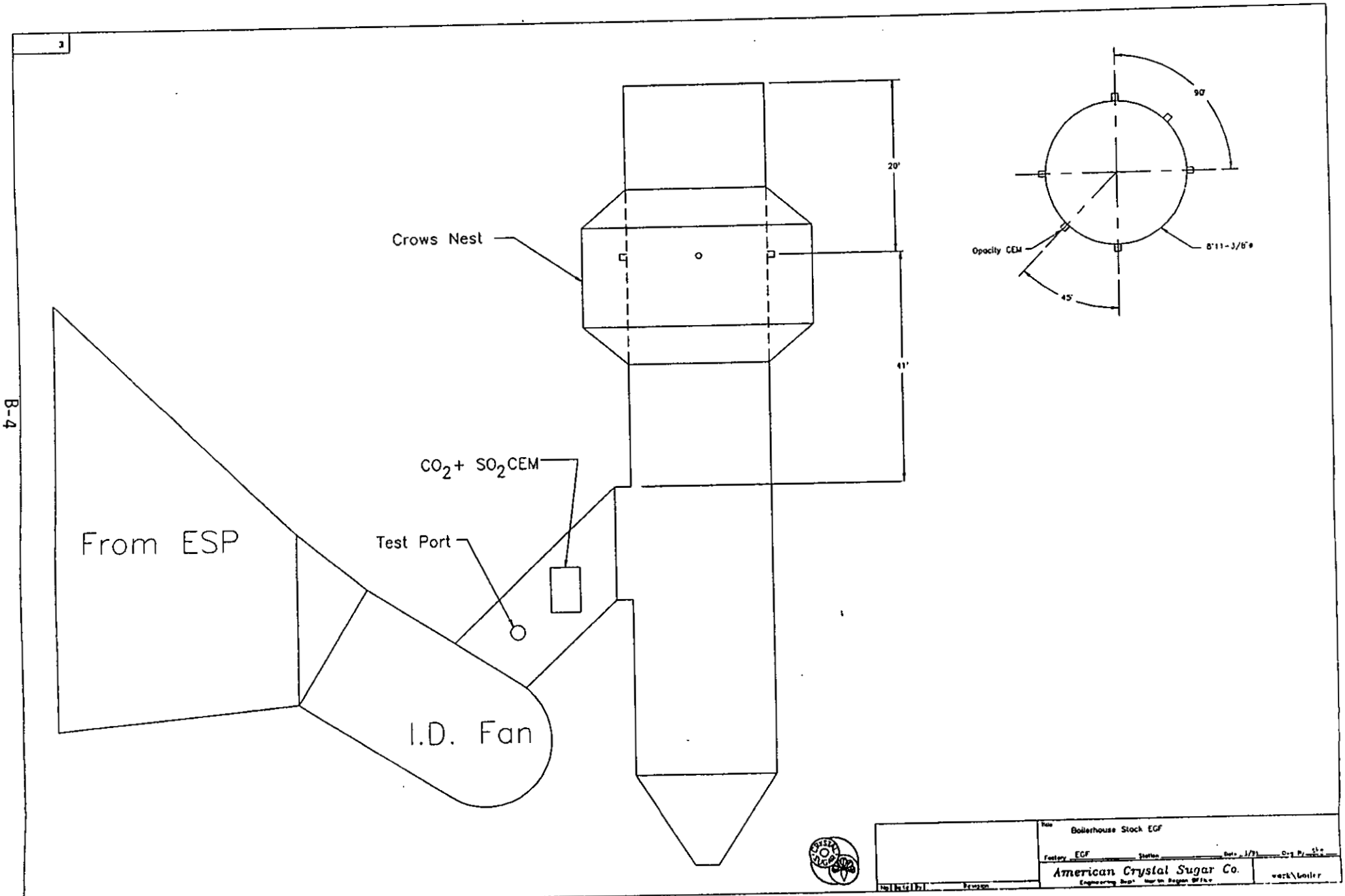


Base Elev. = 834'

'C' Pulp Drier Pollution Control Equipment Flow Diagram.

American Crystal Sugar Co.

100 08/1
E0100401

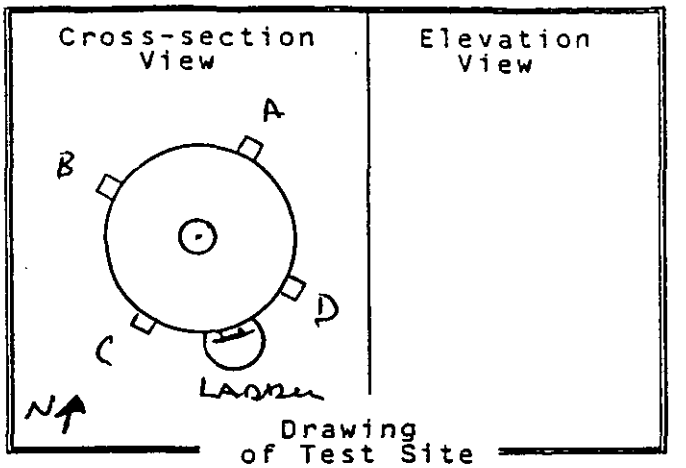

3
Crows Nest
20'
41'
CO_2+ SO_2CEM
Test Port
From ESP
I.D. Fan
90°
Opacity CEM
8'11-3/8"ø
45°
Boilerhouse Stock EGF
Factory EGF
American Crystal Sugar Co.
work\boiler

APPENDIX C

FIELD DATA SHEETS

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job ACS-EGF
Source No. 1 Boiler Stack
Test 1 Run 0 Date 2-22-94
Stack dimen. 105-5 IN.
Dry bulb 460 °F Wet bulb ___ °F
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 29.73 in Hg
Static pressure -.44 in WC
Operators SB + KN
Pitot No. 23V-4 C_p .840



Traverse Point No.		Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
			Port length: 3.5 in.		Time start:	hrs
A	1	.021	2.22	5.72		
	2	.067	7.07	10.57		
	3	.118	12.45	15.95		
	4	.177	18.67	22.17		
	5	.250	26.38	29.88		
	6	.356	37.56	41.06		
B	1					
	2					
	3					
	4					
	5					
	6					
C	1					
	2					
	3					
	4					
	5					
	6					
D	1					
	2					
	3					
	4					
	5					
	6					
Temp. meas. device & S/N: Digital T_c - DDT - 29					Time end:	hrs

C-1 *R or nothing = reg. manometer; S= expanded; E=electronic* S-3921

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job AMS - EGF
Source NO. 1 Boiler STACK
Method 1-5 Filter holder: GLASS

Date 2-22-94 Test 1 Run 1
No. of traverse points 24
Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.00 cfm at 15 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 6177

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: SB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	604	496	108
Impinger No. 3			
Condenser			
Desiccant	1395	1379	16
Total			124

Integrated Gas Sampling Data:

Bag Pump No. 234 Box No. 24 Bag No. 1

Bag Material: 5-layer Aluminized Tedlar Size: 44 L

Pretest leak check: 00 cc/min at 15 in. Hg.

Time start: 1220 (HRS) Time end: 1330 (HRS)

Sampling rate: 200 cc/min Operator: SB

S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

S-0046RR

INTERPOLL LABORATORIES A METHOD 5 FIELD DATA SHEET

Job ACS- EGF
Source No. 1 Boiler Stack
Date 2-22-94 Test 1 Run

Operators SB+KN
Meter Box No. 3 ^H@ 1.74 IN WC
Gasmeter coeff. 1.0027

Pitot No. 23V-4 Cp .810
Bar. Press. 29.23 inHg H2O 9 %
Nozzle No. 5-5 Nozzle Dia .30 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC) ΔP	Orifice Meter (inWC) ΔH	Dgs. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack TS	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
	(1220)	(257.80)											
A-6	2.5	259.99	.49	2.29	9.93	8	419	260	244	44	70	66	8.1
5	5	262.10	.47	2.22	2.04	8	418	260	244	44	74	67	8.3
4	7.5	264.20	.47	2.23	4.17	8	418	262	245	44	76	67	8.3
3	10	266.20	.44	2.09	6.23	7	418	262	247	44	77	69	8.9
2	12.5	268.20	.42	2.01	8.25	7	416	264	248	40	78	70	8.3
1	15	270.25	.33	1.58	0.04	5	415	263	251	40	80	72	8.5
B-6	17.5	272.44	.57	2.75	2.41	9	412	248	250	40	81	72	8.7
5	20	274.76	.61	2.94	4.86	10	412	249	248	40	82	75	8.5
4	22.5	277.20	.67	3.23	7.43	11	415	245	246	40	84	76	8.5
3	25	279.70	.66	3.20	9.99	11	414	233	236	40	84	77	8.9
2	27.5	282.23	.66	3.21	2.56	12	411	240	234	41	84	77	8.5
1	30	284.65	.53	2.59	4.87	10	407	247	241	41	84	78	8.2
C-6	32.5	287.14	.51	2.49	7.13	9	410	246	244	41	84	78	8.1
5	35	289.41	.53	2.58	9.44	9	412	244	243	41	84	79	6.5
4	37.5	291.60	.47	2.29	1.61	9	414	246	244	40	86	80	8.1
3	40	293.69	.35	1.72	3.50	7	410	246	233	40	87	81	8.0
2	42.5	295.33	.30	1.47	5.25	5	412	237	253	40	87	81	6.1
1	45	296.99	.27	1.33	6.91	5	410	258	254	41	87	81	6.8
D-6	47.5	298.92	.37	1.82	8.85	6	407	250	251	41	87	82	7.9
5	50	300.60	.32	1.58	0.67	6	406	252	249	40	88	83	8.0
4	52.5	302.52	.32	1.58	2.41	6	406	263	258	40	88	83	8.0
3	55	304.27	.28	1.39	4.18	6	406	264	249	41	89	84	8.3
2	57.5	305.92	.30	1.49	5.95	5	406	265	253	42	89	84	8.1
1	60	307.77	.32	1.58	7.77	5	407	259	254	41	89	84	6.9
	(1330)												
	θ = 60	Vm = 49.97		ΔH = 2.15							Avg. = 80.1		

S-0037

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job AES-ECF Date 2-22-94 Test 1 Run 2
Source NO. 1 Boiler Stack No. of traverse points 24
Method 1-5 Filter holder: GCAS2 Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: ☒ 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.00 cfm at 15 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 6178

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: SB

Condensate Data:

Item	Weight (g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	583	489	94
Impinger No. 3			
Condenser			
Desiccant	1356	1344	12
Total			106

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 24 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 1430 (HRS) Time end: 1532 (HRS)
Sampling rate: 400 cc/min Operator: SB
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

S-0046RR

INTERPOLL LABORATORIES — A METHOD 5 FIELD DATA SHEET

Job ACS - EGF
Source No 1 Boiler Stack
Date 2-23-94 Test 1 Run 2

Operators SD & KW
Meter Box No. 3 ΔH 1.74 IN WC
Coeff. 1.0227

Pitot No. 23V-4 Cp .840
Bar. Press. 29.93 inHg H2O .5 x
Nozzle No. 2-5 Nozzle Dia .340 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dry Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (v/v)
	(1430)	(308.15)		1.54	9.93	5	408	251	248	47	82	82	6.4
D - 6	2.5	309.99	.32	1.55	1.72	5	406	250	239	48	82	82	7.4
5	5	311.78	.32	1.45	3.45	5	408	251	248	45	84	83	7.8
4	7.5	313.60	.30	1.30	5.09	4	409	262	248	45	85	83	9.0
3	10	315.18	.27	1.30	6.74	4	410	261	248	45	85	83	8.5
2	12.5	316.78	.27	1.30	8.23	3	406	260	249	44	86	83	8.9
1	15	318.20	.22	1.07	6.38	6	405	265	261	42	87	84	8.2
C - 6	17.5	320.38	.46	2.23	2.69	8	406	264	262	41	88	85	8.9
5	20	322.60	.53	2.57	5.07	9	406	259	258	42	89	86	8.7
4	22.5	325.10	.56	2.72	7.28	8	410	248	256	42	90	86	8.9
3	25	327.32	.48	2.33	9.30	6	408	249	255	42	91	87	8.3
2	27.5	329.42	.40	1.95	1.11	5	407	260	258	38	92	87	8.4
1	30	331.33	.32	1.52	3.54	8	410	250	252	38	92	88	8.3
B - 6	32.5	333.62	.58	2.82	5.86	8	410	236	250	40	92	88	9.3
5	35	335.99	.53	2.58	8.32	9	405	239	250	40	93	88	9.3
4	37.5	338.30	.57	2.84	0.75	9	409	242	251	42	94	89	8.4
3	40	340.89	.58	2.83	3.06	8	410	248	260	44	94	89	9.5
2	42.5	343.15	.52	2.54	5.42	8	408	241	250	39	94	89	8.9
1	45	345.51	.54	2.64	7.52	6	409	237	251	40	95	90	9.3
A - 6	47.5	347.57	.43	2.10	9.61	6	410	261	254	40	93	90	9.3
5	50	349.65	.42	2.06	1.64	6	406	241	255	40	95	90	8.7
4	52.5	351.67	.40	1.96	3.57	6	405	249	261	41	95	91	9.5
3	55	353.63	.36	1.77	5.54	6	406	248	261	41	95	91	9.3
2	57.5	355.62	.37	1.82	7.55	6	405	243	251	41	95	91	9.1
1	60	357.55	.39	1.92									
	(1532)												
	θ = 60	Vm = 49.40		ΔH 2.06							Avg. = 88.6		

C-5

S-0037R

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS - FGF
Source No. 1 Boiler Stack
Method 1-5 Filter holder: Glass

Date 2-22-94 Test 1 Run 3
No. of traverse points 24
Filter type: 4"G.F

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.00 cfm at 15 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 6178

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles:
Sample recovered by:

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	589	496	93
Impinger No. 3			
Condenser			
Desiccant	1406	1395	11
Total			104

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 24 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 1610 (HRS) Time end: 1715 (HRS)
Sampling rate: 400 cc/min Operator: SB
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

S-0046RR

CF-011

INTERPOLL LABORATORIES A METHOD 5 FIELD DATA SHEET

Job ACS- EGF
Source No. 1 Boiler Stack
Date 2-22-94 Test 1 Run 3

Operators SB + KN
Meter Box No. 3 ΔH@ 1.74 IN WC
Gasmeter coeff. 1.0027

Pitot No. 23V-4 Cp .840
Bar. Press. 24.73 inHg H2O 10 %
Nozzle No. 7-5 Nozzle Dia .312 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (%v/v)
	(1610)	(357.95)											
A-6	2.5	360.07	.48	2.34	0.16	7	408	256	241	38	84	82	9.5
5	5	362.20	.45	2.17	2.28	7	407	255	246	38	84	83	9.3
4	7.5	364.40	.46	2.23	4.42	7	406	256	255	44	85	84	9.4
3	10	366.50	.40	1.94	6.43	6	406	254	256	38	86	84	8.5
2	12.5	368.43	.38	1.84	8.39	6	406	254	254	40	87	85	8.4
1	15	370.58	.43	2.09	0.48	6	405	254	254	38	88	85	8.3
B-6	17.5	372.70	.50	2.43	2.73	8	405	254	254	38	89	85	8.3
5	20	375.15	.64	3.11	5.27	10	406	255	256	39	89	85	8.5
4	22.5	377.70	.60	2.92	7.74	9	406	254	258	39	90	86	8.9
3	25	380.20	.62	3.02	0.25	9	407	254	258	38	90	86	8.9
2	27.5	382.74	.63	3.07	2.77	10	407	252	256	38	90	86	8.4
1	30	384.99	.44	2.15	4.89	8	406	248	251	40	91	86	9.3
C-6	32.5	387.20	.50	2.44	7.15	8	407	246	252	41	91	86	8.7
5	35	389.52	.52	2.54	9.45	8	407	245	239	40	90	86	8.9
4	37.5	391.60	.46	2.24	1.61	8	408	254	238	39	91	86	9.0
3	40	393.90	.43	2.10	3.71	7	408	237	241	40	91	87	8.5
2	42.5	395.62	.33	1.61	5.54	5	408	239	248	42	92	87	8.7
1	45	397.45	.32	1.56	7.36	5	407	248	240	41	92	87	8.0
D-6	47.5	399.45	.35	1.71	9.25	5	408	249	242	40	92	87	8.4
5	50	401.29	.37	1.81	1.20	5	407	245	240	41	91	88	8.9
4	52.5	402.80	.27	1.32	2.87	5	406	244	246	40	93	88	9.4
3	55	405.10	.47	2.30	5.06	6	408	248	246	41	93	88	8.5
2	57.5	407.27	.45	2.21	7.22	6	406	250	243	39	93	89	9.5
1	60	409.30	.42	2.06	9.30	6	407	254	242	41	94	89	8.7
	(1715)												
	θ = 60	Vm = 61.35		ΔH = 2.22							Avg. = 87.9		

S-0037R

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job ACS / E.G.F.
Source "C" Dryer Stack
Test 1 Run 0 Date 2-22-94
Stack dimen. 48 IN.
Dry bulb 210 °F Wet bulb ___ °F
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 29.94 in Hg
Static pressure -.95 in WC
Operators D VanHoever & D. Voller
Pitot No. V22-6 C_p .84

Cross-section View	Elevation View
Drawing of Test Site	

Traverse Point No.	Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
		Port length: in.		Time start: hrs	
A 1				.40	
2				.43	
3				.68	
4				.86	
5				.96	
6				1.10	
7				1.10	210
8				1.05	
9				.96	
10				.88	
11				.80	
12				.75	
B 1				.60	
2				.61	
3	ACFM =	46,241		.62	
4	DSCFM =	24,010		.81	
5	FT/sec =	61.32		.93	
6	TS =	210		1.10	
7	mc =	34		1.10	
8	O_2 =	15		1.10	
9	S.P. =	-.95		.96	
10				.94	
11				.82	
12				.77	
Temp. meas. device & S/N: PDT #8				Time end: hrs	

R or nothing = reg. manometer; S= expanded; E=electronic

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS / EGF — Date 2/22/94 Test 1 Run 1
Source "C" DRYER STACK — No. of traverse points 24
Method 5 Filter holder: glass — Filter type: glass fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 7 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: _____ _____

Recovery solvent(s)
☒ acetone
☐ other(s) _____

No. of probe wash bottles: 1
Sample recovered by: DVH

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		200	
Impinger No. 2	652		452
Impinger No. 3			
Condenser			
Desiccant	1397	1386	11
Total			463

Integrated Gas Sampling Data:

Bag Pump No. 233 Box No. 1 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1423 (HRS) Time end: 1622 (HRS)
Sampling rate: 200 cc/min Operator: DVH
S/N of O_2 Analyzer used to monitor train outlet: 11

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: ACS / E.GF
Source: "C" Dryer Stack
Date: 2/02/94 Test: 1 Run: 1

Operators: DW & D.V
Meter Box No.: 7 ^H@ 1.93 IN WC
Converter coeff.: .9976

Pitot No.: V22-6 Cp: .84
Bar. Press.: 29.94 inHg H2O 32 X
Nozzle No.: 6-3 Nozzle Dia: .184 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Del. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (xv/v)
	1418	926.43											
B 12	5	928.08	.71	.37	8.07	2	213	241	236	40	70	68	12.0
11	10	929.89	.86	.46	9.91	2	213				77	75	13.2
10	15	931.60	.94	.51	1.85	2	213				77	75	10.3
9	20	933.70	1.05	.57	3.91	2	213	242	231	42	81	77	12.2
8	25	936.00	1.10	.60	6.03	2.5	214				82	78	15.1
7	30	938.06	1.10	.60	8.15	2.5	214				83	78	15.8
6	35	940.10	.93	.51	0.10	2.5	214	244	236	43	84	78	16.4
5	40	942.06	.91	.49	2.04	2.0	214				84	79	16.3
4	45	943.81	.86	.47	3.92	2	214				85	80	15.9
3	50	945.54	.61	.35	5.55	2	209	246	239	44	86	80	16.1
2	55	947.13	.49	.28	7.02	2	209				86	80	16.5
1	60	948.65	.55	.32	8.57	2	209				85	80	17.0
A 12	65	950.47	.82	.47	0.46	2	209	249	250	43	84	80	17.1
11	70	952.30	.78	.45	2.31	2	209				84	80	17.4
10	75	954.12	.87	.50	4.25	2.5	213				85	82	17.1
9	80	956.30	.98	.56	6.31	2.5	213	250	252	43	86	83	17.1
8	85	958.50	1.10	.63	8.51	2.5	214				86	81	17.0
7	90	960.66	1.0	.57	0.59	2.5	214				87	81	17.3
6	95	962.66	.98	.56	2.66	2.5	214	251	256	44	87	82	17.0
5	100	964.66	.86	.49	4.60	2.5	214				87	82	17.0
4	105	966.60	.84	.48	6.51	2.5	213				88	82	17.1
3	110	968.36	.70	.40	8.26	2.5	213	257	258	45	87	83	16.5
2	115	969.97	.68	.39	9.99	2.5	212				87	83	16.7
1	120	971.67	.62	.36	1.65	2.5	212				86	88	16.9
	(1622)												
	θ = 120	Vm = 45.24		^H = .47							Avg. = 85		

W=30

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS/E.G.F Date 2/22/94 Test 1 Run 2
Source C Dryer Stack No. of traverse points 24
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 7 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DHH

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		3200	
Impinger No. 2	661		461
Impinger No. 3			
Condenser			
Desiccant	1460	1450	10
Total			471

Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 1 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1710 (HRS) Time end: 1911 (HRS)
Sampling rate: 200 cc/min Operator: DHH
S/N of O_2 Analyzer used to monitor train outlet: 11

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job ACB/EGF
Source C Dryer STACK
Date 2/22/94 Test 1 Run 2

Operators DOA + DV
Meter Box No. 7 ΔH@ 1.93 IN WC
Coeff. .9976

Pitot No. V22-6 Cp .84
Bar. Press. 29.94 inHg H2O 33 %
Nozzle No. 6-3 Nozzle Dia .164 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xx/x)
	1705	971.93											
A 12	5	973.73	.80	.42	3.72	2	214	231	236	36	80	80	17.2
11	10	975.49	.78	.41	5.48	2	214				82	81	15.3
10	15	977.27	.83	.44	7.31	2	210				83	81	13.3
9	20	979.24	.90	.48	9.22	2	212	237	241	38	84	81	12.5
8	25	981.30	1.0	.53	1.23	2	213				85	81	13.0
7	30	983.29	1.05	.56	3.28	2	213				87	82	12.5
6	35	985.36	1.05	.56	5.35	2	213	241	246	38	86	82	13.3
5	40	987.46	1.05	.56	7.41	2	213				88	82	11.3
4	45	989.42	.94	.50	9.37	2	211				93	86	14.6
3	50	991.26	.81	.44	1.21	2	211	246	251	39	88	83	14.7
2	55	993.00	.72	.39	2.92	2	211				88	83	15.1
1	60	994.70	.61	.33	4.51	2	207				88	83	16.0
B 12	65	996.31	.78	.42	6.29	2	207	253	253	40	84	83	16.3
11	70	998.19	.75	.40	8.03	2	210				88	84	16.5
10	75	999.96	.81	.44	9.86	2	210				90	84	16.5
9	80	1001.80	.94	.50	1.81	2	217	256	258	41	88	84	16.3
8	85	1003.90	1.03	.55	3.86	2	216				89	84	16.0
7	90	1006.03	1.10	.57	5.98	2	216				89	84	16.0
6	95	1008.09	1.10	.59	8.09	2	215	250	251	43	89	84	15.6
5	100	1010.13	.97	.52	0.08	2	215				89	84	15.6
4	105	1011.99	.88	.47	1.98	2	211				89	84	15.6
3	110	1013.74	.75	.40	3.73	2	217	253	251	43	89	84	15.7
2	115	1015.44	.73	.39	5.43	2	217				89	84	15.4
1	120	1017.18	.63	.34	7.06	2	215				87	84	15.4
	(1911)												
	θ =	Vm = 45.25		ΔH = .47							Avg. = 85		

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS/E.G.F. Date 2/22/94 Test 1 Run 3
Source E Dryer Stack No. of traverse points 24
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 6 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DVH

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1	586	300	286
Impinger No. 2	673	505	168
Impinger No. 3			
Condenser			
Desiccant	1518	1513	5
Total			459

Integrated Gas Sampling Data:

Bag Pump No. 233 Box No. 1 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1945 (HRS) Time end: 2146 (HRS)
Sampling rate: 200 cc/min Operator: DVH
S/N of O_2 Analyzer used to monitor train outlet: 11

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: ACS EGF
Source: C Dryer Stack
Date: 2/22/93 Test: 1 Run: 3

Operators: DVH&DIV
Meter Box No.: 7 ΔH@: 1.93 IN WC
Gamma (Correction coeff.): .9976

Pitot No.: V22-6 Cp: .84
Bar. Press.: 29.94 inHg H2O: 33 %
Nozzle No.: 6-3 Nozzle Dia: .184 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgm. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Cos/In (°F)	Cos/Out (°F)	Oxygen (%v/v)
	1940	17.70											
B 12	5	19.43	.73	.39	9.42	2.5	211	236	241	40	80	80	16.1
11	10	21.16	.73	.39	1.13	2.5	211				82	81	15.6
10	15	22.97	.83	.44	2.96	2.5	223				84	81	15.5
9	20	24.85	.95	.51	4.92	2.5	213	249	248	43	85	83	15.6
8	25	26.99	1.05	.56	6.97	2.5	216				88	83	15.6
7	30	29.06	1.10	.59	9.08	2.5	218				86	82	15.7
6	35	31.10	1.10	.58	1.19	2.5	48	251	247	43	86	82	15.7
5	40	33.16	.97	.52	3.17	2.5	216				87	83	15.5
4	45	35.16	.84	.45	5.01	2.5	216				86	83	15.4
3	50	36.93	.75	.40	6.75	2.5	216	253	248	44	86	83	15.7
2	55	38.37	.63	.34	8.36	2.5	211				86	82	15.0
1	60	39.90	.61	.33	9.93	2.5	211				90	86	14.3
A 12	65	41.75	.78	.42	1.73	2.5	211	257	249	44	86	82	15.8
11	70	43.56	.82	.44	3.55	2.5	211				87	84	15.6
10	75	45.36	.80	.43	5.36	2.5	214				88	83	15.6
9	80	47.36	.94	.50	7.31	2.5	216	250	250	44	88	83	15.7
8	85	49.26	.93	.50	9.25	2.5	216				89	83	15.7
7	90	51.36	1.10	.59	1.37	2.5	218				89	84	15.8
6	95	53.93	1.10	.59	3.48	2.5	215	253	256	44	88	84	15.9
5	100	55.81	1.10	.59	5.60	2.5	218				87	81	15.8
4	105	59.70	1.10	.59	7.70	2.5	218				90	84	15.6
3	110	59.44	.97	.52	9.69	2.5	215				88	84	14.2
2	115	61.50	.84	.45	1.54	2.5	215				890	84	15.3
1	120	63.30	.75	.40	3.29	2.5	215				84	81	
	(2146)												
	θ = 120	Vm = 45.60		ΔH = .48							Avg. = 84.6		

C-14

S-0037R

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job ACS - EGF

Source No. 2 Boiler Stack

Test 2 Run 0 Date 2-23-94

Stack dimen. 105.5" IN.

Dry bulb 385 °F Wet bulb ___ °F

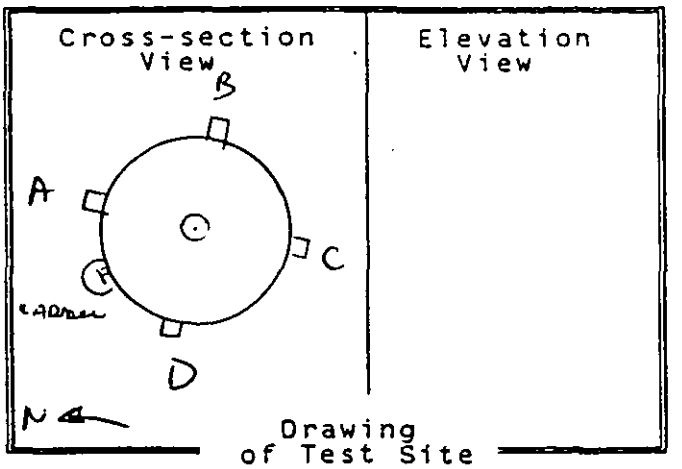
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 29.36 in Hg

Static pressure -.33 in WC

Operators SB + KN

Pitot No. 23V-4 C_p .940



Traverse Point No.		Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
			Port length: 3.5" in.		Time start: 1100 hrs	
A	-1	.021	2.22	5.72	.27	
	2	.067	7.07	10.57	.33	
	3	.118	12.45	15.95	.44	
	4	.177	18.67	22.17	.42	
	5	.250	20.38	29.88	.40	
	6	.356	37.56	41.06	.43	
B	-1					
	2					
	3					
	4					
	5					
	6					
C	-1					
	2					
	3					
	4					
	5					
	6					
D	-1					
	2					
	3					
	4					
	5					
	6					
Temp. meas. device & S/N: Digital Tc - PDT29					Time end: 1103 hrs	

C-15 *R or nothing = reg. manometer; S= expanded; E=electronic* S-3921

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS -EGF Date 2-22-94 Test 2 Run 1
Source No. 2 Boiler Stack No. of traverse points 24
Method 1-5 Filter holder: Glass Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.00 cfm at 12 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 6269

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: SB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	598	502	96
Impinger No. 3			
Condenser			
Desiccant	1364	1356	8
Total			104

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 10 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 1105 (HRS) Time end: 1210 (HRS)
Sampling rate: 400 cc/min Operator: SB
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: ACS - EGF
Source: No. 2 Boiler Stack
Date: 2-22-94 Test 2 Run 1

Operators: SB + KN
Meter Box No. 3 ΔH@ 1.74 IN WC
Gasmeter coeff. 1.0027

Pitot No. 23V-4 Cp .840
Bar. Press. 29.36 inHg H2O 9 %
Nozzle No. 2-5 Nozzle Dia. .310 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dev. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (v/v)
	(1105)	(417.60)											
A - 6	2.5	419.42	.33	1.58	9.37	5	382	242	243	44	57	57	6.7
5	5	421.26	.38	1.82	1.28	6	382	243	248	43	58	57	6.7
4	7.5	423.21	.40	1.90	3.23	6	393	246	248	43	65	59	6.7
3	10	425.20	.43	2.06	5.24	7	394	242	246	44	66	59	6.9
2	12.5	427.32	.47	2.25	7.39	8	392	244	248	42	66	59	6.0
1	15	429.42	.40	1.92	9.37	7	390	243	246	41	69	62	5.9
B - 6	17.5	431.32	.35	1.69	1.22	7	392	241	244	42	73	64	7.2
5	20	433.18	.37	1.79	3.13	6	394	242	243	41	73	64	6.9
4	22.5	435.20	.44	2.15	5.23	8	385	244	241	42	74	66	6.0
3	25	437.23	.43	2.10	7.30	8	389	244	244	46	75	67	6.9
2	27.5	439.52	.55	2.69	9.65	10	388	246	244	40	77	68	6.0
1	30	441.72	.46	2.26	1.80	9	387	242	240	37	78	69	6.1
C - 6	32.5	443.55	.27	1.34	3.47	6	384	261	240	33	80	71	7.5
5	35	445.32	.29	1.44	5.19	5	384	261	231	34	78	71	7.2
4	37.5	446.90	.24	1.29	6.83	5	385	250	262	40	80	72	7.5
3	40	448.65	.32	1.59	8.64	5	384	266	254	34	81	73	6.3
2	42.5	450.26	.25	1.24	0.25	5	385	264	259	40	82	74	6.1
1	45	452.14	.39	1.94	2.24	7	385	267	252	40	83	75	7.2
D - 6	47.5	453.80	.23	1.15	3.81	5	384	259	263	40	83	76	6.9
5	50	455.39	.24	1.20	5.39	5	384	258	264	40	83	76	7.1
4	52.5	456.99	.24	1.21	6.98	5	380	240	261	41	83	77	6.7
3	55	458.48	.22	1.10	8.50	4	385	248	260	40	85	78	7.4
2	57.5	460.05	.22	1.10	0.02	4	384	249	261	42	85	78	6.9
1	60	461.28	.15	.75	1.18	3	384	252	260	39	85	78	6.4
	(1210)												
	θ = 60	Vm = 43.68		ΔH = 1.65							Avg. = 72.2		

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS - EGF Date 2-22-94 Test 2 Run 2
Source No. 2 Boiler Stack No. of traverse points 24
Method 5 Filter holder: Glass Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: ☒ 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.00 cfm at 12 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 6270

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: SB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	582	503	79
Impinger No. 3			
Condenser			
Desiccant	1417	1406	11
Total			90

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 10 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 1250 (HRS) Time end: 1353 (HRS)
Sampling rate: 400 cc/min Operator: SB
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

S-0046R

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job ACS - EC F
Source NO. 3 Boiler Stack
Date 2-22-94 Test 2 Run 2

Operators SB + KN
Meter Box No. 3 ΔH@ 1.24 IN WC
Gasmeter coeff. 1.0027

Pitot No. 23V-4 Cp .84
Bar. Press. 29.36 inHg H2O 15 x
Nozzle No. 7.5 Nozzle Dia. 3/5 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgm. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (xv/v)
	(1250)	(461.50)			3.11	4	385	252	260	34	77	76	7.3
D-6	2.5	463.19	.26	1.26	4.73	4	385	252	259	36	78	76	7.1
5	5	464.80	.24	1.27	6.23	4	384	260	264	35	78	77	7.0
4	7.5	466.32	.22	1.08	7.85	4	391	261	264	35	75	78	7.4
3	10	467.89	.26	1.24	9.35	4	390	262	264	34	81	78	7.9
2	12.5	469.38	.22	1.07	0.88	4	392	262	263	36	82	79	7.9
1	15	470.92	.23	1.12	2.44	4	395	255	267	36	83	80	7.5
C-6	17.5	472.46	.24	1.17	4.10	4	394	255	262	36	84	80	7.7
5	20	474.08	.27	1.32	5.77	5	394	257	264	35	85	81	7.9
4	22.5	475.72	.27	1.32	7.47	5	391	294	259	38	86	81	8.1
3	25	477.40	.28	1.37	9.23	5	390	256	251	34	87	82	7.1
2	27.5	479.21	.30	1.47	0.67	5	390	259	254	35	88	82	[illegible]
1	30	480.78	.20	0.98	2.60	4	390	259	256	35	88	82	7.4
B-6	32.5	482.58	.36	1.77	4.59	5	390	258	258	38	88	82	8.0
5	35	484.50	.38	1.87	6.82	6	393	256	258	37	88	82	7.4
4	37.5	486.80	.48	2.36	8.90	8	396	254	256	37	88	83	7.9
3	40	488.96	.42	2.06	1.12	8	393	254	256	35	89	84	7.1
2	42.5	491.10	.48	2.36	3.29	8	392	254	256	34	89	84	6.3
1	45	493.32	.45	2.22	5.05	8	393	254	258	33	89	83	6.8
A-6	47.5	495.24	.30	1.48	6.88	6	394	256	254	34	89	83	7.2
5	50	496.99	.32	1.57	8.76	5	393	254	254	34	89	84	7.4
4	52.5	498.76	.34	1.67	1.06	5	393	256	254	34	89	84	7.5
3	55	501.00	.48	2.34	2.92	8	393	258	251	33	90	84	8.3
2	57.5	502.98	.36	1.77	5.07	7	393	253	250	33	90	84	7.4
1	60	505.07	.44	2.17		7	392			32			–
	(1353)												
	θ = 60	Vm = 43.57		ΔH = 1.60							Avg. = 83.3		

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job AES-EGF Date 2-23-94 Test 2 Run 3
Source No. 2 Boiler Stack No. of traverse points 24
Method 17 Filter holder: Glass Filter type: 4" G.F.

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.00 cfm at 13 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 6260

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: SLB

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	579	505	74
Impinger No. 3			
Condenser			
Desiccant	1372	1364	8
Total			82

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 10 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 16 in. Hg.
Time start: 1415 (HRS) Time end: 1518 (HRS)
Sampling rate: 400 cc/min Operator: SLB
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: ACS-EGF
Source: No. 2 Boiler Stack
Date: 2-23-94 Test 2 Run 3

Operators: SS, KN
Meter Box No.: 3 ΔH@ 1.74 IN WC
Gasmeter coeff.: 1.0027

Pitot No.: 23U-4 Cp .84
Bar. Press.: 25.36 inHg H2O 9 %
Nozzle No.: 2-5 Nozzle Dia .310 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dgc. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Cond/In	Cond/Out	Oxygen (x v/v)
-	(1415)	(505.55)	-	-	-	-	-	-	-	-	-	-	-
A-6	2.5	507.32	.29	1.45	7.29	5	391	255	237	42	82	82	7.4
5	5	509.28	.37	1.84	9.25	6	393	254	242	42	84	83	7.5
4	7.5	511.44	.43	2.14	1.38	7	393	254	248	41	85	83	7.1
3	10	513.42	.38	1.90	3.37	6	393	255	250	40	87	83	8.1
2	12.5	515.32	.35	1.75	5.29	6	392	245	241	40	87	84	8.3
1	15	517.42	.42	2.11	7.40	7	391	250	246	41	89	84	7.9
B-6	17.5	519.43	.34	1.71	9.30	6	390	239	249	41	90	85	8.4
5	20	521.21	.31	1.56	1.12	5	391	242	254	44	90	85	8.3
4	22.5	523.00	.34	1.71	3.02	5	392	250	254	40	91	86	8.1
3	25	525.04	.37	1.86	5.01	5	392	254	254	40	92	86	8.0
2	27.5	527.21	.45	2.27	7.20	6	392	254	258	40	92	87	8.1
1	30	529.36	.42	2.12	9.32	6	391	255	257	41	93	87	8.3
C-6	32.5	530.92	.25	1.26	0.97	5	392	254	258	42	93	87	8.0
5	35	532.60	.26	1.31	2.64	5	392	250	259	40	93	87	8.3
4	37.5	534.30	.26	1.31	4.31	5	392	251	258	44	93	88	8.9
3	40	536.12	.30	1.52	6.11	5	391	267	257	40	94	89	8.3
2	42.5	537.88	.28	1.42	7.85	6	392	265	258	39	96	90	8.5
1	45	539.40	.22	1.12	9.40	5	393	265	258	38	96	90	8.7
D-6	47.5	540.92	.22	1.11	0.94	5	396	266	260	35	96	90	7.8
5	50	542.54	.23	1.16	2.52	5	395	264	264	40	96	90	8.7
4	52.5	544.18	.25	1.27	4.17	5	392	267	242	37	96	90	8.9
3	55	545.75	.20	1.02	5.65	4	392	267	268	38	96	90	9.1
2	57.5	547.14	.18	0.91	7.05	4	392	265	266	38	97	90	8.3
1	60	548.20	.12	0.61	8.20	3	392	265	266	39	97	90	7.9
	(1518)												
-	θ = 60	Vm = 42.65	-	ΔH = 1.52	-	-	-	-	-	-	Avg. = 89.3		-

C-21

S-0037R

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job ACS / E.G.F

Source "B" Dryer Stack

Test 2 Run ___ Date 2/23/94

Stack dimen. 59 IN.

Dry bulb ___ °F Wet bulb ___ °F

Manometer: ☐ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 29.43 in Hg

Static pressure -.79 in WC

Operators D. VanHoover & D Valler

Pitot No. V22-6 C_p .84

Cross-section View	Elevation View
Drawing of Test Site	

* Do Not include a 4" coupling which is not.

Traverse Point No.	Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
		Port length: 4.25 in.		Time start: 0845 hrs	
A 1	.021	1.24	* 5.49	.53	
2	.067	3.95	8.20	.61	
3	.118	6.96	11.21	.81	
4	.177	10.44	14.69	.85	
5	.250	14.75	19	.89	
6	.356	21	25.25	.95	
7	.644	38	42.25	1.05	
8	.750	44.25	48.5	1.05	
9	.823	48.56	52.81	.98	237
10	.882	52.04	56.29	.91	
11	.933	55.05	59.30	.81	
12	.979	57.76	62.01	.72	
B 1				.40	
2				.43	
3				.46	
4				.50	
5				.63	
6		ft/sec = 60.93		.80	
7		ACFM = 69415		1.02	
8		DSCFM = 34069		.98	
9				.97	
10				.93	
11				.87	
12				.86	
Temp. meas. device & S/N: PDT #18				Time end: hrs	

R or nothing = reg. manometer; S= expanded; E=electronic

INTERFOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS/EGF Date 2/23/94 Test 2 Run 1
Source "B" Dryer Stack No. of traverse points 24
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: ≤ 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 7 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: Dust

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		300	
Impinger No. 2	505		305
Impinger No. 3			
Condenser			
Desiccant	1449	1441	8
Total			313

Integrated Gas Sampling Data:

Bag Pump No. 238 Box No. 23 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1025 (HRS) Time end: 1225 (HRS)
Sampling rate: 200 cc/min Operator: DH
S/N of O_2 Analyzer used to monitor train outlet: 11

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job ACS EGF
Source B Dryer Stack
Date 2/23/94 Test 2 Run 2

Operators DVH - D.V
Meter Box No. 7 ΔH 2.93 IN WC
Counter coeff. .9976

Pitot No. V22-6 Cp .85
Bar. Press. 29.43 inHg H2O 3% %
Nozzle No. 6-3 Nozzle Dia .184 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dev. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (v/v)
	1021	63.6											
B 12	5	65.37	.82	.41	5.35	2	230	237	241	43	77	78	16.2
11	10	67.19	.87	.43	7.16	2	244				78	77	16.2
10	15	69.08	.93	.46	9.03	2	244				78	76	16.5
9	20	70.99	.98	.48	0.95	2	242	246	246	43	80	77	14.4
8	25	72.97	.95	.47	2.85	2	240				81	78	15.6
7	30	74.85	1.00	.50	4.79	2	241				82	79	14.3
6	35	76.52	.72	.36	6.45	2	239	249	257	43	83	79	15.0
5	40	77.97	.57	.28	7.94	2	236				84	80	15.6
4	45	79.50	.48	.24	9.30	2	238				84	80	15.7
3	50	80.84	.48	.24	0.66	2	237	257	260	44	84	80	12.1
2	55	81.99	.45	.22	1.81	2	237				83	81	15.8
1	60	83.30	.40	.20	3.22	2	237				85	81	16.2
A 12	65	85.16	.88	.44	5.07	2	237	258	261	43	83	80	16.2
11	70	86.93	.86	.43	6.88	2	241				85	81	15.9
10	75	88.76	.92	.46	8.76	2	240				86	81	13.9
9	80	90.76	1.02	.51	0.75	2.5	240	260	261	43	86	81	16.2
8	85	92.73	1.05	.53	2.76	2.5	239				87	81	14.1
7	90	94.79	1.0	.50	4.73	2.5	238				87	82	14.5
6	95	96.59	.86	.43	6.56	2	238	260	260	45	87	82	15.8
5	100	98.38	.82	.41	8.34	2	239				87	82	15.8
4	105	100.16	.80	.40	0.11	2	239				87	82	15.7
3	110	101.83	.78	.38	1.82	2	240	261	256	44	87	82	15.9
2	115	103.42	.63	.31	3.39	2	238				87	82	16.1
1	120	104.80	.48	.24	4.75	2	238				86	82	13.9
	1225												
	θ = 120	Vm = 41.2		ΔH = .45							Avg. = 85.3		

C-24

S-00378

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS/EG,F Date 2/23/94 Test 2 Run 2
Source B DRYER STACK No. of traverse points 24
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 7 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: _____

Recovery solvent(s)
☒ acetone
☐ other(s) _____

No. of probe wash bottles: 1
Sample recovered by: DWH

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	522	200	322
Impinger No. 3			
Condenser			
Desiccant	1523	1518	5
Total			327

Integrated Gas Sampling Data:

Bag Pump No. 233 Box No. 23 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1305 (HRS) Time end: 1503 (HRS)
Sampling rate: 200 cc/min Operator: DWH
S/N of O_2 Analyzer used to monitor train outlet: 11

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job ACS EGF
Source B Dryer Stack
Date 2/23/93 Test 2 Run 2

Operators DVH + D.V
Meter Box No. 7 ΔH 1.93 IN WC
Coefficient coeff. .9976

Pitot No. V22-6 Cp .84
Bar. Press. 28.43 inHg H2O 30 %
Nozzle No. 6-3 Nozzle Dia .187 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Dxyppp (xv/v)
	1300	10505			6.86	2	240	239	241	40	79	79	15.0
A 12	5	106.96	.78	.43	8.81	2	240				83	80	15.8
11	10	108.89	.90	.49	0.79	2	239				85	81	15.8
10	15	110.80	.93	.51	2.83	2	239	246	249	41	86	81	15.8
9	20	112.80	.97	.54	4.88	2	239				87	82	15.7
8	25	114.83	.94	.55	6.98	2	238				88	82	15.5
7	30	117.00	1.02	.57	8.88	2	238	256	254	41	88	83	15.5
6	35	118.89	.84	.47	0.76	2	237				88	83	15.7
5	40	120.73	.82	.46	2.64	2	237				89	84	15.8
4	45	122.56	.82	.46	4.43	2	237	255	260	42	89	84	15.7
3	50	124.50	.74	.41	6.11	2	236				89	84	15.7
2	55	126.20	.65	.36	7.72	2	236				89	84	15.9
1	60	127.80	.60	.33	9.62	2	236	257	260	43	87	84	15.9
B 12	65	129.64	.83	.46	1.57	2	236				89	84	16.0
11	70	131.68	.88	.49	3.58	2	237				89	84	16.0
10	75	133.58	.93	.52	5.58	2	237	254	257	43	89	84	16.0
9	80	135.70	.93	.52	7.63	2	237				89	84	15.8
8	85	137.64	.97	.54	9.68	2	237				89	84	15.8
7	90	139.60	.97	.54	1.64	2	237	256	257	45	89	84	15.6
6	95	141.48	.88	.49	3.18	2	236				89	84	15.6
5	100	143.20	.55	.31	4.58	2	236				89	84	12.4
4	105	144.72	.45	.25	5.98	2	231	251	257	45	88	84	15.4
3	110	146.04	.45	.25	7.33	2	235				87	84	15.4
2	115	147.30	.42	.23	8.80						87	84	15.6
1	120	148.60	.37	.20									
	1503												
	θ = 120	Vm = 43.55		ΔH = .43							Avg. = 85.3		

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS/EGF
Source B Dryer Stack
Method 5 Filter holder: glass

Date 2/23/94 Test 2 Run 3
No. of traverse points 24
Filter type: glass fiber

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 6 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: _____ _____

Recovery solvent(s)
☒ acetone
☐ other(s) _____

No. of probe wash bottles: _____
Sample recovered by: _____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		200	
Impinger No. 2	531		331
Impinger No. 3			
Condenser			
Desiccant	1456	1449	7
Total			338

Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 23 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1550 (HRS) Time end: 1744 (HRS)
Sampling rate: 200 cc/min Operator: DH
S/N of O_2 Analyzer used to monitor train outlet: NA

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job ACS/EGF
Source B Dryer Stack
Date 2/23/93 Test 2 Run 3

Operators DVH & DV
Meter Box No. 7 ΔH 1.93 IN WC
Barometer corr. .9976

Pitot No. V23-6 Cp .84
Bar. Press. 29.43 inHg H2O 68 %
Nozzle No. 6-3 Nozzle Dia .154 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (v/v)
	1543	149.00											
B 12	5	150.93	.83	.49	0.93	2	236	250	235	46	80	80	15.6
11	10	152.96	.84	.49	2.87	2	236				81	80	15.6
10	15	154.92	.90	.52	4.87	2	236				85	81	15.8
9	20	156.99	.92	.54	6.90	2	236	251	239	46	86	82	15.8
8	25	159.01	.97	.57	8.99	2	236				87	82	15.8
7	30	161.03	.97	.57	1.00	2	237				87	82	14.8
6	35	162.93	.69	.40	2.84	2	237	254	246	46	87	82	15.6
5	40	164.49	.54	.31	4.41	2	237				88	82	15.6
4	45	165.88	.49	.28	5.88	2	237				87	82	15.6
3	50	167.36	.46	.27	7.32	2	237	256	250	46	87	82	15.6
2	55	168.74	.44	.26	8.73	2	235				87	82	15.8
1	60	170.05	.40	.23	0.08	2	235				86	82	15.9
A 12	65	172.10	.87	.51	2.06	2	235	258	251	47	86	82	15.8
11	70	174.13	.86	.50	4.03	2	235				88	83	15.6
10	75	175.99	.85	.50	5.99	2	235				88	83	15.6
9	80	178.11	.91	.53	8.03	2	235	254	252	48	88	83	14.9
8	85	180.20	.98	.57	0.13	2	235				88	83	14.9
7	90	182.40	.99	.58	2.25	2	236				89	84	14.2
6	95	184.51	1.10	.65	4.49	2	236	256	253	48	89	84	13.0
5	100	186.60	.93	.55	6.55	2.5	235				89	84	14.4
4	105	188.50	.84	.49	8.50	2.5	235				87	83	15.0
3	110	190.30	.78	.46	0.38	2.5	236	254	256	48	86	82	14.5
2	115	192.04	.72	.42	2.18	2.5	236				85	81	12.7
1	120	193.91	.70	.41	3.96		234				85	81	14.9
	(1744)												
	θ = 120	Vm = 44.91		ΔH = .46							Avg. = 84.3		

C-28

S-00378

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS/EGF Date 2/23/94 Test 3 Run 1
Source B DRYER STACK No. of traverse points 4
Method - Filter holder: S.S Filter type: glass fiber

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac)
Postest: 0 cfm at 6 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DWH

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser	201	0	201
Desiccant	1528	1523	5
Total			206

Integrated Gas Sampling Data: ~~23~~ 1

Bag Pump No. 23B Box No. 18 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1840 (HRS) Time end: 1940 (HRS)
Sampling rate: 400 cc/min Operator: DWH
S/N of O_2 Analyzer used to monitor train outlet: 11

CF-023

~Cascade Impactor

INTERPOLL LABORATORIES F-A METHOD 5 FIELD DATA SHEET

Job ACS/EGF
Source B Dryer Stack
Date 2/23/94 Test 3 Run 1

Operators DWP & E.J.
Meter Box No. 7 ΔH@ 1.93 IN WC
Gasmeter coeff. .9974

Pitot No. V22-6 Cp .84
Bar. Press. 29.43 inHg H2O 28 %
Nozzle No. Impact Nozzle Dia .206 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1833	194.08											
A2	5	196.45	.78	.72	6.43	4	235	239	246	46	79	77	14.7
2	10	198.70	.78	.71	8.75	4	235				78	81	15.0
2	15	201.06	.78	.71	1.08	4	235				82	78	15.0
1	20	203.43	.78	.71	3.42	4.5	235	241	248	47	84	79	15.2
1	25	205.70	.78	.71	5.76	5	235				85	79	15.3
1	30	208.03	.78	.71	8.09	6	237				86	80	15.3
B2	35	210.40	.78	.71	0.44	6	237	246	248	44	84	80	15.6
2	40	212.79	.78	.71	2.77	6	237				85	80	15.5
2	45	215.16	.78	.71	5.12	6	237				87	82	15.5
1	50	217.49	.78	.72	7.46	7	237	248	253	43	87	82	15.7
1	55	219.80	.78	.72	9.81	7	237				86	82	15.8
1	60	222.13	.78	.72	2.16	7	237				85	81	16.0
	(1940)												
	θ = 60	Vm = 28.05		ΔH = .71							Avg. =	82.0	

S-0037R

NOx - Run # 3 Orsat Bag Data

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS/EGF Date 2/23/94 Test ___ Run 3
Source B Dryer Stack No. of traverse points 3
Method 3 Filter holder: NA Filter type: NA

Sample Train Leak Check:

Pretest: ☒ 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: ☐ ___ cfm at ___ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

___ ☐ acetone ___
___ ☐ other(s) ___

No. of probe wash bottles: ___
Sample recovered by: ___

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

1945
2045

Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 18 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1945 (HRS) Time end: 2045 (HRS)
Sampling rate: 400 cc/min Operator: DJK
S/N of O_2 Analyzer used to monitor train outlet: N/A

CF-023

Interpoll Laboratories
(612) 786-6020

PM-10 TRAVERSE POINT SELECTION DATA SHEET

Job ACS/EGF
Source B Dryer Stack
Test 3 Run 1
Date 2/23/94
Operator D. Van Hoever

Pitot Tube No. V22-6
Barometric pres. 29.43 in.Hg.
Duct shape: [X] Round [ ] Rectang.
Duct dimensions 59 in.
Length of port 7 in.

PM-10 Guidelines require that the velocity at each of the four selected traverse points be within +/- 20%. Record the velocity pressure of the traverse points and perform the indicated calculations. The values in the last column must fall within range of 80 - 120.

Traverse Point	Gas Temp. (deg-F)	Velocity Pressure ΔP (in. WC)	$\sqrt{\Delta P}$	$\frac{100\sqrt{\Delta P}}{(\sqrt{\Delta P})_{Avg}}$
B 1	235	.50	.7071	80.22
2	235	.90	.9486	107.62
A 1	235	.93	.9643	109.4
2	235	.82	.9055	102.7
Averages	235		.8813	

The average velocity pressure to be used for the sizing run may now be calculated from the following expression:

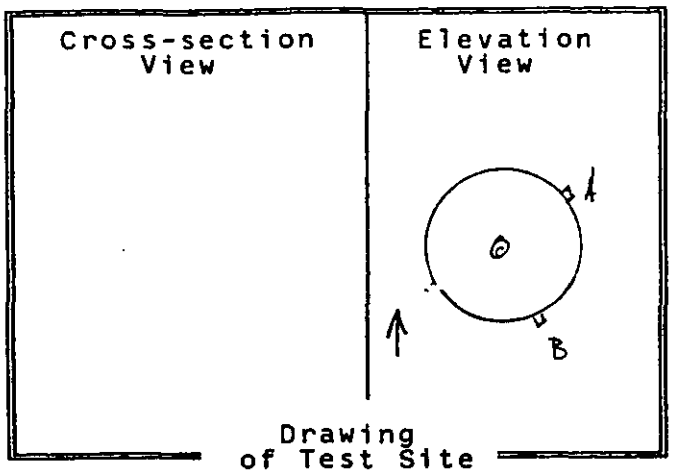
$$\Delta P = (\sqrt{\Delta P}_{Avg})^2 = .7768 \text{ in. WC}$$

Traverse points on round ducts: .15 D and .85 D
Distance from the duct wall: 8.85 50.17 in.
Distance from the end of port: 15.85 57.15 in.

CF-016

INTERPOLL LABORATORIES - EPA METHOD 2 FIELD DATA SHEET

Job ACS / EGF
Source "A" Dryer Stack
Test 4 Run ___ Date 2/24/94
Stack dimen. 47 IN.
Dry bulb ___ °F Wet bulb ___ °F
Manometer: ☒ Reg. ☐ Exp. ☐ Elec.
Barometric pressure 29.28 in Hg
Static pressure -.78 in WC
Operators D. VanHoose & E.
Pitot No. V22-6 C_p ___



Traverse Point No.	Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
		Port length: in.		Time start: 0749 hrs	
A 1				.38	
2				.40	
3				.42	
4				.42	
5				.45	
6				.63	
7				1.25	209
8				1.20	
9				1.00	
10				.86	
11				.73	
12				.50	
B 1				.93	
2				1.0	
3		ft/sec = 59.87		1.10	
4		43280		1.20	
5		23353		1.10	
6				1.10	
7				1.08	
8				1.04	
9				.97	
10				.86	
11				.70	
12				.40	
Temp. meas. device & S/N: PDT #18				Time end: hrs	

R or nothing = reg. manometer; S= expanded; E=electronic

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS/EGF Date 2/24/94 Test 4 Run 1
Source "A" Dryer Stack No. of traverse points 24
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0 cfm at 6 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DVH

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	603	200	403
Impinger No. 3			
Condenser			
Desiccant	1445	1432	13
Total			416

Integrated Gas Sampling Data:

Bag Pump No. 23A Box No. 19 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 0935 (HRS) Time end: 1134 (HRS)
Sampling rate: 200 cc/min Operator: DVH
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

INTERPOLL LABORATORIES EPA METHOD 5 FIELD DATA SHEET

Job: ACS / EGE
Source: A Dryer Stack
Date: 2/24/94 Test: 4 Run: 1

Operators: DWH + FJ
Meter Box No.: 2313 ΔH@ 1.74 IN WC
Gasmeter coeff.: 1.0027

Pitot No.: V22-4 Cp: .84
Bar. Press.: 29.26 inHg H2O: 32 X
Nozzle No.: 6-3 Nozzle Dia: .184 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC) Δp	Orifice Meter (inWC) ΔH	Dec. Vol. (cf)	VAC. inHg	Stack (°F)	Probe (°F)	Oven (°F)	Impg. (°F)	Gas/In (°F)	Gas/Out (°F)	Oxygen (%v/v)
	0930	548.50											
A 12	5	549.81	.37	.18	9.71	2	209	249	253	36	60	59	16.0
11	10	551.23	.46	.22	1.05	2	205				61	60	16.4
10	15	552.52	.46	.22	2.39	2	202				62	61	16.5
9	20	553.87	.46	.22	3.73	2	208	256	254	37	64	62	16.5
8	25	555.18	.46	.22	5.08	2	208				65	62	16.4
7	30	556.55	.49	.23	6.46	2	215				67	63	16.5
6	35	558.82	1.30	.62	8.71	3	217	257	253	37	68	64	16.3
5	40	560.97	1.25	.60	0.92	3	216				71	66	15.9
4	45	563.14	1.10	.53	3.01	3	215				72	66	15.7
3	50	564.89	.92	.44	4.92	2	215	258	251	37	73	67	15.7
2	55	566.85	.80	.39	6.72	2	205				73	68	15.5
1	60	568.40	.59	.29	8.26	2	205				74	69	15.7
B 12	65	570.20	.86	.42	0.13	2	205	257	254	39	73	69	15.9
11	70	572.16	.95	.46	2.10	2	207				74	69	15.9
10	75	574.24	1.10	.54	4.21	2	207				76	70	16.2
9	80	576.44	1.2	0.59	6.42	2	208	258	253	40	77	71	16.5
8	85	578.58	1.1	0.54	8.54	2	208				77	71	16.7
7	90	580.76	1.1	0.54	0.66	2	208				77	71	17.2
6	95	582.91	1.1	0.54	2.78	2	207	254	254	45	78	72	17.2
5	100	584.04	1.05	0.51	4.86	2	207				78	72	17.3
4	105	586.15	1.03	0.51	6.91	2	206				77	72	17.4
3	110	588.20	.95	0.47	8.89	2	205				78	72	17.2
2	115	590.87	.79	0.39	0.70	2	205	256	256	46	77	71	16.9
1	120	592.36	.57	0.28	2.23	2	205				76	71	16.7
	(1134)												
	θ = 120	Vm = 43.86		ΔH = .41							Avg. = 69.7		

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS/EGF Date 2/24/94 Test 4 Run 2
Source A Dryer Stack No. of traverse points 24
Method 5 Filter holder: glass Filter type: glass fiber

Sample Train Leak Check:

Pretest: 0.02 cfm at 15 in. Hg. (vac) ☒
Postest: 0.00 cfm at 10 in. Hg. (vac) ☒

Particulate Catch Data:

No.s of filters used: 6272

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DWH

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1		200	
Impinger No. 2	580		380
Impinger No. 3			
Condenser			
Desiccant	1427	1415	12
Total			392

Integrated Gas Sampling Data:

Bag Pump No. 239 Box No. 19 Bag No. 8
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1200 (HRS) Time end: 1405 (HRS)
Sampling rate: 200 cc/min Operator: DWH
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

S-0046RR

INTERPOLL LABORATORIES A METHOD 5 FIELD DATA SHEET

Job ACS/EGF
Source A. Dryer Stack
Date 2/24/94 Test 4 Run 2

Operators DJH
Meter Box No. 3 ΔH@ 1.77 IN WC
Gasmeter coeff. 1.0027

Pitot No. V22-4 Cp .81
Bar. Press. 29.28 inHg H2O 32 %
Nozzle No. 6-3 Nozzle Dia. .184 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Obs. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas/In	Gas/Out	Oxygen (%v/v)
	1200	592.60											
B 12	5	594.72	.90	.44	4.50	2	205	250	246	40	68	67	16.1
11	10	596.82	1.0	.49	6.51	2	203	251	246	40	70	67	16.2
10	15	598.81	1.1	0.54	8.61	2	204	251	246	38	72	68	16.2
9	20	600.97	1.2	0.59	0.82	2	204	252	247	37	73	69	16.2
8	25	602.99	1.1	0.54	2.93	2	204	250	246	37	75	70	15.9
7	30	605.04	1.1	0.54	5.05	2	204	251	247	38	76	70	16.2
6	35	607.17	1.1	0.54	7.17	2	205	250	248	37	76	71	16.2
5	40	609.31	1.05	0.52	9.25	2	204	251	248	39	77	72	16.3
4	45	611.36	1.0	0.44	1.28	2	204	250	247	40	78	72	16.1
3	50	613.32	.86	0.42	3.16	2	202	250	248	39	78	72	16.0
2	55	614.99	.74	0.36	4.91	2	202	251	247	40	78	73	16.1
1	60	616.62	.53	0.26	6.46	2	204	252	247	39	78	73	16.3
A 12	65	617.92	.35	0.17	7.60	2	204	251	248	40	75	72	16.4
11	70	618.99	.36	0.17	8.82	2	203	251	248	41	76	72	16.3
10	75	620.29	.40	0.19	0.10	2	205	251	247	40	76	72	16.3
9	80	621.64	.40	0.19	1.38	2	205	252	247	40	76	72	16.2
8	85	622.97	.37	0.18	2.62	2	205	251	248	41	76	72	16.3
7	90	624.44	.48	0.23	4.02	2	205	251	248	40	77	73	16.5
6	95	626.70	1.3	0.64	6.33	2	205	250	247	41	77	73	16.4
5	100	628.99	1.3	0.64	8.65	2	204	250	248	42	79	73	16.1
4	105	630.99	1.1	0.54	0.78	2	204	253	249	40	79	74	16.2
3	110	632.81	.92	0.46	2.74	2	202	251	252	41	79	74	16.0
2	115	634.59	.72	0.36	4.47	2	201	250	248	42	78	73	16.0
1	120	636.24	.57	0.28	6.01	2	201	251	249	41	79	74	15.9
	(1405)												
	θ = 120	Ym = .9364		ΔH = .41							Avg. = 73.8		

S-0037R

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS / EGF — Date 2/24/94 — Test 4 — Run 3
Source A Dryer Stack — No. of traverse points 24
Method 5 — Filter holder: glass — Filter type: glass fiber

Sample Train Leak Check:

Pretest: < 0.02 cfm at 15 in. Hg. (vac)
Postest: 0.00 cfm at 10 in. Hg. (vac)

Particulate Catch Data:

No.s of filters used: 6273

Recovery solvent(s)
☒ acetone
☐ other(s)

No. of probe wash bottles: 1
Sample recovered by: DVH

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2	580	200	380
Impinger No. 3			
Condenser			
Desiccant	1456	1445	11
Total			391

Integrated Gas Sampling Data:

Bag Pump No. 23A — Box No. 19 — Bag No. 3
Bag Material: 5-layer Aluminized Tedlar — Size: 44 L
Pretest leak check: 0 cc/min at 14 in. Hg.
Time start: 1425 (HRS) — Time end: _____ (HRS)
Sampling rate: 200 cc/min — Operator: DVH
S/N of O_2 Analyzer used to monitor train outlet: 7

CF-023

S-0046RR

INTERPOLL LABORATORIES — METHOD 5 FIELD DATA SHEET

Job ACS - EGF — Operators SB + DV — Pitot No. U22-4 — Cp .84
Source "A" PULP DRYER STACK — Meter Box No. 3 — ΔH 1.74 IN WC — Bar. Press. 29.28 inHg — H2O 32 x
Date 2-24-94 — Test # — Run # 3 — Counter coeff. 1.0027 — Nozzle No. 16-3 — Nozzle Dia .184 IN.

Traverse Point No.	Sampling Time (min)	Sample Volume (cf)	Velocity Head (inWC)	Orifice Meter (inWC)	Dec. Vol. (cf)	VAC. inHg	Temperatures (°F) Stack	Probe	Oven	Impg.	Gas In	Gas Out	Oxygen (x v/v)
	(1425)	(676.55)											
A 12	5	637.85	.34	0.17	7.74	2	204	251	248	40	71	70	16.2
11	10	638.99	.35	0.17	8.95	2	203	250	248	39	72	70	16.1
10	15	640.24	.37	0.18	0.19	2	203	251	247	40	73	71	16.2
9	20	641.47	.37	0.18	1.44	2	203	252	248	40	74	71	16.0
8	25	642.76	.37	0.18	2.69	2	204	251	248	39	74	71	16.1
7	30	644.20	.47	0.23	4.09	2	204	252	249	40	75	72	16.3
6	35	646.652	1.3	0.66	6.43	2	204	250	248	41	76	72	16.4
5	40	648.91	1.3	0.66	8.77	2	204	252	249	40	78	73	16.3
4	45	650.99	1.1	0.56	0.93	2	203	251	248	41	79	73	16.4
3	50	652.99	.87	0.44	2.85	2	203	252	247	40	78	73	16.2
2	55	654.861	.70	0.35	4.58	2	203	251	248	40	77	72	16.4
1	60	656.17	.55	0.28	6.11	2	201	253	250	41	76	72	16.5
B 12	65	658.23	.92	0.47	8.08	2	201	252	248	40	76	72	16.7
11	70	660.32	1.0	0.5	0.13	2	203	252	249	40	77	72	16.5
10	75	662.41	1.1	0.56	2.29	2	203	251	249	39	78	73	16.7
9	80	664.59	1.25	0.63	4.59	2	203	249	248	38	78	73	16.7
8	85	666.784	1.15	0.58	6.80	2	203	254	248	37	78	73	16.5
7	90	668.99	1.05	0.53	8.91	2	204	253	247	38	78	73	16.5
6	95	671.12	1.05	0.53	1.02	2	204	252	247	38	79	73	16.5
5	100	673.22	1.05	0.53	3.13	2	203	253	248	40	79	73	16.7
4	105	675.32	1.0	0.51	5.20	2	202	252	248	39	79	73	16.5
3	110	677.28	.87	0.44	7.12	2	201	253	247	38	79	73	16.5
2	115	678.99	.73	0.37	8.89	2	200	251	248	38	78	73	16.5
1	120	680.63	.55	0.28	0.42	2	201	252	247	40	78	73	16.5
	θ = 120	Vs = 44.09		ΔH = .42							Avg. = 74		

C-39

Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection
Field Data Sheet

Job ACS - Grand Forks Date 2/24/94 Bar. Pressure 29.28 IN.HG.
Test Location Dryer - A Fuel Type _____ Sample Train No. [illegible]
_____ Technician EJ Pump No. 3

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	4-1-A	61	9:30	26.55	60	☑ Yes ☐ No
2	4-1-B	62	9:45	26.60	60	☑ Yes ☐ No
3	4-1-C	63	10:00	26.60	60	☑ Yes ☐ No
4	4-1-A	64	10:15	26.55	60	☑ Yes ☐ No
5	4-2-B	65	10:30	26.65	60	☑ Yes ☐ No
6	4-2-B'	66	10:45	26.65	60	☑ Yes ☐ No
7	4-2-C	19	11:00	26.65	60	☑ Yes ☐ No
8	4-2-A	20	11:15	26.60	60	☑ Yes ☐ No
9	4-3 B	21	12:00	26.70	60	☑ Yes ☐ No
10	4-3 C	22	12:15	26.70	60	☑ Yes ☐ No
11	4-3 A	23	12:30	26.70	60	☑ Yes ☐ No
12	4-3 B	24	12:45	26.70	60	☑ Yes ☐ No
13						☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐ No

S-263R

Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection
Field Data Sheet

Job ACS/E. Grand Forks Date 2/23/94 Bar. Pressure 29.43 IN.HG.
Test Location P&P B Fuel Type _____ Sample Train No. Green
_____ Technician ES Pump No. 2

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	2-1-A	43	16:45	26.90	60	☑ Yes ☐ No
2	2-1 B	44	17:00	26.90	60	☑ Yes ☐ No
3	2-1 C	46	17:15	26.95	60	☑ Yes ☐ No
4	2-1 A	45	17:30	26.90	60	☑ Yes ☐ No
5	2-2 B	47	17:45	26.95	60	☑ Yes ☐ No
6	2-2 C	48	19:30	26.95	60	☑ Yes ☐ No
7	2-2 A	67	19:50	26.95	60	☑ Yes ☐ No
8	2-2 B	68	19:10	27.00	60	☑ Yes ☐ No
9	2-3 C	69	19:45	26.95	60	☑ Yes ☐ No
10	2-3 A	70	2013	2680	60	☒ Yes ☐ No
11	2-3 B	71	2029	26.80	60	☒ Yes ☐ No
12	2-3 C	72	2040	26.80	60	☒ Yes ☐ No
13						☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐ No

S-263R

Interpoll Laboratories
(612)786-6020

EPA Method 7 Sample Collection
Field Data Sheet

Job ACS-FGF Date 2-24-94 Bar. Pressure 29.24 IN.HG.
Test Location "L" PULP Fuel Type COAL Sample Train No. BLUE
DRYER STACK Technician SB+DV Pump No. 2

No.	Test Run Point	Flask No.	Time (HRS)	Vacuum (IN.HG.)	Flask Temp. (°F)	Leak Rate <0.4 IN.HG./MIN.
1	L-1-A	13	0832	26.70	50	☒ Yes ☐ No
2	L-1-B	14	0847	26.90	50	☒ Yes ☐ No
3	L-1-C	15	0914	26.80	50	☒ Yes ☐ No
4	L-1-A	16	0929	26.85	50	☒ Yes ☐ No
5	L-2-D	17	0945	26.90	45	☒ Yes ☐ No
6	L-2-C	18	0958	26.60	40	☒ Yes ☐ No
7	L-2-A	43	1014	27.10	40	☒ Yes ☐ No
8	L-2-B	44	1030	27.10	40	☒ Yes ☐ No
9	L-3-C	45	1048	27.10	40	☒ Yes ☐ No
10	L-3-A	46	1108	26.90	40	☒ Yes ☐ No
11	L-3-B	47	1120	27.40	35	☒ Yes ☐ No
12	L-3-C	48	1135	27.80	36	☒ Yes ☐ No
13						☐ Yes ☐ No
14						☐ Yes ☐ No
15						☐ Yes ☐ No
16						☐ Yes ☐ No
17						☐ Yes ☐ No
18						☐ Yes ☐ No
19						☐ Yes ☐ No
20						☐ Yes ☐ No
21						☐ Yes ☐ No
22						☐ Yes ☐ No
23						☐ Yes ☐ No
24						☐ Yes ☐ No
25						☐ Yes ☐ No
26						☐ Yes ☐ No
27						☐ Yes ☐

INTERPOLL LABORATORIES - EPA METHOD 5 FIELD DATA SHEET

Job ACS - EGF

Source "C" PULP DRYER STACK

Test 5 Run 2 Date 8-24-94

Stack dimen. 48 IN.

Dry bulb 215 °F Wet bulb 157 °F

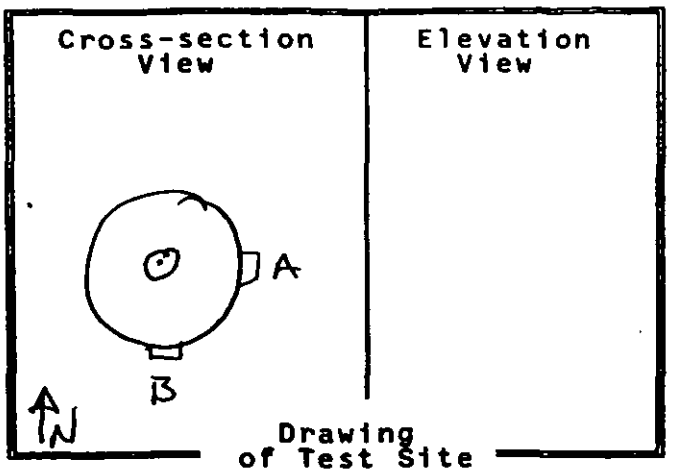
Manometer: ☐ Reg. ☐ Exp. ☐ Elec.

Barometric pressure 29.28 in Hg

Static pressure -1.20 in WC

Operators SB + DV

Pitot No. 23V6 C_p .840



Traverse Point No.		Fraction of Diameter	Distance from Stack Wall (in)	Distance from End of Port (in)	Velocity Pressure (in WC)	Temperature of gas (°F)
			Port length: 25.5 in.		Time start: 1021 hrs	
A	1	.021	1.01	26.51	.78	214
	2	.067	3.22	28.72	1.02	214
	3	.118	5.66	31.16	.84	214
	4	.177	8.50	34.00	.94	214
	5	.250	12.00	37.50	.90	214
	6	.356	17.09	42.59	.92	214
	7	.644	30.91	56.91	.92	214
	8	.750	36.00	61.50	.90	214
	9	.823	39.50	65.00	.88	214
	10	.882	42.34	67.84	.74	213
	11	.933	44.78	70.28	.60	213
	12	.974	46.99	72.49	.54	213
B	1				.60	213
	2				.68	213
	3				.70	213
	4				.88	214
	5				.90	214
	6				.94	214
	7				.94	214
	8				.98	214
	9				.92	214
	10				.70	214
	11				.64	214
	12				.52	214
Temp. meas. device & S/N: DIGITAL TC -PPT29					Time end: 1028 hrs	

R or nothing = reg. manometer; S= expanded; E=electronic S-3921

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS- EGF Date 2-24-94 Test 5 Run 1
Source "C" PULP DRYER STACK No. of traverse points 3
Method 3 Filter holder: S.S. Filter type: GLASS WOOL

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ____ cfm at ____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: Recovery solvent(s)

_____ ☐ acetone _____
_____ ☐ other(s) _____

No. of probe wash bottles: _____
Sample recovered by: _____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. 233 Box No. 21 Bag No. 1
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 0830 (HRS) Time end: 0930 (HRS)
Sampling rate: 400 cc/min Operator: SB
S/N of O_2 Analyzer used to monitor train outlet: —

CF-023

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS - EGF Date 2-24-94 Test 5 Run 2
Source "C" Duct Dryer Stack No. of traverse points 3
Method 5 Filter Holder: S-S Filter type: Glass Wool

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ____ cfm at ____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: _____ _____

Recovery solvent(s)
☐ acetone _____
☐ other(s) _____

No. of probe wash bottles: _____
Sample recovered by: _____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. 23B Box No. 21 Bag No. 2
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 0930 (HRS) Time end: 1030 (HRS)
Sampling rate: 400 cc/min Operator: STB
S/N of O_2 Analyzer used to monitor train outlet: ____

CF-023

S-0046RR

INTERPOLL LABORATORIES EPA METHOD 5/17 SAMPLE LOG SHEET

Job ACS - FGT Date 2-24-94 Test 5 Run 3
Source "2" Pump Dryer Stack No. of traverse points 3
Method 5 Filter holder: S-S. Filter type: Glass wool

Sample Train Leak Check:

Pretest: (0.02 cfm at 15 in. Hg. (vac) ☐
Postest: ____ cfm at ____ in. Hg. (vac) ☐

Particulate Catch Data:

No.s of filters used: _____ _____

Recovery solvent(s)
☐ acetone _____
☐ other(s) _____

No. of probe wash bottles: _____
Sample recovered by: _____

Condensate Data:

Item	Weight(g)		
	Final	Tare	Difference
Impinger No. 1			
Impinger No. 2			
Impinger No. 3			
Condenser			
Desiccant			
Total			

Integrated Gas Sampling Data:

Bag Pump No. 235 Box No. 21 Bag No. 3
Bag Material: 5-layer Aluminized Tedlar Size: 44 L
Pretest leak check: 00 cc/min at 15 in. Hg.
Time start: 1030 (HRS) Time end: 1130 (HRS)
Sampling rate: 400 cc/min Operator: SB
S/N of O_2 Analyzer used to monitor train outlet: ____

CF-023

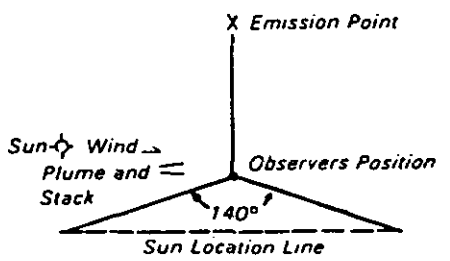
S-0046RR

Interpoll Laboratories
(612)786-6020

Visible Emissions Form Test #4

SOURCE NAME: American Crystal Sugar
ADDRESS:
CITY: East Grand Forks | STATE: MN | ZIP:
PHONE: | SOURCE ID NUMBER:
PROCESS EQUIPMENT: A Pulp Dryer | OPERATING MODE:
CONTROL EQUIPMENT: | OPERATING MODE:
DESCRIBE EMISSION POINT
START | STOP
HEIGHT ABOVE GROUND LEVEL: START | STOP | HEIGHT RELATIVE TO OBSERVER: START | STOP
DISTANCE FROM OBSERVER: START | STOP | DIRECTION FROM OBSERVER: START | STOP
DESCRIBE EMISSIONS
START | STOP
EMISSION COLOR: START | STOP | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT: NO ☐ YES ☐ | IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED
START | STOP
DESCRIBE BACKGROUND
START | STOP
BACKGROUND COLOR: START | STOP | SKY CONDITIONS: START | STOP
WIND SPEED: START | STOP | WIND DIRECTION: START | STOP
AMBIENT TEMP.: START | STOP | WET BULB TEMP. | RH, percent

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE: 2-22-94
START TIME
STOP TIME

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1					31				
2					32				
3					33				
4					34				
5					35				
6					36				
7					37				
8					38				
9					39				
10					40				
11					41				
12					42				
13					43				
14					44				
15					45				
16					46				
17					47				
18					48				
19					49				
20					50				
21					51				
22					52				
23					53				
24					54				
25					55				
26					56				
27					57				
28					58				
29					59				
30					60				

AVERAGE OPACITY FOR HIGHEST PERIOD:
NUMBER OF READINGS ABOVE % WERE:
RANGE OF OPACITY READINGS: MINIMUM | MAXIMUM
OBSERVER'S NAME (PRINT): Richard J. Eickem
OBSERVER'S SIGNATURE: Richard J. Eickem | DATE: 2-22-94
ORGANIZATION: Interpoll Labs Inc.
CERTIFIED BY: ETA Inc. | DATE: 10-6-93
VERIFIED BY: | DATE:

COMMENTS: Could not read due to cloud cover and plumes intermixing

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE
TITLE | DATE

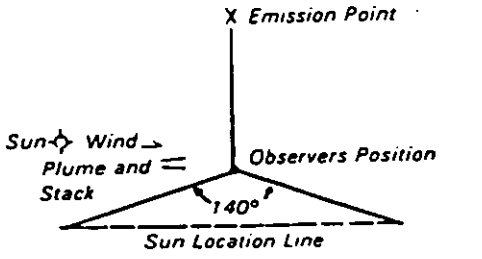
Interpoll Laboratories
(612)786-6020

Visible Emissions Form

Test 2

SOURCE NAME: American Crystal Sugar
ADDRESS:
CITY: East Grand Forks | STATE: MN | ZIP:
PHONE: | SOURCE ID NUMBER:
PROCESS EQUIPMENT: B Pulp Dryer | OPERATING MODE:
CONTROL EQUIPMENT: | OPERATING MODE:
DESCRIBE EMISSION POINT
START STOP
HEIGHT ABOVE GROUND LEVEL START STOP | HEIGHT RELATIVE TO OBSERVER START STOP
DISTANCE FROM OBSERVER START STOP | DIRECTION FROM OBSERVER START STOP
DESCRIBE EMISSIONS
START STOP
EMISSION COLOR START STOP | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT: NO ☐ YES ☐ | IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED
START STOP
DESCRIBE BACKGROUND
START STOP
BACKGROUND COLOR START STOP | SKY CONDITIONS START STOP
WIND SPEED START STOP | WIND DIRECTION START STOP
AMBIENT TEMP. START STOP | WET BULB TEMP | RH.percent

Source Layout Sketch — Draw North Arrow



OBSERVATION DATE: 2-22-94
START TIME
STOP TIME

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1					31				
2					32				
3					33				
4					34				
5					35				
6					36				
7					37				
8					38				
9					39				
10					40				
11					41				
12					42				
13					43				
14					44				
15					45				
16					46				
17					47				
18					48				
19					49				
20					50				
21					51				
22					52				
23					53				
24					54				
25					55				
26					56				
27					57				
28					58				
29					59				
30					60				

AVERAGE OPACITY FOR HIGHEST PERIOD
NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS MINIMUM MAXIMUM
OBSERVER'S NAME (PRINT): RICHARD J. EIDEM
OBSERVER'S SIGNATURE: Richard J. Eidem | DATE: 2-22-94
ORGANIZATION: Interpoll Labs Inc.
CERTIFIED BY: ETA Inc. | DATE: 10-6-93
VERIFIED BY: | DATE:

COMMENTS: Could not read due to cloud cover and plumes intermixing

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE
TITLE | DATE

S-0079R

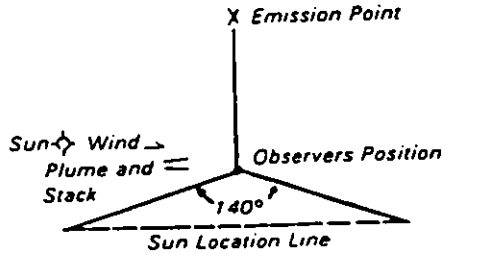
Interpoll Laboratories
(612)786-6020

Visible Emissions Form

Test #5

SOURCE NAME: American Crystal Sugar
ADDRESS:
CITY | STATE | ZIP
PHONE | SOURCE ID NUMBER
PROCESS EQUIPMENT: C Pulp Dryer | OPERATING MODE
CONTROL EQUIPMENT | OPERATING MODE
DESCRIBE EMISSION POINT — START — STOP
HEIGHT ABOVE GROUND LEVEL — START — STOP | HEIGHT RELATIVE TO OBSERVER — START — STOP
DISTANCE FROM OBSERVER — START — STOP | DIRECTION FROM OBSERVER — START — STOP
DESCRIBE EMISSIONS — START — STOP
EMISSION COLOR — START — STOP | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT: NO ☐ YES ☐ | IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED — START — STOP
DESCRIBE BACKGROUND — START — STOP
BACKGROUND COLOR — START — STOP | SKY CONDITIONS — START — STOP
WIND SPEED — START — STOP | WIND DIRECTION — START — STOP
AMBIENT TEMP. — START — STOP | WET BULB TEMP. | RH,percent

Source Layout Sketch — Draw North Arrow



COMMENTS: Could not read due to cloud cover and plumes intermixing

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE
TITLE | DATE

OBSERVATION DATE: 2-22-94

SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1					31				
2					32				
3					33				
4					34				
5					35				
6					36				
7					37				
8					38				
9					39				
10					40				
11					41				
12					42				
13					43				
14					44				
15					45				
16					46				
17					47				
18					48				
19					49				
20					50				
21					51				
22					52				
23					53				
24					54				
25					55				
26					56				
27					57				
28					58				
29					59				
30					60				

AVERAGE OPACITY FOR HIGHEST PERIOD | NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS — MINIMUM — MAXIMUM
OBSERVER'S NAME (PRINT): Richard J. Eidem
OBSERVER'S SIGNATURE: Richard J. Eidem | DATE: 2-22-94
ORGANIZATION: Interpoll Labs Inc.
CERTIFIED BY: ETA Inc. | DATE: 10-6-93
VERIFIED BY | DATE

S-0079R

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Richard Sidens

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 Lore
President

240743
Certificate Number

Vice President

Minneapolis
Location

David B. Savage, Jr.
Program Manager

October 6, 1993
Date of Issue

APPENDIX D

INTERPOLL LABORATORIES ANALYTICAL DATA

TABLE OF CONTENTS

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

ACS – SCF	Source: [illegible] boiler
Team Leader: SB	Test Site: Stack
Date Submitted: 2-25-94	Date of Test: 2-22-94
Test No.: [illegible]	No. of Runs Completed: 3
Date of Analysis: 2-22-94	Technician: [illegible]

Test/Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
1	[illegible]	1	0.00	[illegible]	19.10	11.30	8.80	[illegible]
		2	0.00	11.25	19.70	11.20	8.50	[illegible]
	☑ B ☐ F	Avg				11.25	8.50	
2	[illegible]	1	0.00	11.60	19.70	11.60	8.10	1.10
		2	0.00	11.60	19.70	11.60	8.10	1.10
	☑ B ☐ F	Avg				11.60	8.10	
3	[illegible]	1	0.00	11.60	19.70	11.60	8.10	1.10
		2	0.00	11.60	19.70	11.60	8.10	1.10
	☑ B ☐ F	Avg				11.60	8.10	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

- ☑ Ambient Air QA Check
- ☑ Orsat Analyzer System Leak Check
- ☑ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job: [illegible] Source: [illegible] Dryer
Team Leader: DVH Test Site: [illegible]
Date Submitted: 2-25-94 Date of Test: 2-[illegible]-94
Test No.: [illegible] No. of Runs Completed: [illegible]
Date of Analysis: [illegible]-2-94 Technician: [illegible]

Test/Run	Sample Log Number and Type	No. of Anl	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
#1	[illegible]-26	1	0.00	4.80	20.30	4.80	15.50	1.1[illegible]
		2	0.00	4.80	20.30	4.80	15.50	1.1[illegible]
	☑ B ☐ F	Avg				4.80	15.50	
#2	-27	1	0.00	5.20	20.20	5.20	15.00	1.1[illegible]
		2	0.00	5.20	20.20	5.20	15.00	1.1[illegible]
	☑ B ☐ F	Avg				5.20	15.00	
#3	-28	1	0.00	4.80	20.20	4.80	15.40	1.15
		2	0.00	4.80	20.20	4.80	15.40	1.15
	☑ B ☐ F	Avg				4.80	15.40	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

- ☑ Ambient Air QA Check
- ☑ Orsat Analyzer System Leak Check
- ☑ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines Fuel Type	F_O Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.120

LSC-04-RR

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Source
Team Leader
Test Site
Date Submitted
Date of Test
Test No.
No. of Runs Completed
Date of Analysis
Technician

Test/ Run	Sample Log Number and Type	No. of Anl.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
1		1						
		2						
	□ B □ F	Avg						
2		1						
		2						
	□ B □ F	Avg						
3		1						
		2						
	□ B □ F	Avg						
		1						
		2						
	□ B □ F	Avg						
		1						
		2						
	□ B □ F	Avg						
		1						
		2						
	□ B □ F	Avg						
		1						
		2						
	□ B □ F	Avg						
		1						
		2						
	□ B □ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☑ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines	
Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
D-3 Wood/Wood Bark	1.000-1.150

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Team Leader: ACS EGF DVH
Date Submitted: 2-23-94
Test No.: 2
Date of Analysis: 2-23-94

Source: B Dryer
Test Site: Stack
Date of Test: 2-23-94
No. of Runs Completed: 3
Technician: C. [illegible]

Test/ Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %V/V Dry	Conc. O_2 %V/V Dry	F_o
2/1	[illegible]-32	1	0.00	3.90	20.40	3.90	16.50	1.13
		2	0.00	3.90	20.40	3.90	16.50	1.13
	☑ B ☐ F	Avg				3.90	16.50	
2/2	[illegible]-33	1	0.00	3.90	20.40	3.90	16.50	1.13
		2	0.00	3.90	20.40	3.90	16.50	1.13
	☑ B ☐ F	Avg				3.90	16.50	
2/3	[illegible]-34	1	0.00	3.90	20.40	3.90	16.50	1.13
		2	0.00	3.90	20.40	3.90	16.50	1.13
	☑ B ☐ F	Avg				3.90	16.50	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☑ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job: ACS - EGF
Team Leader: SR
Date Submitted: 2-25-94
Test No.: 4
Date of Analysis: 3-2-94

Source: A' Pulp Dryer
Test Site: Stack
Date of Test: 2-24-94
No. of Runs Completed: 3
Technician: R/C/WM

Test/Run	Sample Log Number and Type	No. of An.	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc CO_2 %v/v Dry	Conc O_2 %v/v Dry	F_o
4/1	2326-35	1	0.00	4.10	20.30	4.10	15.90	[illegible]
	☑ B ☐ F	2	0.00	4.10	20.30	4.10	15.90	[illegible]
		Avg				4.10	15.90	
4/2	-36	1	0.00	4.30	20.30	4.30	16.00	1.14
	☑ B ☐ F	2	0.00	4.30	20.30	4.30	16.00	1.14
		Avg				4.30	16.00	
4/3	-37	1	0.00	4.30	20.30	4.30	16.00	1.14
	☑ B ☐ F	2	0.00	4.30	20.30	4.30	16.00	1.14
		Avg				4.30	16.00	
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						
	☐ B ☐ F	1						
		2						
		Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☑ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

LSC-04-BR

Interpoll Laboratories
(612) 786-6020

EPA Method 3 Data Reporting Sheet
Orsat Analysis

Job: ACS – EGF
Team Leader: SB
Date Submitted: 2-24-94
Test No.: 5
Date of Analysis: 3-2-94

Source: C Pulp Dryer
Test Site: Stack
Date of Test: 2-24-94
No. of Runs Completed:
Technician: RE/DEM

Test/ Run	Sample Log Number and Type	No. of An-	Buret Readings (ml) Zero Pt.	After CO_2	After O_2	Conc. CO_2 %v/v Dry	Conc. O_2 %v/v Dry	F_o
5/1	432-39	1	0.00	2.00	20.70	2.00	18.70	1.10
		2	0.00	2.00	20.70	2.00	18.70	1.16
	☑ B ☐ F	Avg				2.00	18.70	
5/2	-40	1	0.00	1.30	20.90	1.30	19.60	1.00
		2	0.00	1.30	20.90	1.30	19.60	1.00
	☑ B ☐ F	Avg				1.30	19.60	
5/3	-41	1	0.00	4.20	20.50	4.20	16.30	1.10
		2	0.00	4.20	20.50	4.20	16.30	1.10
	☑ B ☐ F	Avg				4.20	16.30	
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						
		1						
		2						
	☐ B ☐ F	Avg						

☑ Ambient Air QA Check
☑ Orsat Analyzer System Leak Check
☑ F_o Within EPA M-3 Guidelines for fuel type.

Where $F_o = \frac{20.9 - O_2}{CO_2}$

F=Flask (250 cc all glass)
B=Tedlar Bag (5-layer)

EPA Method 3 Guidelines

Fuel Type	F0 Range
Coal:	
Anthracite/Lignite	1.016-1.130
Bituminous	1.083-1.230
Oil:	
Distillate	1.260-1.413
Residual	1.210-1.370
Gas:	
Natural	1.600-1.836
Propane	1.434-1.586
Butane	1.405-1.553
Wood/Wood Bark	1.000-1.130

LSC-04-BR

INTERPOLL LABORATORIES
(612) 7_-6020

S-305RR
(9/90)

EPA Method 10 NDIR Analysis

Job Name ACS EGF
Source #2 Boiler
Date of Analysis 2-28-94
Technician C. Helgeson

NDIR Analyzer:
- ☐ Fuji ACS Model 3300
- ☐ Mon. Lab Model 8310
- ☒ Dasibi Model 3003

Range: 0 - 200 ppm
Flow rate: 1000 cc/min

Pretest Calibration

	Conc.	Reading	Vendor	Cyl. Number
Zero gas:	0 ppm	0 ppm	T.C.Ox	0793-27
Upscale gas:	40 ppm	40 ppm	Scott	ALM 030329
Upscale gas:	144 ppm	144 ppm	National	CC114302
Upscale gas:	___ ppm	___ ppm		

Post-test Calibration

	Conc.	Reading	Vendor	Cyl. Number
Zero gas:	0 ppm	0 ppm	T.C.Ox	0793-27
Upscale gas:	40 ppm	40 ppm	Scott	ALM 030329
Upscale gas:	144 ppm	144 ppm	National	CC114302
Upscale gas:	___ ppm	___ ppm		

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry)		
		Dilution Factor	Reading	Actual ppm
4₁	2326-29	10.0	20.9	210
4₂	-30	5.0	36.8	180
4₃	-31	5.0	39.8	200

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry)		
		Dilution Factor	Reading	Actual ppm

Note 1: If sample dilution is requried the sample is diluted with CO-free gas prior to analysis.
Note 2: The Fuji ACS model 3300 has a rejection ratio for CO to CO_2 greater then 100,000: 1 and the Mon. Labs Model 8310 and Dasibi Model 3003 have rejection ratios greater then 200,000:1 and thus CO_2 removal prior to analysis is not required.
Note 3: The analyzer must be zeroed and spanned immediately before and after sample analysis. Additional checks may be performed between sample analyses if required.

INTERPOLL LABORATORIES
(612) 7 -6020

S-305RR
(9/90)

EPA Method 10 NDIR Analysis

Job Name ACS EGF
Source #1 Boiler Stack
Date of Analysis 2-28-94
Technician C. Helgeson

NDIR Analyzer:
- ☐ Fuji ACS Model 3300
- ☐ Mon. Lab Model 8310
- ☒ Dasibi Model 3003

Range: 0 - 200 ppm
Flow rate: 1000 cc/min

Pretest Calibration

	Conc.	Reading	Vendor	Cyl. Number
Zero gas:	0 ppm	0 ppm	T.C.O.K	0793-27
Upscale gas:	40 ppm	40 ppm	Scott	ALM 030329
Upscale gas:	144 ppm	144 ppm	National	CC114 302
Upscale gas:	ppm	ppm		

Post-test Calibration

	Conc.	Reading	Vendor	Cyl. Number
Zero gas:	0 ppm	0 ppm	T.C.O.K	0793-27
Upscale gas:	40 ppm	40 ppm	SCOTT	ALM 030329
Upscale gas:	144 ppm	144 ppm	National	CC114302
Upscale gas:	ppm	ppm		

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry) Dilution Factor	Reading	Actual ppm
#1	2326-23	10	40.7	410
#2	-24	10	38.0	380
#3	-25	10	37.2	370

Sample Description Test/Run	Sample Log Number	CO Conc. (ppm, Dry) Dilution Factor	Reading	Actual ppm

Note 1: If sample dilution is requried the sample is diluted with CO-free gas prior to analysis.
Note 2: The Fuji ACS model 3300 has a rejection ratio for CO to CO_2 greater then 100,000: 1 and the Mon. Labs Model 8310 and Dasibi Model 3003 have rejection ratios greater then 200,000:1 and thus CO_2 removal prior to analysis is not required.
Note 3: The analyzer must be zeroed and spanned immediately before and after sample analysis. Additional checks may be performed between sample analyses if required.

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job ACS/EGF
Team Leader SB
Date Submitted 2-25-94
Test No. 1
Date of Analysis 3-6-94

Source NO. 1 Boiler
Test Site Stack
Date of Test 2-22-94
No. of Runs Completed 3
Technician R.EIDEM

0	Test 1 Run 0 Field Blank Log Number 2326-01I Comments	Dish No. 8 Dish Tare Wt. 46.9791 g Dish+Sample Wt. 46.9795 g Sample Wt. 0.0004 g
1	Test 1 Run 1 Log Number -02I Comments	Dish No. 10 Dish Tare Wt. 47.5456 g Dish+Sample Wt. 47.5496 g Sample Wt. 0.0040 g
2	Test 1 Run 2 Log Number -03I Comments	Dish No. 46 Dish Tare Wt. 45.4252 g Dish+Sample Wt. 45.4282 g Sample Wt. 0.0030 g
3	Test 1 Run 3 Log Number -04I Comments	Dish No. 66 Dish Tare Wt. 48.3091 g Dish+Sample Wt. 48.3107 g Sample Wt. 0.0016 g
4	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g
5	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g

Blank Solvent Wt. 0.0004 g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0036	0.0026	0.0012		

LSC-03.GR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job ACS/EGF
Team Leader SB
Date Submitted 2-25-94
Test No. 1
Date of Analysis 3-8-94
Transport Leakage ☐ (None) ☒ _____ ml

Source No. 1 Boiler
Test Site Stack
Date of Test 2-22-94
No. of Runs Completed 3
Technician B. Duke
Solvent Acetone

0
Test 1 Run 0 (Field Blank)
Log Number 2326-01P
Vol. of Solvent 100 ml
*Solvent Residue 3.0 ug/ml
Dish No. 23
Dish Tare Wt. 46.0837 g
Dish+Sample Wt. 46.0840 g
Sample Wt. 0.0003 g

1
Test 1 Run 1
Vol. of Solvent 150 ml
Log Number -02P
Comments
Dish No. 25
Dish Tare Wt. 44.3439 g
Dish+Sample Wt. 44.3669 g
Sample Wt. 0.0230 g

2
Test 1 Run 2
Vol. of Solvent 150 ml
Log Number -03P
Comments
Dish No. 27
Dish Tare Wt. 52.4467 g
Dish+Sample Wt. 52.4645 g
Sample Wt. 0.0178 g

3
Test 1 Run 3
Vol. of Solvent 140 ml
Log Number -04P
Comments
Dish No. 38
Dish Tare Wt. 48.6502 g
Dish+Sample Wt. 48.6608 g
Sample Wt. 0.0106 g

4
Test _____ Run _____
Vol. of Solvent _____ ml
Log Number _____
Comments
Dish No. _____
Dish Tare Wt. _____ g
Dish+Sample Wt. _____ g
Sample Wt. _____ g

5
Test _____ Run _____
Vol. of Solvent _____ ml
Log Number _____
Comments
Dish No. _____
Dish Tare Wt. _____ g
Dish+Sample Wt. _____ g
Sample Wt. _____ g

*Solvent Residue 3.0 ug/ml = [(Sample Wt. 0.0003 g)(10⁶)]/Vol. of Sol. 100 ml
EPA-MS Acetone Residue Blank Spec. (7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0225	0.0173	0.0100 D-10		

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job ACS/EGF
Team Leader SB
Date Submitted 2-25-94
Test No. 1
Date of Analysis 3-3-94

Source No. 1 Boiler
Test Site Stack
Date of Test 2-22-94
No. of Runs Completed 3
Technician B. Dahm

0
Test 1 Run 0
Field Blank
Log Number 2326-01F
Comments
Filter No. 6268
Filter Type 4" GF
Filter Tare Wt. .8678 g
Filter+Sample Wt. .8678 g
Sample Wt. 0.0000 g

1
Test 1 Run 1
Log Number -02F
Comments
Filter No. 6177
Filter Type 4" GF
Filter Tare Wt. .8629 g
Filter+Sample Wt. .8769 g
Sample Wt. 0.0140 g

2
Test 1 Run 2
Log Number -03F
Comments
Filter No. 6178
Filter Type 4" GF
Filter Tare Wt. .8614 g
Filter+Sample Wt. .8745 g
Sample Wt. 0.0131 g

3
Test 1 Run 3
Log Number -04F
Comments
Filter No. 6179
Filter Type 4" GF
Filter Tare Wt. .8625 g
Filter+Sample Wt. .8756 g
Sample Wt. 0.0131 g

4
Test ____ Run ____
Log Number
Comments
Filter No.
Filter Type
Filter Tare Wt. g
Filter+Sample Wt. g
Sample Wt. g

5
Test ____ Run ____
Log Number
Comments
Filter No.
Filter Type
Filter Tare Wt. g
Filter+Sample Wt. g
Sample Wt. g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0140	0.0131	0.0131		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0401	0.0330	0.0243		

LSC-02PR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job ACS / EGF
Team Leader DWH
Date Submitted 2-25-94
Test No. 1
Date of Analysis 3-6-94

Source C dryer
Test Site stack
Date of Test 2-22-94
No. of Runs Completed 3
Technician R. ELDEM

0	Test 1 Run 0 Field Blank Log Number 2326-05I Comments	Dish No. 12 Dish Tare Wt. 48.1490 g Dish+Sample Wt. 48.1494 g Sample Wt. 0.0004 g
1	Test 1 Run 1 Log Number -06I Comments	Dish No. 19 Dish Tare Wt. 48.9561 g Dish+Sample Wt. 48.9681 g Sample Wt. 0.0120 g
2	Test 1 Run 2 Log Number -07I Comments	Dish No. 20 Dish Tare Wt. 48.8128 g Dish+Sample Wt. 48.8237 g Sample Wt. 0.0109 g
3	Test 1 Run 3 Log Number -08I Comments	Dish No. 21 Dish Tare Wt. 47.5271 g Dish+Sample Wt. 47.5388 g Sample Wt. 0.0117 g
4	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g
5	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g

Blank Solvent Wt. 0.0004g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0116	0.0105	0.0113	D-12	

LSC-03.GR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job ACS - EGF
Team Leader DVH
Date Submitted 2-25-94
Test No. 1
Date of Analysis 3-3-94
Transport Leakage ☐ None ☒ _____ ml

Source C Dryer
Test Site Stack
Date of Test 1
No. of Runs Completed 3
Technician R. EIDEM
Solvent acetone

0	Test 1 Run 0 Field Blank Log Number 2326-05P Vol. of Solvent 100 ml *Solvent Residue 3.00 ug/ml	Dish No. 502 Dish Tare Wt. 46.9034 g Dish+Sample Wt. 46.9037 g Sample Wt. 0.0003 g
1	Test 1 Run 1 Vol. of Solvent 225 ml Log Number -06P Comments	Dish No. 504 Dish Tare Wt. 50.0215 g Dish+Sample Wt 50.0644 g Sample Wt. 0.0429 g
2	Test 1 Run 2 Vol. of Solvent 190 ml Log Number -07P Comments	Dish No. 522 Dish Tare Wt. 47.0022 g Dish+Sample Wt 47.0816 g Sample Wt. 0.0794 g
3	Test 1 Run 3 Vol. of Solvent 190 ml Log Number -08P Comments	Dish No. 609 Dish Tare Wt. 45.5609 g Dish+Sample Wt. 45.5828 g Sample Wt. 0.0219 g
4	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
5	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

*Solvent Residue 3.0 ug/ml = [(Sample Wt. 0.0003 g)(10⁶)]/Vol. of Sol. 100 ml
EPA-M5 Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0423	0.0788	0.0214 D-13		

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job AGS/EGF
Team Leader DVH
Date Submitted 2-25-94
Test No. 1
Date of Analysis 3-3-94

Source C Dryer
Test Site Stack
Date of Test 2-22-94
No. of Runs Completed 3
Technician C. Helseson

	Test 1 Run 0 Field Blank Log Number 2326-05F Comments	Filter No. 6263 Filter Type 4"GF Filter Tare Wt. .8703 g Filter+Sample Wt. .8703 g Sample Wt. g
0		
1	Test 1 Run 1 Log Number -06F Comments	Filter No. 6139 Filter Type 4"GF Filter Tare Wt. .8880 g Filter+Sample Wt. 1.0089 g Sample Wt. 0.1209 g
2	Test 1 Run 2 Log Number -07F Comments	Filter No. 6141 Filter Type 4"GF Filter Tare Wt. .8786 g Filter+Sample Wt. .9898 g Sample Wt. 0.1112 g
3	Test 1 Run 3 Log Number -08F Comments	Filter No. 6258 Filter Type 4"GF Filter Tare Wt. .8791 g Filter+Sample Wt. .9971 g Sample Wt. 0.1180 g
4	Test ____ Run ____ Log Number ____ Comments	Filter No. ____ Filter Type ____ Filter Tare Wt. ____ g Filter+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Log Number ____ Comments	Filter No. ____ Filter Type ____ Filter Tare Wt. ____ g Filter+Sample Wt. ____ g Sample Wt. ____ g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.1209	0.1112	0.1180		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.1748	0.2005	0.1507		

LSC-02PR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job ACS / EGF
Team Leader SB
Date Submitted 2-25-94
Test No. 2
Date of Analysis 3-6-94

Source NO. 2 Boiler
Test Site Stack
Date of Test 2-23-94
No. of Runs Completed 3
Technician R. EIDEM

0	Test ____ Run 0 Field Blank Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 2 Run 1 Log Number 2326-09 I Comments ____	Dish No. 204 Dish Tare Wt. 47.4651 g Dish+Sample Wt. 47.4666 g Sample Wt. 0.0015 g
2	Test 2 Run 2 Log Number -10 I Comments ____	Dish No. 611 Dish Tare Wt. 50.0085 g Dish+Sample Wt. 50.0106 g Sample Wt. 0.0021 g
3	Test 2 Run 3 Log Number -11 I Comments ____	Dish No. 622 Dish Tare Wt. 48.8452 g Dish+Sample Wt. 48.8464 g Sample Wt. 0.0012 g
4	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Log Number ____ Comments ____	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

Blank Solvent Wt. 0.0004 g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0011	0.0017	0.0008		

D-15

LSC-03.GR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job ACS-EGF
Team Leader SB
Date Submitted 2-25-94
Test No. 2
Date of Analysis 3-7-94
Transport Leakage ☐ (None) ☐ _____ ml

Source NO. 2 Boiler
Test Site Stack
Date of Test 2-23-94
No. of Runs Completed 3
Technician R. ELDEN
Solvent acetone

0	Test ____ Run 0 Field Blank Log Number _____ Vol. of Solvent ____ ml *Solvent Residue 3.0 ug/ml	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
1	Test 2 Run 1 Vol. of Solvent 200 ml Log Number 2326-09P Comments _____	Dish No. 80 Dish Tare Wt. 49.6267 g Dish+Sample Wt. 49.6374 g Sample Wt. 0.0107 g
2	Test 2 Run 2 Vol. of Solvent 175 ml Log Number -10P Comments _____	Dish No. 84 Dish Tare Wt. 49.1007 g Dish+Sample Wt 49.1102 g Sample Wt. 0.0095 g
3	Test 2 Run 3 Vol. of Solvent 190 ml Log Number -11P Comments _____	Dish No. 93 Dish Tare Wt. 53.9906 g Dish+Sample Wt 53.9933 g Sample Wt. 0.0027 g
4	Test ____ Run ____ Vol. of Solvent ____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
5	Test ____ Run ____ Vol. of Solvent ____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

*Solvent Residue ___ ug/ml = [(Sample Wt. ____ g)(10^6)]/Vol. of Sol. ____ ml
EPA-MS Acetone Residue Blank Spec. ≤ 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0101	0.0090	0.0022		

D-16

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job ACS/EGF
Team Leader SB
Date Submitted 2-25-94
Test No. 2
Date of Analysis 3-3-94

Source No. 2 Boiler
Test Site Stack
Date of Test 2-23-94
No. of Runs Completed 3
Technician B. Burke

0 Test ____ Run 0
Field Blank
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

1 Test 2 Run 1
Log Number 232609F
Comments ____
Filter No. 6269
Filter Type 4"GF
Filter Tare Wt. .8710 g
Filter+Sample Wt. .8914 g
Sample Wt. 0.0204 g

2 Test 2 Run 2
Log Number -10F
Comments ____
Filter No. 6270
Filter Type 4"GF
Filter Tare Wt. .8667 g
Filter+Sample Wt. .8857 g
Sample Wt. 0.0190 g

3 Test 2 Run 3
Log Number -11F
Comments ____
Filter No. 6260
Filter Type 4"GF
Filter Tare Wt. .8540 g
Filter+Sample Wt. .8701 g
Sample Wt. 0.0161 g

4 Test ____ Run ____
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

5 Test ____ Run ____
Log Number ____
Comments ____
Filter No. ____
Filter Type ____
Filter Tare Wt. ____ g
Filter+Sample Wt. ____ g
Sample Wt. ____ g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0204	0.0190	0.0161		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0316	0.0297	0.0191		

LSC-02PR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job ACS / EGF
Team Leader DUH
Date Submitted 2-25-94
Test No. 2
Date of Analysis 3-6-94

Source R dryer
Test Site Stack
Date of Test 2-23-94
No. of Runs Completed 3
Technician R. ELDEN

0	Test 2 Run 0 Field Blank Log Number 2326-12I Comments	Dish No. 2 Dish Tare Wt. 46.2267 g Dish+Sample Wt. 46.2271 g Sample Wt. 0.0004 g
1	Test 2 Run 1 Log Number -13I Comments	Dish No. 3 Dish Tare Wt. 52.1230 g Dish+Sample Wt. 52.1310 g Sample Wt. 0.0080 g
2	Test 2 Run 2 Log Number -14I Comments	Dish No. 11 Dish Tare Wt. 47.7595 g Dish+Sample Wt. 47.7676 g Sample Wt. 0.0081 g
3	Test 2 Run 3 Log Number -15I Comments	Dish No. 17 Dish Tare Wt. 48.3931 g Dish+Sample Wt. 48.4002 g Sample Wt. 0.0071 g
4	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g
5	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. g Dish+Sample Wt. g Sample Wt. g

Blank Solvent Wt. 0.0004 g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0076	0.0077	0.0067	D-18	

LSC-03.GR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job ACS - EGF
Team Leader DVH
Date Submitted 2-25-94
Test No. 2
Date of Analysis 3-3-94
Transport Leakage ☐ None ☒ _____ ml

Source B Dryer
Test Site Stack
Date of Test 2-23-94
No. of Runs Completed 3
Technician R. EIDEM
Solvent Acetone

0	Test 2 Run 0 Field Blank Log Number 2326 - 12P Vol. of Solvent 100 ml *Solvent Residue 3.00 ug/ml	Dish No. 40 Dish Tare Wt. 47.6433 g Dish+Sample Wt. 47.6436 g Sample Wt. 0.0003 g
1	Test 2 Run 1 Vol. of Solvent 150 ml Log Number -13P Comments	Dish No. 47 Dish Tare Wt. 48.4658 g Dish+Sample Wt. 48.4968 g Sample Wt. 0.0310 g
2	Test 2 Run 2 Vol. of Solvent 160 ml Log Number -14P Comments	Dish No. 64 Dish Tare Wt. 43.1473 g Dish+Sample Wt. 43.1756 g Sample Wt. 0.0283 g
3	Test 2 Run 3 Vol. of Solvent 125 ml Log Number -15P Comments	Dish No. 69 Dish Tare Wt. 47.9924 g Dish+Sample Wt. 48.0209 g Sample Wt. 0.0285 g
4	Test ____ Run ____ Vol. of Solvent ____ ml Log Number ____ Comments	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Vol. of Solvent ____ ml Log Number ____ Comments	Dish No. ____ Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

*Solvent Residue 3.0 ug/ml = [(Sample Wt. 0.0003 g)(10⁶)]/Vol. of Sol. 100 ml
EPA-M5 Acetone Residue Blank Spec. < 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0305	0.0278	0.0281		

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job Acs/EGF
Team Leader DVH
Date Submitted 2-25-94
Test No. 2
Date of Analysis 3-3-94

Source B Dryer
Test Site Stack
Date of Test 2-23-94
No. of Runs Completed 3
Technician B. [illegible]

0	Test 2 Run 0 Field Blank Log Number 2326-12F Comments	Filter No. 6262 Filter Type 4"GF Filter Tare Wt. .8607 g Filter+Sample Wt. .8608 g Sample Wt. 0.0001 g
1	Test 2 Run 1 Log Number -13F Comments	Filter No. 6257 Filter Type 4"GF Filter Tare Wt. .8697 g Filter+Sample Wt. .9760 g Sample Wt. 0.1063 g
2	Test 2 Run 2 Log Number -14F Comments	Filter No. 6261 Filter Type 4"GF Filter Tare Wt. .8723 g Filter+Sample Wt. .9798 g Sample Wt. 0.1075 g
3	Test 2 Run 3 Log Number -15F Comments	Filter No. 6142 Filter Type 4"GF Filter Tare Wt. .8724 g Filter+Sample Wt. .9803 g Sample Wt. 0.1079 g
4	Test Run Log Number Comments	Filter No. Filter Type Filter Tare Wt. g Filter+Sample Wt. g Sample Wt. g
5	Test Run Log Number Comments	Filter No. Filter Type Filter Tare Wt. g Filter+Sample Wt. g Sample Wt. g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.1063	0.1075	0.1079		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.1444	0.1430	0.1427		

LSC-02PR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job ACS/EGF
Team Leader DUIT
Date Submitted
Test No. 4
Date of Analysis 3-9-94

Source A Dryer
Test Site Stack
Date of Test 2-24-94
No. of Runs Completed 3
Technician C. Nelson

0	Test ____ Run 0 Field Blank Log Number Comments	Dish No. Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
1	Test 4 Run 1 Log Number 2326-116I Comments	Dish No. 328 Dish Tare Wt. 41.9654 g Dish+Sample Wt. 41.9809 g Sample Wt. 0.0155 g
2	Test 4 Run 2 Log Number -117I Comments	Dish No. 340 Dish Tare Wt. 47.9136 g Dish+Sample Wt. 47.9299 g Sample Wt. 0.0163 g
3	Test 4 Run 3 Log Number -118I Comments	Dish No. 341 Dish Tare Wt. 47.6589 g Dish+Sample Wt. 47.6751 g Sample Wt. 0.0162 g
4	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g
5	Test ____ Run ____ Log Number Comments	Dish No. Dish Tare Wt. ____ g Dish+Sample Wt. ____ g Sample Wt. ____ g

Blank Solvent Wt. .0004 g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0151	0.0159	0.0158	D-21	

LSC-03.GF

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job ACS-EGE
Team Leader OVit
Date Submitted 2-25-94
Test No. 4
Date of Analysis 3-3-94
Transport Leakage ☐ None ☒ _____ ml

Source A Dryer
Test Site Stack
Date of Test 2-24-94
No. of Runs Completed 3
Technician REIDEM
Solvent acetone

0	Test ____ Run 0 Field Blank Log Number _____ Vol. of Solvent ____ ml *Solvent Residue 3.0 ug/ml	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g	
1	Test 4 Run 1 Vol. of Solvent 125 ml Log Number 2326-16P Comments _____	Dish No. 16 Dish Tare Wt. 49.1384 g Dish+Sample Wt. 49.1860 g Sample Wt. 0.0476 g	
2	Test 4 Run 2 Vol. of Solvent 190 ml Log Number -17P Comments _____	Dish No. 175 Dish Tare Wt. 53.0301 g Dish+Sample Wt. 53.0600 g Sample Wt. 0.0299 g	
3	Test 4 Run 3 Vol. of Solvent 150 ml Log Number -18P Comments _____	Dish No. 509 Dish Tare Wt. 47.6214 g Dish+Sample Wt. 47.6500 g Sample Wt. 0.0286 g	
4	Test ____ Run ____ Vol. of Solvent ____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g	
5	Test ____ Run ____ Vol. of Solvent ____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g	

*Solvent Residue ___ ug/ml = [(Sample Wt. ____ g)(10^6)]/Vol. of Sol. ____ ml
EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0469	0.0293	0.0281 D-22		

LSC-01YR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job ACS ECGF
Team Leader DUH
Date Submitted 2-25-94
Test No. 4
Date of Analysis 3-3-94

Source A Dryer
Test Site stack
Date of Test 2-24-94
No. of Runs Completed 3
Technician D.D

	Test ____ Run 0	Filter No. ____
	Field Blank	Filter Type ____
0	Log Number ____	Filter Tare Wt. ____ g
	Comments ____	Filter+Sample Wt. ____ g
	____	Sample Wt. ____ g
	Test 4 Run 1	Filter No. 6271
	Log Number 2326-16F	Filter Type 4"6F
1	Comments ____	Filter Tare Wt. .8667 g
	____	Filter+Sample Wt. .9583 g
	____	Sample Wt. 0.0916 g
	Test 4 Run 2	Filter No. 6272
	Log Number -17F	Filter Type 4"6F
2	Comments ____	Filter Tare Wt. .8611 g
	____	Filter+Sample Wt. .9435 g
	____	Sample Wt. .0824 g
	Test 4 Run 3	Filter No. 6273
	Log Number -18F	Filter Type 4"6F
3	Comments ____	Filter Tare Wt. .8641 g
	____	Filter+Sample Wt. .9574 g
	____	Sample Wt. .0933 g
	Test ____ Run ____	Filter No. ____
	Log Number ____	Filter Type ____
4	Comments ____	Filter Tare Wt. ____ g
	____	Filter+Sample Wt. ____ g
	____	Sample Wt. ____ g
	Test ____ Run ____	Filter No. ____
	Log Number ____	Filter Type ____
5	Comments ____	Filter Tare Wt. ____ g
	____	Filter+Sample Wt. ____ g
	____	Sample Wt. ____ g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.0916	0.0824	0.0933		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.1536	0.1276	0.1372		

LSC-02PR

Interpoll Laboratories
(612)786-6020

Cascade Impactor Laboratory Data Sheet

Job ACS/EGF — Date of test 2-23-94

Source B Dryer Stack — Test 3 Run 1

Analyst B. Drake — Impactor No. 3 — Substrate used None

Stage No.	Weight (g)					Cum. Weight (g)	% W/W	Part Dia. (um)
	Tare	Final	Uncorr. Mass	Control	Corr. Mass			
Preimpact.	49.43470	49.44260	0.00790	-0.00030	0.00760	0.00760	10.91	10.0
1	1.90515	1.91012	0.00497	—	0.00497	0.01257	18.04	6.1
2	1.95586	1.95934	0.00348	—	0.00348	0.01605	23.03	4.0
3	2.00689	2.01162	0.00473	—	0.00473	0.02078	29.82	2.45
4	1.92693	1.92918	0.00235	—	0.00235	0.02313	33.19	1.5
5	1.98803	1.98995	0.00192	—	0.00192	0.02505	35.95	0.98
6	2.01648	2.01894	0.00246	—	0.00246	0.02751	39.48	0.61
7	2.05108	2.05531	0.00423	—	0.00423	0.03174	45.55	.345
Filter	65.60500	65.64294	0.03794	—	0.03794	0.06968		

Sampling rate data:

V_{std} = 26.85 DSCF — P_b = 29.43 in. Hg

t_m = 236 °F — P_g = -.79 in. WC

θ = 60 min. — MC = 26.56 % v/v

$$q_a = \frac{5.67\ V_{std}\ (t_m + 460)}{\theta\ (P_b + P_g/13.6)(100 - MC)}$$

$$q_a = \frac{5.67 \times (26.85) \times (236 + 460)}{(60) \times (29.43 + -.79 / 13.6) \times (100 - 26.56)} = 0.819 \text{ acfm}$$

Rev. 1 CF-028

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (1)

**********SOURCE**********
Job ACS EGF
Source Dryer A
Date of Sampling 2-24-94
Test No(s) 4

**********RECOVERY**********
Date of Recovery 2-25-94
Recovered by JHS
Recovery volume 500 ml ml
Barometric at time 29.108 IN.HG.

**********ANALYTICAL**********
Date of Analysis 2-28-94
Analyst SMS
Eluent ASUA
Chromatograph: Dionex System 4000i

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Intergrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$$C_{RS} = DF(C_{DS}) \qquad M_{NO_3} = (C_{RS} - \bar{C}_B)V_R \qquad \bar{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$$

where: C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

C_B = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (2)

	Sample Log ID No.	Flask No.	Test/ Run	Final Flask Conditions t_f (°F)	+	-	ΔPg (IN.HG.)	Chrom Run No.	DF	Nitrate Concentration (ug/ml) Uncorr. for blank C_{RS}	Corr. for blank ($C_{RS} - \bar{C}_B$)	Total nitrate in Sample (ug) (M_{NO_3})
1	232U-IA	61	4-1-A	70°		X	0.25		1	0.568	0.568	284
2	70	62	4-1-B	↓		X	0.10		1	0.546	0.546	273
3	71	63	4-1-C			X	0.70		1	0.635	0.635	318
4	72	64	4-1-A		X		0.90		1	0.699	0.699	350
5	73	65	4-2-			X	0.30		1	0.647	0.647	324
6	74	66	4-2-B			X	0.90		1	0.547	0.547	274
7	75	19	4-2-C		X		0.70		1	0.501 0.496 avg=.494	0.501	251
8	76	20	4-2-A			X	1.00		1	0.521	0.521	261
9	77	21	4-3-B			X	1.90		1	0.736	0.736	368
10	78	22	4-3-C			X	0.30		1	0.670	0.670	335
11	79	23	4-3-A			X	1.25		1	0.684	0.684	342
12	80	24	4-3-B	↓	X		1.70		1	0.697	0.697	349
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
Blank 1									1	CB1		
Blank 2									1	CB2		
Blank 3									1	CB3		

$\bar{C}_B$ = _____

S-340(2) R-9/85

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (1)

**********SOURCE**********
Job ACS EGF
Source PULP B
Date of Sampling 2-23-94
Test No(s) 2

**********RECOVERY**********
Date of Recovery 2-25-94
Recovered by JHS
Recovery volume 500ml ml
Barometric at time 29.108 IN.HG.

**********ANALYTICAL**********
Date of Analysis 2-28-94
Analyst SMS
Eluent ASHA
Chromatograph: Dionex System 4000i

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Intergrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$$C_{RS} = DF(C_{DS}) \qquad M_{NO_3} = (C_{RS} - \bar{C}_B)V_R \qquad \bar{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$$

where: C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

C_B = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (2)

	Sample Log ID No.	Flask No.	Test/ Run	Final Flask Conditions t_f (°F)	+	-	Δ Pg (IN.HG.)	Chrom Run No.	DF	Nitrate Concentration (ug/ml) Uncorr. for blank C_{RS}	Corr. for blank ($C_{RS} - C_B$)	Total nitrate in Sample (ug) ($M_{NO_3^-}$)
1	2326-57	43*	2-1-A	70°		X	5.65		1	1.53	1.53	765
2	58	44	2-1-B	↓	X		0.70		1	1.59	1.59	795
3	59	46	2-1-C			X	6.00		1	1.65	1.65	825
4	60	45	2-1-A			X	5.00		1	1.68	1.68	840
5	61	47	2-2-B		X		0.50		1	0.992	0.992	492
6	62	48	2-2-C			X	3.35		1	1.12	1.12	560
7	63	67	2-2-A		X		0.60		1	0.517	0.517	259
8	64	68	2-2-B		X		0.50		1	0.486	0.486	243
9	65	69	2-3-C		X		0.10		1	0.552	0.552	276
10	66	70	2-3-A			X	0.10		1	0.641	0.641	307
11	67	71	2-3-B			X	6.50		1	0.505	0.505	253
12	68	72	2-3-C	↓		X	4.30		1	0.540	0.540	270
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
Blank 1									1	CB1		
Blank 2									1	CB2		
Blank 3									1	CB3		

$\bar{C}_B$ = ____

* flasks used to collect 2 separate samples

S-340(2) R-9/85

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (1)

**********SOURCE**********
Job ACS EGF
Source C Pulp
Date of Sampling 2-24-94
Test No(s) 5

**********RECOVERY**********
Date of Recovery 2-25-94
Recovered by JHS
Recovery volume 500 ml ml
Barometric at time 29.108 IN.HG.

**********ANALYTICAL**********
Date of Analysis 2-28 94
Analyst BMS
Eluent A34A
Chromatograph: Dionex System 4000i

Samples collected in accordance with EPA Method 7, CFR Title 40, Part 60, Appendix A. Samples analyzed in accordance with EPA Method 7A by ion chromatography. Mercury manometers used to measure flask pressures/vacuums in sampling and in recovery. Thommen Model TX 19 jewel barometer calibrated against laboratory mercury in glass barometer used to measure field barometric pressure. Three field blanks are prepared and the average used to correct measured nitrate concentrations. All samples are analyzed as a batch using a Dionex Model 4270 Chromatograph Data Intergrator. The integrator is programmed to give the actual concentration of the 500 ml recovered sample even if a subsequent dilution was made. The dilution is indicated here as well as on the chromatogram.

$$C_{RS} = DF(C_{DS}) \qquad M_{NO_3} = (C_{RS} - \bar{C}_B)V_R \qquad \bar{C}_B = (C_{B1} + C_{B2} + C_{B3})/3$$

where: C_{RS} = concentration of nitrate in 500 ml recovered sample in ug/ml

DF = dilution factor

C_{DS} = concentration of nitrate of a 500 ml recovered sample which has been diluted by a factor of DF to bring it into the proper range for the ion chromatograph. This value is an intermediate number and is not outputted by the electronic integrator which is programmed to output the concentration of the original undiluted 500 ml recovered sample.

M_{NO_3} = total mass of nitrate in micrograms in the 500 ml recovered sample and/or in the 2L flask.

C_B = average conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

C_{B1}, C_{B2}, C_{B3} = conc. of nitrate in 500 ml recovered samples from the three field blanks (ug/ml)

V_R = recovery volume for samples and field blanks in ml

Interpoll Laboratories
(612)786-6020

EPA Method 7A Recovery and Analysis Data Sheet (2)

	Sample Log ID No.	Flask No.	Test/ Run	Final Flask Conditions t_f (°F)	+	-	ΔPg (IN.HG.)	Chrom Run No.	DF	Nitrate Concentration (ug/ml) Uncorr. for blank C_{RS}	Corr. for blank ($C_{RS} - C_B$)	Total nitrate in Sample (ug) ($M_{NO_3^-}$)
1	232645	13	S-1-A	70°		X	1.10		1	1.05	1.05	525
2	46	14	S-1-B			X	6.35		1	0.908	0.908	454
3	47	15	S-1-C			X	5.75		1	0.871	0.871	436
4	48	16	S-1-A			X	0.40		1	0.875	0.875	438
5	49	17	S-2-B		X		1.60		1	0.1665	0.1665	333
6	50	18	S-2-C			X	5.00		1	0.1654	0.1654	327
7	51	43	S-2-A			X	5.65		1	1.53	1.53	765
8	52	44*	S-2-B		X		0.70		1	1.58	1.58	790
9	53	45	S-3-C			X	6.00		1	1.69 ~~0.957~~ sms 6-28-94	1.69	845
10	54	46	S-3-A			X	6.00		1	1.67	1.67	835
11	55	47	S-3-B		X		0.50		1	0.952	0.952	476
12	56	48	S-3-C			X	3.35		1	1.11	1.11	555
13												
14												
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
Blank 1									1	CB1		
Blank 2									1	CB2		
Blank 3									1	CB3		

$\bar{C}_B$ = _____

* flask used to collect 2 separate samples

S-340(2) R-9/85

Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job ACS/EGF — Source C DRYER STACK
Field Engineer DH — Test Site "
Date Submitted 2/25/94 — Date of Test 2/22/94
Test No. 1 — No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
2	Probe Wash: ☒ Acetone ☐ $MeCl_2$ ☐ DI Water ☐ _____	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	
2	Filter: ☒ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	
4	Impingers: ☒ DI Water ☐ $3\%H_2O_2$ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H_2SO_4 (HCl) ☐ 2,4-DNPH ☐ _____ ☐ _____	☒ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other _____	
3	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☒ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	
	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other _____	
	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	
	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Type of Source: Dryer

Fuel Type:

Coal: ☒Bituminous ☐Anthracite ☐Lignite
Wood: ☐Wood Waste ☐Dust ☐Bark
Oil: ☐Waste Oil ☐No. 2 ☐No. 6
☐ Natural Gas ☐ RDF ☐ Other _____

S-278

G:\STACK\WP\FORMS\S-278.LAS

Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job AES - EGF
Field Engineer SCB
Date Submitted 2-25-94
Test No. 1

Source No. 1 Boiler
Test Site Stack
Date of Test 2-22-94
No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
4	Probe Wash: ☒ Acetone ☐ $MeCl_2$ ☐ DI Water ☐ _____	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	
4	Filter: ☒ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	
4	Impingers: ☒ DI Water ☐ 3%H_2O_2 ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H_2SO_4 (HCl) ☐ 2,4-DNPH ☐ _____ ☐ _____	☒ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other _____	
3	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☒ As per EPA M-3 ☒ As per EPA M-10 ☐ Other _____	CO
0	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other _____	
0	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
0	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	
0	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Type of Source: Boiler

Fuel Type:

Coal: ☒ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☐ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
☐ Natural Gas ☐ RDF ☐ Other _____

S-278
G:\STACK\WP\FORMS\S-278.LAS

Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job PCS - EGF
Field Engineer SCS
Date Submitted 2-25-94
Test No. 2
Source No. 2 Boiler
Test Site Stack
Date of Test 2 23 94
No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
3	Probe Wash: ☒ Acetone ☐ $MeCl_2$ ☐ DI Water ☐ _____	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	
3	Filter: ☒ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	
3	Impingers: ☒ DI Water ☐ 3%H_2O_2 ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H_2SO_4 (HCl) ☐ 2,4-DNPH ☐ _____ ☐ _____	☒ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other _____	
3	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☒ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	COL
0	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other _____	
0	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
0	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	
0	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Type of Source: Boiler

Fuel Type:

Coal: ☒ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☐ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
☐ Natural Gas ☐ RDF ☐ Other _____

S-278

G:\STACK\WP\FORMS\S-278.LAS

Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job ACS/EGF
Field Engineer Dirt
Date Submitted 2/25/94
Test No. 2

Source B Dryer
Test Site Stack
Date of Test 2/23/94
No. of Runs Completed

No.	Sample Type	Analysis	Comments
4	Probe Wash: ☒ Acetone ☐ $MeCl_2$ ☐ DI Water ☐ _____	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	
4	Filter: ☒ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☒ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	
4	Impingers: ☒ DI Water ☐ $3\%H_2O_2$ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H_2SO_4 (HCl) ☐ 2,4-DNPH ☐ _____ ☐ _____	☒ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other _____	
3	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☒ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	
	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other _____	
	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	
	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Type of Source: DRYER

Fuel Type:

Coal: ☒ Bituminous ☐ Anthracite ☐ Lignite

Wood: ☐ Wood Waste ☐ Dust ☐ Bark

Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6

☐ Natural Gas ☐ RDF ☐ Other _____

S-278

G:\STACK\WP\FORMS\S-278.LAS

Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job ACS/EGF — Source B DRYER
Field Engineer D.J. — Test Site STACK
Date Submitted 2/25/94 — Date of Test 2/23/94
Test No. 3 — No. of Runs Completed 1

No.	Sample Type	Analysis	Comments
1	Probe Wash: ☒ Acetone ☐ $MeCl_2$ ☐ DI Water ☐ _____	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☒ Other PRE IMPACTOR	RINSE
	Filter: ☐ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	
	Impingers: ☐ DI Water ☐ 3%H_2O_2 ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H_2SO_4 (HCl) ☐ 2,4-DNPH ☐ _____ ☐ _____	☐ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other _____	
1	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☒ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	Box #18 Bag #1
	Oxides of Nitrogen (NO_x)	☐ As per EPA M-7A ☐ Other _____	
	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	
1	Misc Samples ☒ Impactor ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Type of Source: _____

Fuel Type:

Coal: ☐Bituminous ☐Anthracite ☐Lignite
Wood: ☐Wood Waste ☐Dust ☐Bark
Oil: ☐Waste Oil ☐No. 2 ☐No. 6
☐ Natural Gas ☐ RDF ☐ Other _____

S-278

G:\STACK\WP\FORMS\S-278.LAS

Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job ACS/EGF — Source A ~~Dryer~~ Pulp Dryer
Field Engineer ~~DVH~~ SB — Test Site Stack
Date Submitted 2/25/94 — Date of Test 2/24/94
Test No. 4 — No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
4	Probe Wash: ☑ Acetone ☐ $MeCl_2$ ☐ DI Water ☐ _____	☑ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other _____	
4	Filter: ☑ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☑ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other _____	
4	Impingers: ☑ DI Water ☐ $3\%H_2O_2$ ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H_2SO_4 (HCl) ☐ 2,4-DNPH ☐ _____ ☐ _____	☑ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other _____	
3	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☑ As per EPA M-3 ☐ As per EPA M-10 ☐ Other _____	
13	Oxides of Nitrogen (NO_x)	☑ As per EPA M-7A ☐ Other _____	
	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other _____	
	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other _____	

Type of Source: Dryer

Fuel Type:

Coal: ☒ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☐ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
☐ Natural Gas ☐ RDF ☐ Other _____

S-278
G:\STACK\WP\FORMS\S-278.LAS

Interpoll Laboratories
(612) 786-6020

Sample Deposition

Job ACS - FCF
Field Engineer SLB
Date Submitted 2-25-94
Test No. 5

Source "A" PULP DRYER
Test Site STACK
Date of Test 2-24-94
No. of Runs Completed 3

No.	Sample Type	Analysis	Comments
	Probe Wash: ☐ Acetone ☐ $MeCl_2$ ☐ DI Water ☐ _____	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ Other_____	
	Filter: ☐ 4" Glass ☐ SS Thimble ☐ 2.5" Glass ☐ Pallflex	☐ As per EPA M-5 ☐ As per EPA M-29 ☐ As per EPA M-201A ☐ As per EPA M-17 ☐ Other_____	
	Impingers: ☐ DI Water ☐ 3%H_2O_2 ☐ 1N NaOH ☐ KOH (Cr VI) ☐ H_2SO_4 (HCl) ☐ 2,4-DNPH ☐ _____ ☐ _____	☐ MN Protocol ☐ WI Protocol ☐ As per EPA M-202 ☐ As per EPA M-6,8 ☐ Acid Gases ☐ Formaldehyde ☐ As per EPA M-29 ☐ As per EPA M-26 ☐ Other_____	
3	Integrated Gas Sample ☒ Tedlar Bag ☐ _____	☒ As per EPA M-3 ☐ As per EPA M-10 ☐ Other_____	
12	Oxides of Nitrogen (NO_x)	☒ As per EPA M-7A ☐ Other_____	
	☐ Fuel Sample ☐ Aggregate	☐ Attached Form S-0163	
	Particle Size	☐ X-Ray Sedigraph ☐ Cascade Impactor ☐ Other_____	
	Misc Samples ☐ _____ ☐ _____	☐ As per EPA M-6 ☐ As per EPA M-7A ☐ Other_____	

Type of Source: PULP DRYER STACK

Fuel Type:

Coal: ☒ Bituminous ☐ Anthracite ☐ Lignite
Wood: ☐ Wood Waste ☐ Dust ☐ Bark
Oil: ☐ Waste Oil ☐ No. 2 ☐ No. 6
☐ Natural Gas ☐ RDF ☐ Other _____

S-278
G:\STACK\WP\FORMS\S-278.LAS

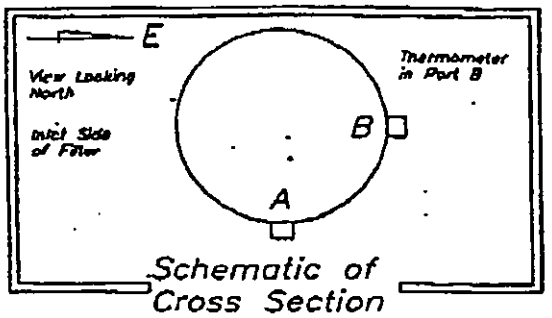
APPENDIX E

PROCESS INFORMATION

American Crystal Sugar Company
EPA Method 2 Field Data Sheet

11421 5852

Source: "C" Hopper Filter Inlet ø = 29"
Test ___ Run ___ Date: 2/22/94
Dry Bulb 104 Wet Bulb ___
Barometric Press. ___ Hg
Static Pressure -.20 WC
Inlet Damper: ___ position
Outlet Damper: ___ position
Operators: BK
Pitot #: 461 Cp ___
Campaign Day: ___
Start Time: ___
End Time: ___



Schematic of Cross Section

Port	Traverse Point #		Distance From end of Port (in) Port Length: 4.00"	Velocity Pressure Range	Velocity Pressure (in WC)	Calculated Data
A	1		4.928	.24		$\bar{v}$ = 29.90
	2		7.04	.28		M% = 38
	3		9.66	.29		M.wt. =
	4		13.37	.24		ACFM = 8252
	5		23.63	.12		SCFM = 6059
	6		27.37	.12		DSCFM = 3938
	7		29.95	.13		
	8		32.07	.23		Comments:
	9					
	10					
	11					
	12					
B	1		4.928	.15		
	2		7.04	.20		
	3		9.66	.25		
	4		13.37	.23		
	5		23.63	.12		
	6		27.37	.12		
	7		29.95	.20		
	8		32.07	.30		
	9					
	10					
	11					
	12					
				$\sqrt{\Delta P}$ = .44		CAD#: E7116D37

"A" Pulp Drier

OPERATING DATA SUMMARY FOR COMBUSTION SOURCES

Company Name: American Crystal Sugar Company
Date of Performance Test: 2/24/94
Summary prepared by: [signature] (Signature)

A. Fuel Input

1. Itemize all fuels and materials that are added to the combustion process during the test period. Attach ultimate/proximate analysis of the fuel.

TEST ___ #	FUEL TYPE & ORIGIN (e.g. Eastern Coal)	RATE OF FUEL INPUT (list units)	MOISTURE CONTENT (as received)	HEAT CONTENT (e.g. BTU/LB, BTU/GAL) (as received)	HEAT INPUT (10^6 BTU/HR)
Run 1	Coal/Subbituminous				
Run 2					
Run 3					

2. Are the above fuels substantially the same as those normally burned? Yes
   If not, explain

3. Are the above fuels normally burned in the proportions shown above? No
   If not, explain Methane from the Anerobic digestive system is used when available to supplement the coal.

4. Describe any changes anticipated for procurement of fuels within the next twelve (12) months.
   none

B. Equipment & Operating Data:

1. Furnace No. "A" Pulp Drier ; EP #3
2. Furnace Manufacturer: C. E.
3. Type of Firing: Traveling Grate
4. Was the furnace operated under normal operating conditions? Yes
   If not, explain
5. Specify normal soot blowing frequency:
   a) source operating time blowing soot: 60 minutes/~~shift~~ week (steam lancing)
   b) number of shifts per day N/A

Campaign Day: 169

Date: Feb 24, 1994

PULP DRIER STACK TESTING

"A" Drier Test # Rual

☐ Engineering
☒ Compliance

Hr.	Size Rate Hr. TPH	Pre heat F.D. Air Hr. °C	Pre heat F.D. Air 1/2 Hr. °C	Heat Profile: Recycle Air Hr. °C	Recycle Air 1/2 Hr. °C	Front Hr. °C	Front 1/2 Hr. °C	Drum Exit Hr. °C	Drum Exit 1/2 Hr. °C	Air/Fuel Ratio Hr. %	Air/Fuel Ratio 1/2 Hr. %	Pressed Pulp Feed Hr. TPH	Pressed Pulp Feed 1/2 Hr. TPH	Damper Position: FD Hr. % Open	Recycle Hr. % Open	ID Hr. % Open	Coal Rate Hr. TPH	Coal Rate 1/2 Hr. TPH
9:00 / 9:30	295	82	84	103	—	574	575	103	102	—	—	18	19	36.8	82.1	60	—	—
10:00 / 10:30	321	84	✓	—	—	612	632	101	102	—	—	21.4	21.1	55.1	77.1	60	—	—
11:00 / 11:30	322	✓	✓	-	-	582	590	102	101	—	—	19.9	20.0	28.1	82.2	60	—	—
12:00 / 12:30	310	95	82	-	-	621	619	99	99	—	-	19.5	19.9	34.0	78.9	6.5	—	—
1:00 / 1:30	307	82	82	-	-	604	590	100	100	—	-	18.2	21.4	29.9	83.3	60	—	-
2:00 / 2:30	330	82	82	-	-	603	590	99	99	—	-	20.9	21.7	33.9	80.7	60	—	—
3:00 / 3:30	314	80	80	-	-	612	591	99	99	—	-	20.4	20.5	34.0	79.3	66	—	-
4:00	319	81		-	-	601				—	-	21.4		28.0	78.3	66	—	—
				-	-					—	-					60	—	-
				-	-					—	-					65	—	-

Hr.	Grate Speed Hr.	Grate Speed 1/2 Hr.	% Moisture: Pressed Pulp Hr. %	Pressed Pulp 1/2 Hr. %	Dried Pulp Hr. %	Dried Pulp 1/2 Hr. %	Pressure Drop: Multiclone Outlet Hr. "H2O	Multiclone Outlet 1/2 Hr. "H2O	Multiclone Inlet Hr. "H2O	Multiclone Inlet 1/2 Hr. "H2O	Pressure Readings: Furnace Hr. "H2O	Drum Exit Hr. "H2O
9:00 / 9:30	37.2	32.8	69.8	68.5	6.6	5.7	6.49	6.48	6.70	6.68	-.21	-.19
10:00 / 10:30	45.3	39.0	68.8	68.6	6.4	8.2	6.42	6.39	6.69	6.69	-.22	-.51
11:00 / 11:30	29.5	29.3	69.2	68.4	7.5	5.2	6.45	6.53	6.69	6.69	-.18	-.47
12:00 / 12:30	34.2	31.6	68.6	69.0	6.4	9.0	6.46	6.43	6.69	6.69	-.19	-.48
1:00 / 1:30	28.3	30.2	68.3	69.6	8.0	7.2	6.47	6.5	6.70	6.70	-.18	-.55
2:00 / 2:30	24.8	28.3	70.8	70.0	7.8	7.3	6.41	6.35	6.68	6.68	-.14	-.50
3:00 / 3:30	32.7	30.9	69.2	70.3	8.4	8.7	6.45	6.52	6.68	6.69	-.11	-.51
4:00	31.7				7.7		6.54		6.69		-.14	-.31

Hr.		Manometer Readings: Venturi Hr. "H2O	FD Duct Hr. "H2O	Recycle Airflow (Control)	Hopper Filter D.P. "H2O	O_2 %	Magnehelic Reading
9:00	Hr	6.30	.50	2402	4.45	—	-3.22
9:30	1/2	6.30	.30	2509	4.48	12.2	-3.41
10:00	Hr	6.4	.35	2517	4.57	11.3	-3.20
10:30	1/2	—		2484	4.41	—	—
11:00	Hr	6.40	.25	2506	4.34	11.0	-3.12
11:30	1/2	—	.25	2396	4.43	—	-
12:00	Hr	6.5	.25	2538	4.52	11.0	-3.24
12:30	1/2	—	.25	2542	4.60	—	-
1:00	Hr	6.5	.25	2515	4.18	10.7	3.1
1:30	1/2	—	.25	2560	4.27	—	—
2:00	Hr	6.6	.25	2588	4.05	10.9	3.10
2:30	1/2	—	.25	2501	4.45	—	—
3:00	Hr	6.5	.25	2594	4.54	8.0	-2.93
3:30	1/2	—	.25	2593	4.73	—	-
4:00	Hr	6.5	.25	2561	4.29	9.0	-2.90
	1/2	—				—	—
	Hr						
	1/2	—				—	-
	Hr						
	1/2	—				-	—

Air Registers:

Run #1: Closed 1,2,7,8; 25%; 50% C; 75%; 100% 3,4,5

Run #2: Closed; 25%; 50%; 75%; 100%

Run 1 Start: 9:30AM End: 11:30 AM Run 2 Start: NOON End:

Controller Name	Rate	Time
Recirc.	75	4.80
Recycle	25	50

NOTES: Run 1

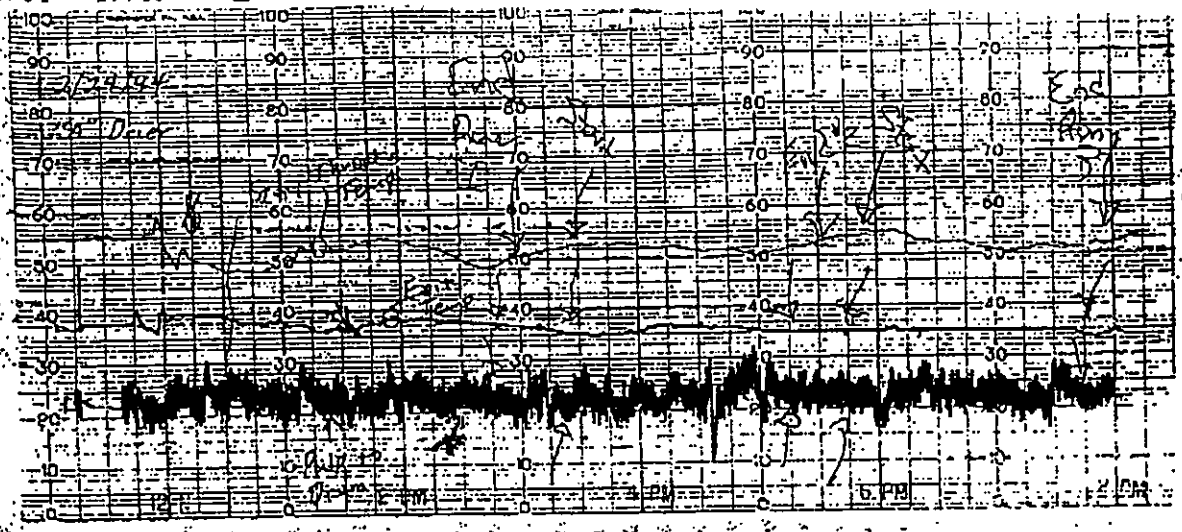
Coal Grate Height = 2.75"

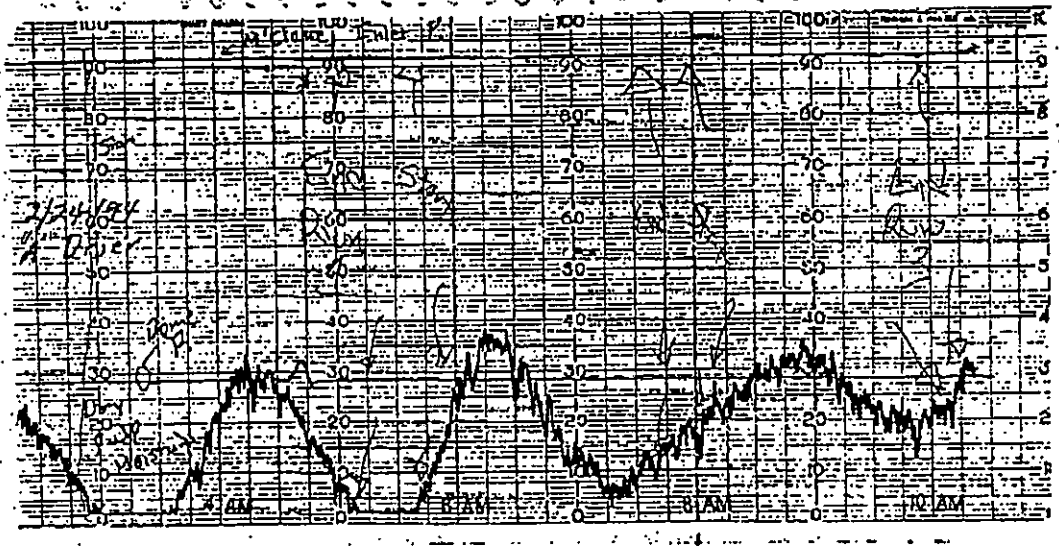
Dry pulp

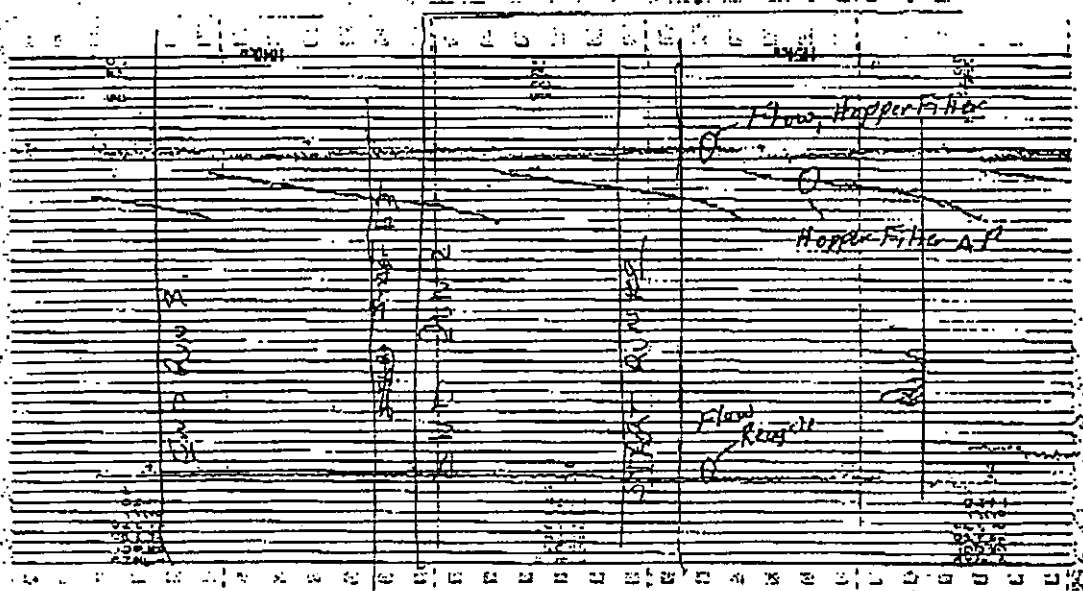
NOTES: Run 2

GENERAL NOTES:

E711001






Flow, Hopper Filter
Hopper Filter Δ P
Flow Rate

Pulp Drier Testing Summary Sheet

For 3 Run Tests

Campaign Day: 169

Date: 2/24/94

Parameters: % Recycle _____

DSCFM _____

A Drier Test # Run 1

* Based on pre-flow
** Based on run #1

	Pre-Air Flows			Run #1	Run #2	Run #3	Post Air Flows Test		Avg-Air Flows		
	Stack	Hopper	Recycle	~~Recycle~~ Stack	Stack	Stack	Hopper	Recycle	Stack	Hopper	Recycle
ACFM	43,280	11,427	5,940	6,110	44340	43440					
DSCFM	23,353	5,852	3,442	3,297	23490	23500					
VEL	59.87				61.34	60.09					
%M	30	30%	30%	30%	31.32	30.33					
°F	209				208.2	203.7					
STAT. P.	-.78	-.50									
% RATE (ASSUMED)	100%	25.0% **	14.1% **	14.1%							

	P.P. TPH	Cool TPH	Multiclone Inlet P	Multiclone DP	Throat °C	Exit °C	Grate Speed	FD Damper	Furn Press	Hopper DP	Hopper ACFM	Recycle	Excess Oxygen
							35.6						
Run 1 $\bar{x}$ =	20.2	3.58					5.8						
σ =	0.89												
							31.6						
Run 2 $\bar{x}$ =	19.6	3.18					4.7						
σ =	0.26						29.5						
Run 3 $\bar{x}$ =	20.3	2.97					1.8						
σ =	0.74						32.2						
3 Run $\bar{x}$ =	20.0	3.24											

Moistures

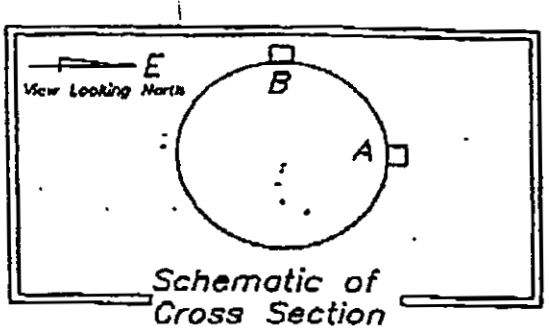
		$\bar{x}$	σ	TDS Actual	TPH Theoretical
Run 1; P.P. Moist:	69.8, 68.5, 68.8, 68.6, 69.2	69.0	0.5	6.26	
Run 2; P.P. Moist:	68.6, 69.0, 68.3, 69.6, 70.8	69.3	0.9	6.02	
Run 3; P.P. Moist:	70.0, 69.2, 70.3, 70.8	70.1	0.6	6.07	
Run 1; D.P. Moist:					
Run 2; D.P. Moist:					
Run 3; D.P. Moist:					

$\bar{X}$ = 6.12

CAD# E7116056

American Crystal Sugar Company
EPA Method 2 Field Data Sheet

Source: "A" Recycle Duct. ø = 18"
Test ___ Run ___ Date: 2/24/94
Dry Bulb 216 Wet Bulb ___
Barometric Press. ___ Hg
Static Pressure -5.3 WC
F.D. Damper: ___ % open
Recycle Damper: ___ % open
Operators: ___
Pitot #: ___ Cp ___
Campaign Day: ___
Start Time: 9:30
End Time: ___

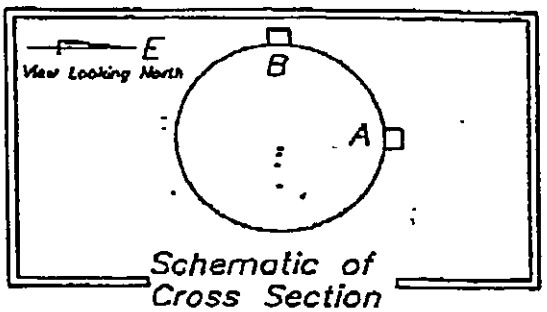


Schematic of Cross Section

Port	Traverse Point #	Distance From end of Port (in) Port Length: 4.00"	Velocity Pressure (in WC)	Velocity Pressure Range	Calculated Data
A	1	4.95	.47		v = 57.6
	2	6.03	.53		M% = 30
	3	7.31	.57		M.wt. =
	4	8.98	.63		ACFM = 6,110
	5	17.02	.85		SCFM = 4,458
	6	18.69	.85		DSCFM = 3,121
	7	19.97	.83		
	8	21.05	.81		Comments:
	9				
	10				
	11				
	12				
B	1	4.95	.60		
	2	6.03	.72		
	3	7.31	.90		
	4	8.98	.84		
	5	17.02	.88		
	6	18.69	.89		
	7	19.97	.86		
	8	21.05	.81		
	9				
	10				
	11				
	12				
			$\sqrt{\Delta P}$ =		CAD#:E7116D32

American Crystal Sugar Company
EPA Method 2 Field Data Sheet

Source: "A" Recycle Duct. ø= 18"
Test ___ Run ___ Date: 2/24/94
Dry Bulb _____ Wet Bulb _____
Barometric Press. _____ Hg
Static Pressure -3.2 WC
F.D. Damper: _____ % open
Recycle Damper: _____ % open
Operators: _____
Pitot #: _____ Cp _____
Campoign Day: _____
Start Time: _____
End Time: _____

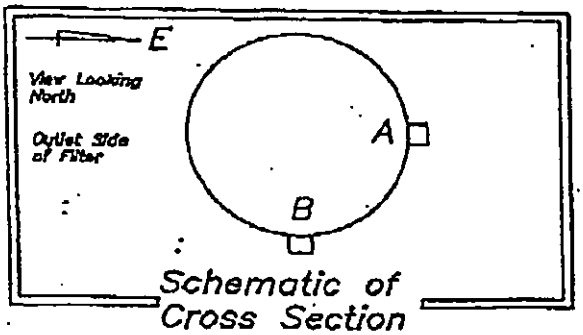


Schematic of Cross Section

Port	Traverse Point #		Distance From end of Port (in) Port Length: 4.00"	Velocity Pressure (in WC)	Velocity Pressure Range	Calculated Data
A	1		4.95	.53		v =
	2		6.03	.74		MW =
	3		7.31	.83		M.wt. =
	4		8.98	.95		ACFM = 5940
	5		17.02	.85		SCFM =
	6		18.69	.74		DSCFM = 3043
	7		19.97	.67		
	8		21.05	.65		Comments:
	9					
	10					
	11					
	12					
B	1		4.95	.47		
	2		6.03	.58		
	3		7.31	.66		
	4		8.98	.67		
	5		17.02	.78		
	6		18.69	.84		
	7		19.97	.77		
	8		21.05	.66		
	9					
	10					
	11					
	12					
				$\sqrt{\Delta P}$ =		CAD#:E7116D32

American Crystal Sugar Company
EPA Method 2 Field Data Sheet

Source: A Hopper Filter Inlet ø= 20"
Test ___ Run ___ Date: 2/24/94
Dry Bulb 104°c 219 Wet Bulb ___
Barometric Press. ___ Hg
Static Pressure -.59 WC
Inlet Damper: ___ position
Outlet Damper: ___ position
Operators: ___
Pitot #: ___ Cp ___
Campaign Day: ___
Start Time: ___
End Time: ___



Schematic of Cross Section

Port	Traverse Point #		Distance From end of Port (in) Port Length: 4.00	Velocity Pressure (in WC)	Velocity Pressure Range	Calculated Data
A	1		4.64		1.2	$\bar{v}$ =
	2		6.10		.99	M% = 30
	3		7.88		1.7	M.wt. =
	4		10.46		1.8	ACFM = 11,427
	5		17.54		1.8	SCFM =
	6		20.12		2.0	DSCFM = 5,851
	7		21.90		1.8	
	8		23.36		1.9	Comments:
	9			Static = -.60		
	10				1.9	
	11				2.1	
	12				2.0	
					1.8	
B	1		4.64		1.4	
	2		6.10		1.6	
	3		7.88		1.7	
	4		10.46		1.8	
	5		17.54			
	6		20.12			
	7		21.90			
	8		23.36			
	9					
	10					
	11					
	12					
				$\sqrt{\Delta P}$ =		CAD#:E7116D31

"B" Drier

OPERATING DATA SUMMARY FOR COMBUSTION SOURCES

Company Name: American Crystal Sugar Co
Date of Performance Test: 2/23/94
Summary prepared by: Bruce Kleinhuis (Signature)

A. Fuel Input

1. Itemize all fuels and materials that are added to the combustion process during the test period. Attach ultimate/proximate analysis of the fuel.

TEST __	FUEL TYPE & ORIGIN (e.g. Eastern Coal)	RATE OF FUEL INPUT (list units)	MOISTURE CONTENT (as received)	HEAT CONTENT (e.g. BTU/LB, BTU/GAL) (as received)	HEAT INPUT (10^6 BTU/HR)
Run 1	Coal/Subbituminous	7940 #/hr	25%	9,400 Btu/lb	74.6
Run 2					
Run 3					

2. Are the above fuels substantially the same as those normally burned ? Yes
If not, explain

3. Are the above fuels normally burned in the proportions shown above ? N/A
If not, explain

4. Describe any changes anticipated for procurement of fuels within the next twelve (12) months.
none

B. Equipment & Operating Data:

1. Furnace No. "B" Pulp Drier ; EP # 4
2. Furnace Manufacturer: C.E.
3. Type of Firing: Traveling Grate
4. Was the furnace operated under normal operating conditions? Yes
If not, explain
5. Specify normal soot blowing frequency:
   a) source operating time blowing soot: 60 minutes/~~shift~~ week (steam lancing)
   b) number of shifts per day N/A

6.. Specify soot blowing times during the test: start 14:30 end 14:33

When was the last time before the test that you blew soot:
(date & time) 2/20/94 ; 6:00 pm

7. Specify normal ash-pulling frequency: Continuous Ash pulling,
   a) source operating time pulling ashes: 10 minutes/shift (sifting grates)
   b) number of shifts per day 3

8. Specify ash pulling times during the test: start 14:30 end 14:38

When was the last time before the test that you pulled ashes:
(date & time) 2/23/94 ; 6:00 a.m.

9. Date and procedures of last maintenance/cleaning of the ~~boiler~~ furnace (please attach records)

C. Instrument Data

1. Include a copy of chart records during test for the combustion efficiency indices (CO, O_2, CO_2, combustibles, steam flow, air flow, etc.) Label as appropriate.

D. Air Pollution Control Equipment

1. Type of control equipment Multiclone / 6MPEWHS / Wheelabrator
   1270 + 0 Baghouse / 1515 / RA / Wheelabrator
2. Air pressure drop (range during test)
   Run 1. 3.95" w.c. Run 2. 4.0" w.c. Run 3. 4.0" w.c.
3. Air flow (range during test) ACFM
   Run 1. 69,000 Run 2. 68,000 Run 3. 68,000
4. Was the control equipment operating normally? Yes
   If not, explain
5. Date and procedures of last maintenance/cleaning of control equipment
   Dec 7, 1994 Redressed Hopper Asp. Fan
   Feb 8, 1994 - Inspected + Cleaned Multiclone

NOTE: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. Rule pt. 7017.2035. The record of operating conditions must also be certified in accordance with Minn. Rule pt. 7017.2040, sub. 5. This form is to be submitted as part of the performance test report

Sheet 1 of 1

Campaign Day: 168

Date: Feb 23, 1994

PULP DRIER STACK TESTING

B Drier   Test # 2 Runs 1, 2 + 3.

☐ Engineering
☒ Compliance

Hr.	Sfce Rate Hr. TPH	Pre Heat F.D. Air Hr. °C	Pre Heat F.D. Air 1/2 Hr. °C	Recycle Air Hr. °C	Recycle Air 1/2 Hr. °C	Throat Hr. °C	Throat 1/2 Hr. °C	Drum Exit Hr. °C	Drum Exit 1/2 Hr. °C	Air/Fuel Ratio Hr. %	Air/Fuel Ratio 1/2 Hr. %	Pressed Pulp Feed Hr. TPH	Pressed Pulp Feed 1/2 Hr. TPH	Damper Position FD Hr. % Open	Damper Position Recycle Hr. % Open	Damper Position ID Hr. % Open	Coal Rate Hr. TPH	Coal Rate 1/2 Hr. TPH	Grate Speed Hr.	Grate Speed 1/2 Hr.	% Moisture Pressed Pulp Hr. %	% Moisture Pressed Pulp 1/2 Hr. %	% Moisture Dried Pulp Hr. %	% Moisture Dried Pulp 1/2 Hr. %	Pressure Drop (Field Sensors) Multiclone Hr. "H₂O	Multiclone 1/2 Hr. "H₂O	Multiclone Inlet Hr. "H₂O	Multiclone Inlet 1/2 Hr. "H₂O	Pressure Readings Furnace Hr. "H₂O	Pressure Readings Drum Exit Hr. "H₂O
9:00/9:30	301	74°		–	–	605		112		–	–	22.7		38.4	80	55.0	–	–	30.2				8.5	6.7	4.00		4.50		-.23	-.74
10:00/10:30	307	77°	76	–	–	630	588	114	111	–	–	23.5	23.74	25.4	84.1	55	–	–	① 24.0	31.1	70	69.5	6.5	7.6	3.94	3.99	4.40	4.51	-.26	-.75
11:00/11:30	301	78	77	–	–	628	586	112	111	–	–	22.9	23.7	24.8	76.3	55	–	–	23.6	24.2	69.3	69.7	6.1	7.6	3.95	3.96	4.46	4.48	-.30	-.76
12:00/12:30	303	79	79	–	–	599	595	112	109	–	–	23.50	24.10	25.7	84.0	55	–	–	23.4	29.3	70.3	69.3	8.3	6.6	3.97	4.01	4.48	4.53	-.29	-.78
1:00/1:30	284	79	79	–	–	597	594	112	111	–	–	23.86	23.44	24.3	87.1	55	–	–	② 23.5	25.7	69.2	69.8	8.4	7.0	3.97	3.96	4.51	4.56	-.31	-.79
2:00/2:30	301	79	79	–	–	596	601	111	110	–	–	24.41	23.58	27.1	81.1	55	–	–	22.4	25.7	70.3	70.1	7.0	7.1	3.98	3.95	4.44	4.42	-.31	-.81
3:00/3:30	241	79	79	–	–	585	614	111	109	–	–	24.10	24.4	24.5	85.8	55	–	–	25.8	③ 25.9	70.1	70.2	7.7	7.6	3.94	3.94	4.51	4.45	-.31	-.82
4:00/4:30	289	79	79	–	–	599	584	109	110	–	–	24.02	24.00	31.4	77.3	55	–	–	27.2	23.4	70.2	70.5			3.95	3.94	4.45	4.37	-.32	-.82
5:00/5:30	304	79	79	–	–	580	602	109	111	–	–	23.50	24.2	34.9	82.4	55	–	–	28.5	19.9	68.9	–			3.97	3.95	4.52	4.42	-.27	-.77
6:00/6:30	305	79	79	–	–	622	623	109		–	–	24.8	24.5	33.7	85.8	55	–	–	28.2		72.6	69.6			3.93	3.91	4.44	4.49	-.22	-.78

Hr.		Manometer Readings Multiclone ΔP Hr. "H₂O	FD Duct Hr. "H₂O	Recycle Airflow (Control) 6	Hopper Filter D.P. 1 "H₂O	O₂ %	Methane Recycle Static
9:00/9:30	Hr		.75		5.17		2.0
	1/2						
10:00/10:30	Hr	4.0	.50	5844	5.14	11.8	2.2
	1/2	4.0	.50	5838	4.81	–	–
11:00/11:30	Hr	4.0	.50	5827	4.93	11.8	2.2
	1/2	4.0	.50	5693	5.14	–	–
12:00/12:30	Hr	4.0	.45	5755	4.78	12.2	2.2
	1/2	4.0	.50	5727	4.98	–	–
1:00/1:30	Hr	4.0	.50	5934	5.15	12.2	2.4
	1/2	4.0	.50	5989	4.97	–	–
2:00/2:30	Hr	4.0	.50	6006	5.12	12.2	2.4
	1/2	4.0	.75	5962	5.00	–	–
3:00/3:30	Hr	4.0	.75	6104	5.20	12.0	2.6
	1/2	4.0	.50	6053	4.52	–	–
4:00/4:30	Hr	4.0	.50	5939	5.05	12.0	2.4
	1/2	4.0	.50	6020	4.81	–	–
5:00/5:30	Hr	4.0	.50	6045	5.09	12.0	2.4
	1/2	4.0	.50	6034	4.59	–	–
6:00/6:30	Hr	4.0	.50	6110	4.98	12.2	2.4
	1/2	4.0	.50	6104	4.79	–	–

Air Registers:

Run #1: Closed 1,2,6–9
25%
50%
75%
100% 3,4,5

Run 1 Start: 10:22 End: 12:30

Run #2 Start: 13:00 End: 15:05

Controller Name:	Ratio	Bias
Recycle Airflow	.5	800
Grate Speed		-1.0
Ratio		.75

Run #2: Closed
25%
50%
75%
100%

Run #3
15:45

NOTES: Run 1

3.5" Grate Height

NOTES: Run 2

GENERAL NOTES:

CAD/ E7111001

E-11

Campaign Day: 168

Date: 2/23/94

PULP DRIER STACK TESTING

B Drier   Test # #3 IMPACTOR #4 NOX

☐ Engineering
☒ Compliance

Hr.	Slice Rate Hr. TPH	Pre Heat F.D. Air Hr. °C	Pre Heat F.D. Air 1/2 Hr. °C	Heat Profile: Recycle Air Hr. °C	Recycle Air 1/2 Hr. °C	Throat Hr. °C	Throat 1/2 Hr. °C	Drum Exit Hr. °C	Drum Exit 1/2 Hr. °C	Air/Fuel Ratio Hr. %	Air/Fuel Ratio 1/2 Hr. %	Pressed Pulp Feed Hr. TPH	Pressed Pulp Feed 1/2 Hr. TPH	Damper Position: FD Hr. % Open	Recycle Hr. % Open	ID Hr. % Open	Coal Rate Hr. TPH	Coal Rate 1/2 Hr. TPH	Grate Speed Hr.	Grate Speed 1/2 Hr.
7:00 / 7:30	304	77	77	–	–	584	611	109	109	–	–	24.04	24.11	30.6	78.4	55	–	–	25.7	26.5
8:00 / 8:30	304	76	76	–	–	588	584	110	109	–	–	23.84	24.52	28.2	84.3	55	–	–	23.8	27.0
9:00 / 9:30				–	–					–	–						–	–		

Hr.	% Moisture: Pressed Pulp Hr. %	Pressed Pulp 1/2 Hr. %	Dried Pulp Hr. %	Dried Pulp 1/2 Hr. %	Pressure Drop (Field Sensors): Multiclone Hr. "H_2O	Multiclone 1/2 Hr. "H_2O	Multiclone Inlet Hr. "H_2O	Multiclone Inlet 1/2 Hr. "H_2O	Pressure Readings: Furnace Hr. "H_2O	Drum Exit Hr. "H_2O	Manometer Readings: Multiclone Inlet ΔP Hr. "H_2O	FD Duct Hr. "H_2O	Recycle Airflow (Control) 6	Hopper Filter D.P. 1 "H_2O	O_2 %	Recycle	
7:00 / 7:30	70.2	69.3			3.99	3.97	4.42	4.40	-.30	-.74			6031	4.68		2.6	Hr
													6048	4.87	–	–	1/2
8:00 / 8:30	69.1	70.6			3.97	3.98	4.37	4.47	-.26	-.77	4.00	.75	5927	5.11	–	2.6	Hr
											–	–	6025	4.61	–	–	1/2
9:00 / 9:30																	Hr
																	1/2
																	Hr
																	1/2
																	Hr
																	1/2
																	Hr
																	1/2
																	Hr
																	1/2
																	Hr
																	1/2
																	Hr
																	1/2
																	Hr
																	1/2

Air Registers:

Run #1: Closed, 25%, 50%, 75%, 100%

Run #2: Closed, 25%, 50%, 75%, 100%

TEST 3
Start: 18:30   Start:
End: 19:41   End:

Controller Name:	Ratio	Bias

NOTES: Run 1

NOTES: Run 2

GENERAL NOTES:

CAD# C7111001

Pulp Drier Testing Summary Sheet

For 3 Run Tests

Campaign Day: 168

Date: 2 / 23 / 94

Parameters: % Recycle _____

DSCFM _____

B Drier Test # _____

* Based on pre-flow
** Based on run #1

K 16:00

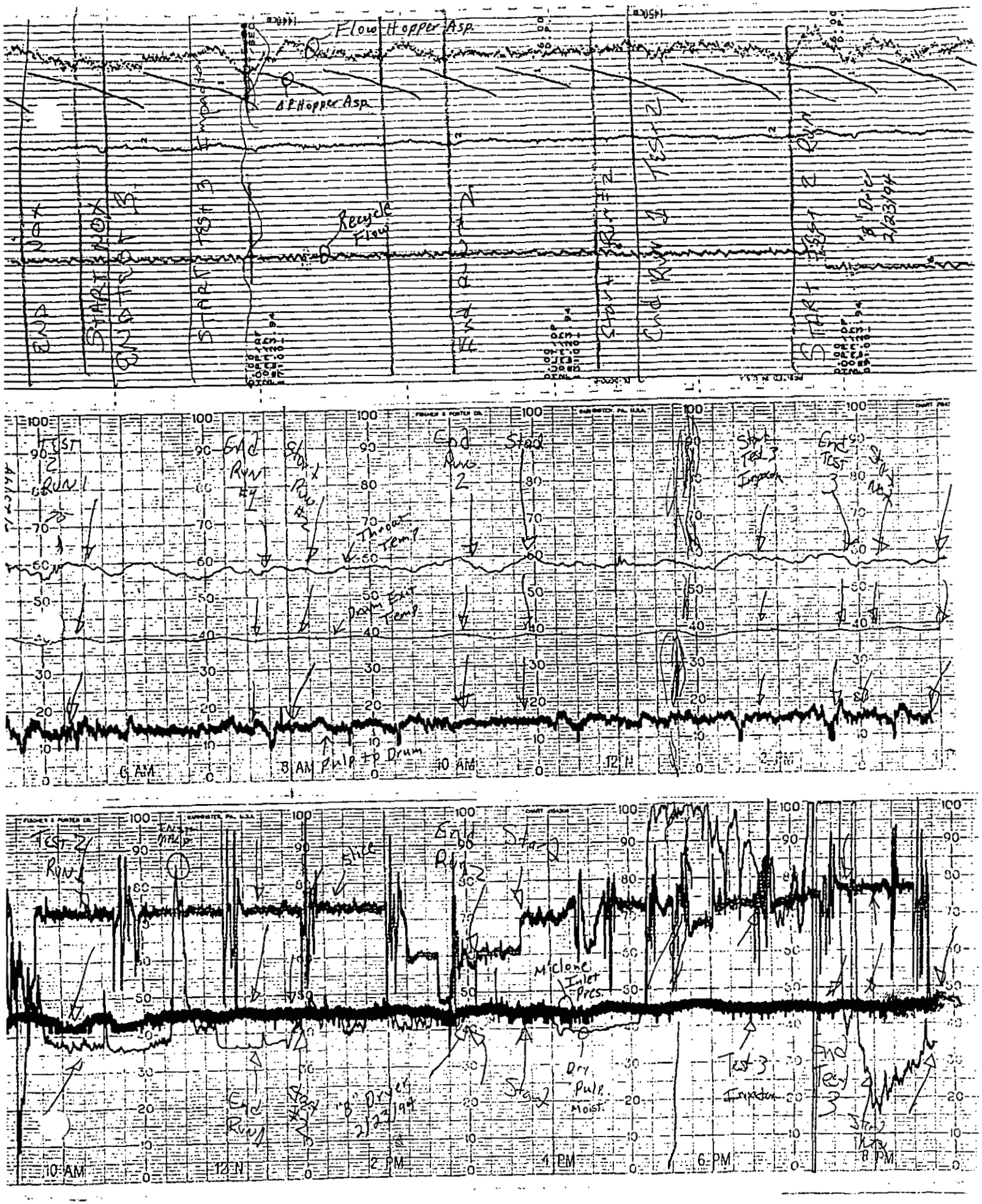
	Pre-Air Flows			Run #1	Run #2	Run #3	Post Air Flows Test		Avg-Air Flows		
	Stack	Hopper	Recycle	Stack	Stack	Stack	Hopper	Recycle	Stack	Hopper	Recycle
ACFM	69,415	8,681	11,351	69000	68990	68410		11,918			
DSCFM	34,069	6,213		37230	36960	37130					
VEL			5,400	60.57	59.86	60.05		6,003			
%M	34	34	34	27.21	27.10	27.10					
°F	237	234	234	238.8	236.8	235.6		235			
STAT. P.	-.79	-.53	-2.4	-.79	-.79	-.79		-3.0			
% RATE (DSCFM)		12.5 * **	16.3 * **					17.5 %			

	P.P. TPH	Coal TPH	Multiclone Inlet P	Multiclone DP	Throat °C	Exit °C	Grate Speed	FD Damper	Furn Press	Hopper DP	Hopper ACFM	Recycle	Excess Oxygen
Run 1 $\bar{x}$ =	23.47	4.05					25.26						
σ =	0.30						2.93						
Run 2 $\bar{x}$ =	24.03	3.85					24.02						
σ =	0.37						1.42						
Run 3 $\bar{x}$ =	24.02	4.01					24.98						
σ =	0.30						3.05						
3 Run $\bar{x}$ =	23.84	3.97					24.75						

Moistures		$\bar{x}$	σ	TDS Actual	TPH Theoretical
Run 1: P.P. Moist:	69.5, 69.3, 69.7, 70.3, 69.3	69.6	0.37	7.13	
Run 2: P.P. Moist:	69.2, 69.8, 70.3, 70.1, 70.1	69.9	0.38	7.23	
Run 3: P.P. Moist:	70.2, 70.2, 70.5, 68.9	70.0	0.62	7.21	
Run 1: D.P. Moist:					
Run 2: D.P. Moist:					
Run 3: D.P. Moist:					

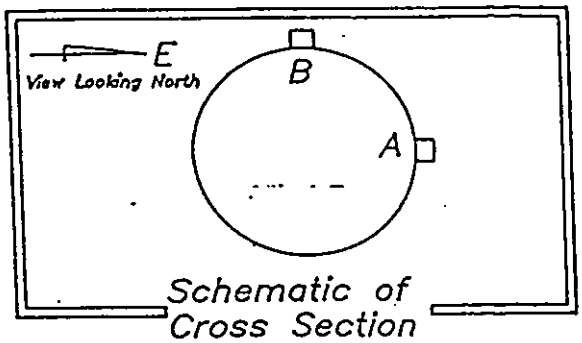
$\bar{X}$ = 7.19 TDS

CAD# E7116D56


Flow Hopper Asp.
ΔP Hopper Asp.
Recycle Flow
Throat Temp
Dryer Exit Temp
Pulp ΔP Drum
Cyclone Inlet Pres.
Dry Pulp Moist.
Test 3 Ended
6 AM
8 AM
10 AM
12 N
2 PM
4 PM
6 PM
8 PM

American Crystal Sugar Company
EPA Method 2 Field Data Sheet

Source: "B" Recycle Duct. ø= 24"
Test ___ Run ___ Date: 2/23/94
Dry Bulb 108 Wet Bulb ___
Barometric Press. 30 Hg
Static Pressure -3.0 WC
F.D. Damper: 39 % open
Recycle Damper: 74 % open
Operators: BK
Pitot #: 4' Cp .84
Campaign Day: 168
Start Time: 16:45
End Time: 16:55



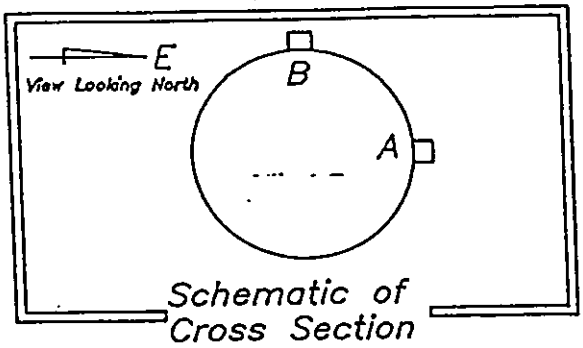
Schematic of Cross Section

Flow Inst. 6900
Damper 74.5
Static (Ctl Rm) 2.70

Port	Traverse Point #		Distance From end of Port (in) Port Length: 4.00"	Velocity Pressure (in WC)	Velocity Pressure Range	Calculated Data
A	1		5.27	.59		v = 63
	2		6.70	.71		M% = est 30
	3		8.41	.83		M.wt. =
	4		10.61	.85		ACFM = 11,918
	5		21.36	.97		SCFM = 8,576
	6		23.59	.99		DSCFM = 6,003
	7		25.30	1.10		
	8		26.73	1.05		Comments:
	9					
	10					
	11					
	12					
B	1		5.27	.57		
	2		6.70	.84		
	3		8.41	.93		
	4		10.61	.99		
	5		21.36	.99		
	6		23.59	1.0		
	7		25.30	.98		
	8		26.73	.88		
	9					
	10					
	11					
	12					
				$\sqrt{\Delta P}$ =		CAD#: E7116D35

American Crystal Sugar Company
EPA Method 2 Field Data Sheet

Source: "B" Recycle Duct. ø = 24"
Test ___ Run ___ Date: ___/___/___
Dry Bulb 112 234 Wet Bulb ___
Barometric Press. ___ Hg
Static Pressure ___ WC
F.D. Damper: ___ % open
Recycle Damper: ___ % open
Operators: BK + DR
Pitot #: 41 Cp .84
Campaign Day: 168
Start Time: ___
End Time: ___



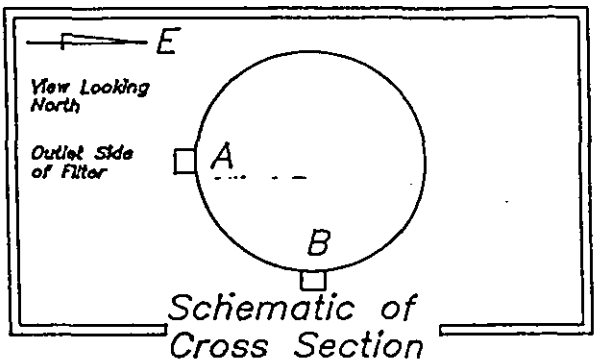
Schematic of Cross Section

Recycle 5080 on controller
5700 - 2nd time

Port	Traverse Point #		Distance From end of Port (in) Port Length: 4.00 "	Velocity Pressure (in WC)	Velocity Pressure Range	Calculated Data
A	1		5.27		.92 .83	v = 60.21
	2		6.70		.95 .91	M% = 32
	3		8.41		1.10 .95	M.wt. =
	4		10.61		1.20 .97	ACFM = 11,351
	5		21.36		1.20 .98	SCFM = 8,092
	6		23.59		1.10 .98	DSCFM = 5,502
	7		25.30		1.40 .98	
	8		26.73		1.00 .97	Comments:
	9				.55	Static pressure was all over the place
	10				.54	
	11				.54	
	12				.68	
					.75	
B	1		5.27		.79	
	2		6.70		.79	
	3		8.41		.77	
	4		10.61			
	5		21.36			-2.1
	6		23.59		Static (P)	-54 on desk
	7		25.30		-2.1	
	8		26.73			
	9					
	10					
	11					
	12					
				$\sqrt{\Delta P}$ =		CAD#: E7116D35

American Crystal Sugar Company
EPA Method 2 Field Data Sheet

Source: "B" Hopper Filter Inlet ø = 20"
Test ___ Run ___ Date: 2/23/94
Dry Bulb 112 234 Wet Bulb ___
Barometric Press. ___ Hg
Static Pressure ___ WC
Inlet Damper: ___ position
Outlet Damper: ___ position
Operators: BK & DK
Pitot #: 4' Cp .84
Campaign Day: 168
Start Time: ___
End Time: ___



Schematic of Cross Section

Hopper

Port	Traverse Point #		Distance From end of Port (in) Port Length: 4.00"	Velocity Pressure (in WC)	Velocity Pressure Range	Calculated Data
A	1		4.64		1.20	$\bar{v}$ =
	2		6.10		1.20	M% =
	3		7.88		1.10	M.wt. =
	4		10.46		.87	ACFM = 8681
	5		17.54		.80	SCFM = 6213
	6		20.12		.77	DSCFM = 4274
	7		21.90		.79	
	8		23.36		.96	Comments:
	9					
	10					
	11					Static = -.53
	12					
B	1		4.64			
	2		6.10			
	3		7.88			
	4		10.46			
	5		17.54			
	6		20.12			
	7		21.90			
	8		23.36			
	9					
	10					
	11					
	12					
				$\sqrt{\Delta P}$ =		CAD#:E7116D34

'B' DRICK
2/23/94
TEST #2.

	P.P. Hoist	$\bar{x}$	TPH
		70.00	240.
10:00	70.00		
10:30	69.50		
11:00	69.30		
11:30	69.70		
12:00	70.30		
12:30	69.30		
1:00	69.2		
1:30	69.8		
2:00	70.3		
2:30	70.1		
3:00	70.1		
3:30	70.2		
4:00	70.2		
4:30	70.5		
5:00	68.9		
5:30	—		
6:00	72.6		
6:30	69.6		
7:00	70.2		
7:30	69.3		
8:00	69.1		

"C" Pulp Drier

OPERATING DATA SUMMARY FOR COMBUSTION SOURCES

Company Name: American Crystal Sugar Company
Date of Performance Test: Feb. 22, 1994
Summary prepared by: Bruce Kleinschmit (Signature)

A. Fuel Input

1. Itemize all fuels and materials that are added to the combustion process during the test period. Attach ultimate/proximate analysis of the fuel.

TEST -	FUEL TYPE & ORIGIN (e.g. Eastern Coal)	RATE OF FUEL INPUT (list units)	MOISTURE CONTENT (as received)	HEAT CONTENT (e.g. BTU/LB, BTU/GAL) (as received)	HEAT INPUT (10^6 BTU/HR)
Run 1	Coal/Subbituminous	5,220 lb/hr	25%	9,400	49.1
Run 2					
Run 3					

2. Are the above fuels substantially the same as those normally burned? Yes
   If not, explain _____

3. Are the above fuels normally burned in the proportions shown above? Yes
   If not, explain _____

4. Describe any changes anticipated for procurement of fuels within the next twelve (12) months.
   None

B. Equipment & Operating Data:

1. Furnace No. "C" Pulp Drier ; EP # 5
2. Furnace Manufacturer: C. E.
3. Type of Firing: Traveling Grate
4. Was the furnace operated under normal operating conditions? Yes
   If not, explain _____
5. Specify normal soot blowing frequency:
   a) source operating time blowing soot: 60 minutes/~~shift~~ week (steam lancing)
   b) number of shifts per day N/A

6.. Specify soot blowing times during the test: start steam lancing 15:50 end 15:53

When was the last time before the test that you blew soot:
(date & time) 2/20/94 2:00 am

7. Specify normal ash-pulling frequency: Continuous ash pulling
   a) source operating time pulling ashes: 10 minutes/shift (sift grates)
   b) number of shifts per day 3

8. Specify ash pulling times during the test: start 15:50 end 15:58

When was the last time before the test that you ~~pulled ashes~~: sift grates
(date & time) 2/22/94 ; 6:00 a.m

9. Date and procedures of last maintenance/cleaning of the ~~boiler~~ furnace (please attach records)
Aug. 1993 - summer shut down

C. Instrument Data

1. Include a copy of chart records during test for the combustion efficiency indices (CO, O_2, CO_2, combustibles, steam flow, air flow, etc.) Label as appropriate.

D. Air Pollution Control Equipment

1. Type of control equipment Multiclone / bUP WHS / Wheelabrator
   15% to Baghouse / 1313 RA / Wheelabrator
2. Air pressure drop (range during test)
   Run 1. 6.0" w.c. Run 2. 6.0" w.c. Run 3. 6.0" w.c.
3. Air flow (range during test)
   Run 1. 46,000 Run 2. 47,000 Run 3. 48,000
4. Was the control equipment operating normally? Yes
   If not, explain
5. Date and procedures of last maintenance/cleaning of control equipment
   1/11/94 Redressed Hopper Asp Baghouse & Cleaned M'clone.

NOTE: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. Rule pt. 7017.2035. The record of operating conditions must also be certified in accordance with Minn. Rule pt. 7017.2040, sub. 5. This form is to be submitted as part of the performance test report

Campaign Day: 167

Date: Feb. 22, 1994

PULP DRIER STACK TESTING

C Drier · Test # 1 Sheet #1 of 2

☐ Engineering
☒ Compliance

Hr.	Slice Rate Hr. TPH	Pre Heat F.D. Air Hr. °C	Pre Heat F.D. Air 1/2 Hr. °C	Heat Profile: Recycle Air Hr. °C	Recycle Air 1/2 Hr. °C	Throat Hr. °C	Throat 1/2 Hr. °C	Drum Exit Hr. °C	Drum Exit 1/2 Hr. °C	Air/Fuel Ratio Hr. %	Air/Fuel Ratio 1/2 Hr. %	Pressed Pulp Feed Hr. TPH	Pressed Pulp Feed 1/2 Hr. TPH	Damper Position: FD Hr. % Open	Recycle Hr. % Open	ID Hr. % Open	Coal Rate Hr. TPH	Coal Rate 1/2 Hr. TPH	Grate Speed Hr.	Grate Speed 1/2 Hr.	% Moistures: Pressed Pulp Hr. %	Pressed Pulp 1/2 Hr. %	Dried Pulp Hr. %	Dried Pulp 1/2 Hr. %	Pressure Drop (Field Sensors): Multiclone Hr. "H2O	Multiclone 1/2 Hr. "H2O	Multiclone Inlet Hr. "H2O	Multiclone Inlet 1/2 Hr. "H2O	Pressure Readings: Furnace Hr. "H2O	Drum Exit Hr. "H2O	Manometer Readings: Multiclone Inlet Hg A.P. Hr. "H2O	FD Duct Hr. "H2O	6 Recycle Airflow (Control)	Hopper Filter D.P. 1 "H2O	O_2 %	Recycle Maintenance
1:00 4:30	302	167	66	103	105	720	711	105	104	—	—	24.85	24.23	35.6	53.9	85	—	—	28.8	28.3	71.9	71.9	8.9	9.8	5.88	5.89	6.23	6.28	-.22	-.49	—	.60	4453	4.7	—	—	Hr
																															6.1	.75	4463	4.80	—	—	1/2
10:00 10:30	309	64	65	105	105	690	680	106	105	—	—	22.46	23.86	33.1	56.0	85	—	—	24.0	25.2	71.8	71.3	8.4	7.3	5.94	5.99	6.24	6.27	-.26	-.61		6.1	.45	4467	4.80	—	—	Hr
																															6.0	.50	4465	4.90	—	—	1/2
11:00 11:30	301	65	65	105	104	650	697	103	105	-	-	22.24	20.87	44.7	53.0	85	-	-	21.5	30.0	70.3	70.7	8.0	7.62	6.02	5.90	6.33	6.27	-.17	-.51		6.0	1.25	4431	4.85	-	-	Hr
																															5.9	1.00	4475	4.70	—	-	1/2
12:00 12:30	300	65	65	104	104	677	715	104	106	-	-	21.02	20.89	44.9	52.4	85	-	-	24.7	23.4	70.7	71.0	8.3	7.7	5.93	5.98	6.30	6.17	-.19	-.61		6.0	1.00	4462	4.10	-	—	Hr
																															6.0	.75	4470	4.7	-	-	1/2
1:00 1:30	300	64	64	105	105	686	678	102	105	-	-	21.08	20.62	38.2	54.7	85	-	-	23.20	23.10	70.7	70.0	7.3	6.6	6.01	6.06	6.29	6.29	-.23	-.56		6.0	.50	4480	4.7	-	-	Hr
																															6.0	.45	4486	4.8	-	-	1/2
2:00 2:30	300	63	63	104	102	681	707	102	105	-	-	21.67	19.71	45.1	55.5	85	-	-	24.2	23.1	71.0	71.0	8.6	8.4	6.03	5.99	6.23	6.20	-.23	-.55		6.0	.25	4495	4.8	-	-	Hr
																															6.0	.50	4410	4.6	-	1.2	1/2
3:00 3:30	320	64	63	102	102	680	649	105	105	-	-	23.46	20.41	37.7	57.3	85	-	-	23.1	23.1	71.0	65.8	7.9	7.5	6.08	6.04	6.27	6.22	-.21	-.54		6.0	.45	4507	4.9	-	1.4	Hr
																															6.0	.35	4537	4.8	-	1.4	1/2
4:00 4:30	302	65	64	102	102	666	675	104	103	-	-	30.03	19.09	36.9	57.3	65	-	-	23.5	28.6	69.3	71.6	71.6	9.4	6.09	6.03	6.38	6.21	-.22	-.49		6.0	.20	4480	4.8	-	1.4	Hr
																															6.0	.06			-	1.2	1/2
5:00 5:30										-	-					85	-	-																	-	-	Hr
																																		-	-	1/2
										-						85	-	-																-	-	Hr
																																		-	-	1/2

Air Registers:

Run #1: Start: 4:18 End: 16:22 Start: End:

Closed 1,2,5-9
25%
50%
75%
100% 3,4,5

Controller Name:	Ratio	Bias
Grate	.70	-1.0

Run #2:

Closed
25%
50%
75%
100% —

NOTES: Run 1

Coal Height = 2.75"; Exit Temp Set Pt: 104

Overall run was very stable in as much as the furnace + exit temp, plus a steady product moisture. Coal burn-off was better than usual. The furnace bancing and sifting was performed near end of run (15:43).

NOTES: Run 2

Furnace O position floated through last hour and a half of test.

GENERAL NOTES:

CAO/ E7111D01

PULP DRIER STACK TESTING

Campaign Day: 167

Date: 2/22/94

C Drier   Test # 1   Sheet 2 of 2

☐ Engineering
☒ Compliance

Hr.	Slice Rate Hr. TPH	Pre Heat F.D. Air Hr. °C	Pre Heat F.D. Air 1/2 Hr. °C	Recycle Air Hr. °C	Recycle Air 1/2 Hr. °C	Throat Hr. °C	Throat 1/2 Hr. °C	Drum Exit Hr. °C	Drum Exit 1/2 Hr. °C	Air/Fuel Ratio Hr. %	Air/Fuel Ratio 1/2 Hr. %	Pressed Pulp Feed Hr. TPH	Pressed Pulp Feed 1/2 Hr. TPH	Damper FD Hr. % Open	Damper Recycle Hr. % Open	Damper ID Hr. % Open	Coal Rate Hr. TPH	Coal Rate 1/2 Hr. TPH	Grate Speed Hr.	Grate Speed 1/2 Hr.
5:00 / 5:30	326	60	63	101	102	628	738	101	108	–	–	19.65	23.16	59.4	51.2	85	–	–	42.4	28.7
6:00 / 6:30	340	72	70	102	102	694	630	108	104	–	–	20.70	21.13	29.1	67.8	85	–	–	17.6	23.3
7:00 / 7:30	325	65	65	102	102	658	679	102	103	–	–	20.01	21.39	44.5	53.7	85	–	–	29.4	30.7
8:00 / 8:30	309	65	64	102	102	663	641	106	105	–	–	20.36	20.23	37.9	56.0	85	–	–	23.5	24.3
9:00 / 9:30		64	64	102	102	642	664	105	104	–	–	19.37	21.99	37.7	56.0	85	–	–	24.4	27.2
10:00 / 10:30										–	–					85	–	–		
										–	–					85	–	–		
										–	–					85	–	–		
										–	–					85	–	–		
										–	–					85	–	–		

Hr.	% Moisture Pressed Pulp Hr. %	Pressed Pulp 1/2 Hr. %	Dried Pulp Hr. %	Dried Pulp 1/2 Hr. %	Pressure Drop (Field Sensors) Multiclone Hr. "H2O	Multiclone 1/2 Hr. "H2O	Multiclone Inlet Hr. "H2O	Multiclone Inlet 1/2 Hr. "H2O	Pressure Readings Furnace Hr. "H2O	Drum Exit Hr. "H2O
5:00 / 5:30	70.5	70.1	9.0	9.4	6.09	5.87	6.31	6.12	-.14	-.53
6:00 / 6:30	(65.4)	70.0	6.8	6.9	5.84	6.09	6.09	6.29	-.32	-.60
7:00 / 7:30	69.9	71.2	7.2		6.02	6.37	6.31	6.32	-.14	-.51
8:00 / 8:30	71.2	72.0	7.8	7.7	6.15	6.02	6.43	6.48	-.20	-.53
9:00 / 9:30	70.1	(68.25)	9.1	9.0	6.11	6.04	6.24	6.35	-.20	-.51
10:00 / 10:30										

Hr.		Manometer Readings Multiclone Inlet ΔP "H2O	FD Duct "H2O	Recycle Airflow (Control)	Hopper Filter D.P. "H2O	O2 %	Recycle
5:00	Hr	6.00	.75	4518	4.7		1.2
5:30	1/2	6.10	.50	4469	4.8		1.2
6:00	Hr	6.00	0.0	4537	4.8		1.2
6:30	1/2	6.00	.40	4529	4.7		1.4
7:00	Hr	6.00	.50	4328	4.8		1.4
7:30	1/2	6.00	.75	4334	4.7		1.4
8:00	Hr	6.10	.50	4357	4.7		1.4
8:30	1/2	6.00	.40	9317	4.8		1.2
9:00	Hr	6.10	.50	4274	4.7		1.2
9:30	1/2	6.0	.50	4335	4.6		

Air Registers:

Run #1: Closed / 25% / 50% / 75% / 100%

Run #2: Closed / 25% / 50% / 75% / 100%

Start: 17:05 End: 19:11

Start: 19:45 End: 21:45

Controller Name:	Ratio	Bias

NOTES: Run 1

NOTES: Run 2

GENERAL NOTES:

CAD# E7111001

E-22

Campaign Day: 169

Date: 2/24/94

PULP DRIER STACK TESTING

C Drier . Test # NOx

☐ Engineering
☒ Compliance

Hr.	Slice Rate Hr. TPH	Pre Heat F.D. Air Hr. °C	Pre Heat F.D. Air 1/2 Hr. °C	Heat Profile Recycle Air Hr. °C	Heat Profile Recycle Air 1/2 Hr. °C	Heat Profile Throat Hr. °C	Heat Profile Throat 1/2 Hr. °C	Heat Profile Drum Exit Hr. °C	Heat Profile Drum Exit 1/2 Hr. °C	Air/Fuel Ratio Hr. %	Air/Fuel Ratio 1/2 Hr. %	Pressed Pulp Feed Hr. TPH	Pressed Pulp Feed 1/2 Hr. TPH	Damper Position FD Hr. % Open	Damper Position Recycle Hr. % Open	Damper Position ID Hr. % Open	Coal Rate Hr. TPH	Coal Rate 1/2 Hr. TPH	Grate Speed Hr.	Grate Speed 1/2 Hr.	% Moisture Pressed Pulp Hr. %	% Moisture Pressed Pulp 1/2 Hr. %	% Moisture Dried Pulp Hr. %	% Moisture Dried Pulp 1/2 Hr. %	Pressure Drop (Field Sensors) Multiclone Hr. "H_2O	Pressure Drop (Field Sensors) Multiclone 1/2 Hr. "H_2O	Pressure Drop (Field Sensors) Multiclone Inlet Hr. "H_2O	Pressure Drop (Field Sensors) Multiclone Inlet 1/2 Hr. "H_2O	Pressure Readings Furnace Hr. "H_2O	Pressure Readings Drum Exit Hr. "H_2O	Manometer Readings Wet ΔP Hr. "H_2O	Manometer Readings FD Duct Hr. "H_2O	Recycle Airflow (Control)	Hopper Filter D.P. "H_2O	O_2 %	Methane	
8:00	- 21					691		101				21				85							7.5		6.06				-.12				3926				Hr / 1/2
9:00	19					724		110				19				85									5.70				-.23				3926				Hr / 1/2
10:00	21					682		101				21				85							7.5		6.03				-.19				3926				Hr / 1/2
11:00	21 ~~19~~					656		107				21				85									5.99				-.19				3926				Hr / 1/2
	19 ~~20~~					693		103				19				85							4.9		5.92				-.11				3926				Hr / 1/2
																																					Hr / 1/2
																																					Hr / 1/2
																																					Hr / 1/2
																																					Hr / 1/2
																																					Hr / 1/2

Air Registers:

Run #1: Closed / 25% / 50% / 75% / 100%

Run #2: Closed / 25% / 50% / 75% / 100%

Start:
End:

Start:
End:

Controller Name:	Ratio	Bias

NOTES: Run 1

NOTES: Run 2

GENERAL NOTES:

CAD# E7111001

Pulp Drier Testing Summary Sheet

For 3 Run Tests

Campaign Day: 166

Date: 2/22/94

Parameters: % Recycle +12 %

DSCFM _____

C Drier Test # 1

* Based on pre-flow
** Based on run #1

O_2 = 15%	Pre-Air Flows			Run #1	Run #2	Run #3	Post Air Flows Test		Avg-Air Flows		
	Stack	Hopper	Recycle	Stack	Stack	Stack	Hopper	Recycle	Stack	Hopper	Recycle
ACFM	46,241	8252	6930	46050	47210	47,840			47,033		
DSCFM	24,010	3938	3299	24130	24510	25,090			24,577		
VEL	61.32			61.07	62.62	63.45			62.38		
%M	34.0	35	35	33.10	33.70	32.85			33.22		
°F	210°	217°	217°	212.4	212.8	214.6			213°F/100%		
STAT. P.	-.95	-0.2	-1.2	-.95	-.95	-.95			-.95		
% RATE (DSCFM)		17.8* 17.9**	15.0* 15.8**						100%		

4500 flow meter

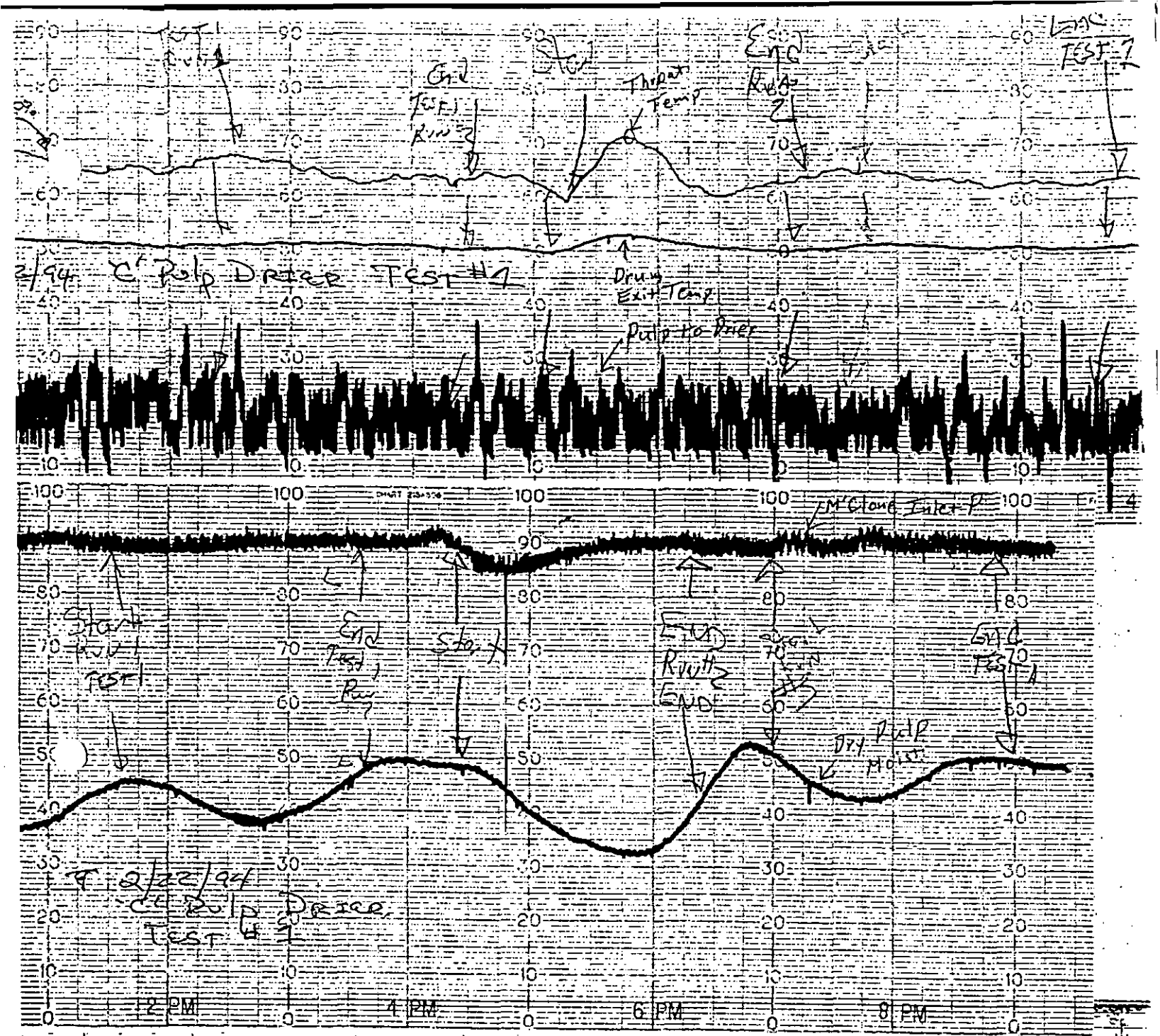
	P.P. TPH	Coal TPH	Multiclone Inlet P	Multiclone DP	Throat °C	Exit °C	Grate Speed	FD Damper	Furn Press	Hopper DP	Hopper ACFM	Recycle	Excess Oxygen
Run 1 $\bar{x}$ =	21.10	2.41					23.9						
σ =	1.36						2.29						
Run 2 $\bar{x}$ =	20.93	2.81					27.9						
σ =	1.22						8.27						
Run 3 $\bar{x}$ =	20.67	2.62					26.02						
σ =	0.92						2.65						
3 Run $\bar{x}$ =	20.9	2.61					25.9						

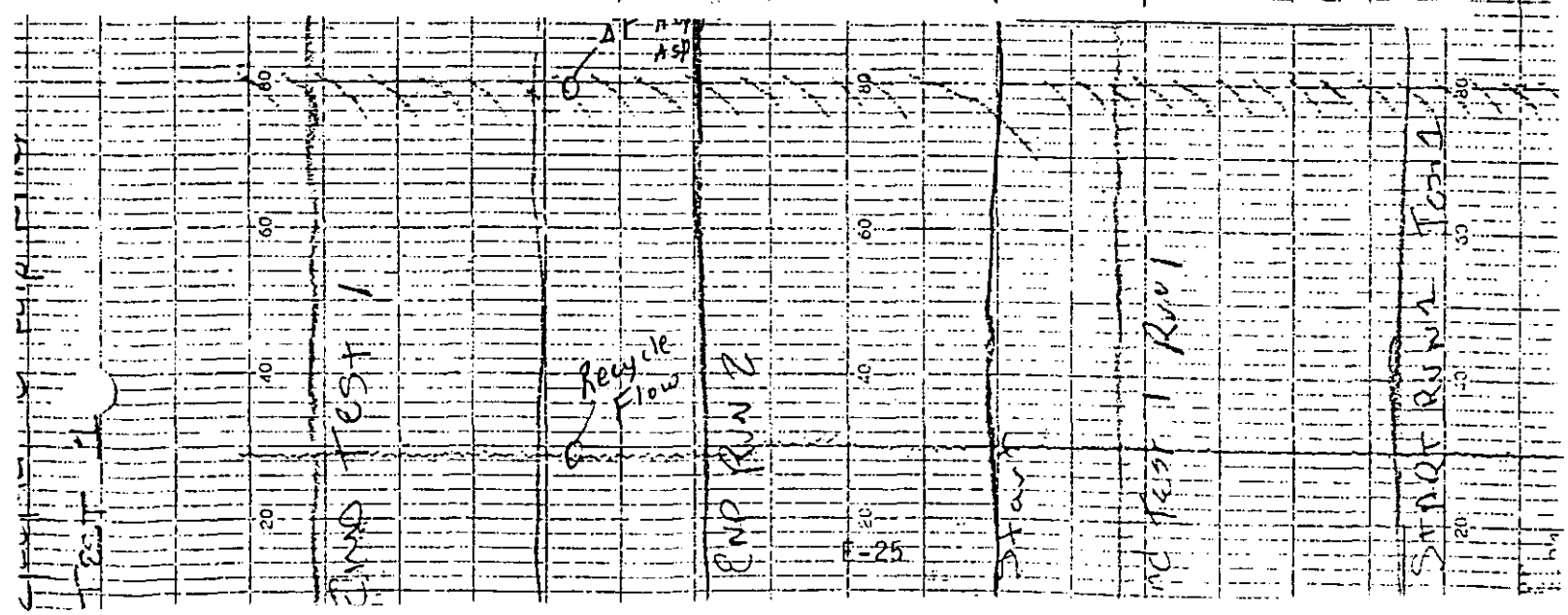
Moistures		$\bar{x}$	σ	TDS Actual	TPH Theoretical
Run 1; P.P. Moist:	71.0, 71.0, 71.0, 65.8, 69.3	69.6	2.02	6.41	
Run 2; P.P. Moist:	70.5, 70.1, 65.4, 70.0, 69.9	69.2	1.90	6.45	
Run 3; P.P. Moist:	71.2, 71.2, 72.0, 70.1, 68.3	70.6	1.28	6.08	
Run 1; D.P. Moist:					
Run 2; D.P. Moist:					
Run 3; D.P. Moist:					

$\bar{x}$ = 6.31

E-24

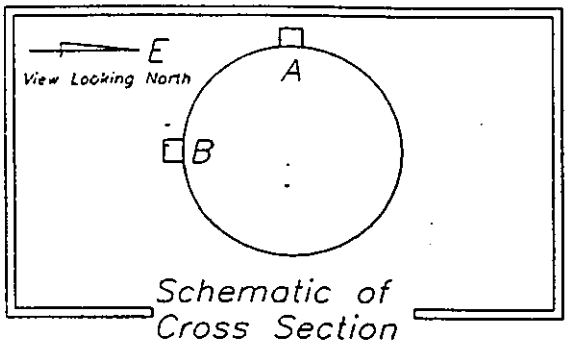
CAD# E7116D56


Start Run 1 Test 1
End Test 1 Run 1
Start Run 2
End Run 2 End Test 1
M'Clone Inlet P
Dry Pulp Moist
12 PM
4 PM
6 PM
8 PM


Recycle Flow
Test 1 Run 1
End Run 2
Start Test 1 Run 1

American Crystal Sugar Company
EPA Method 2 Field Data Sheet

Source: "C" Recycle Duct. ø = 20"
Test ___ Run ___ Date: 2/22/94
Dry Bulb 103 Wet Bulb _____
Barometric Press. _____ Hg
Static Pressure -1.2 WC
F.D. Damper: _____ % open
Recycle Damper: _____ % open
Operators: _____
Pitot #: _____ Cp _____
Campaign Day: _____
Start Time: _____
End Time: _____



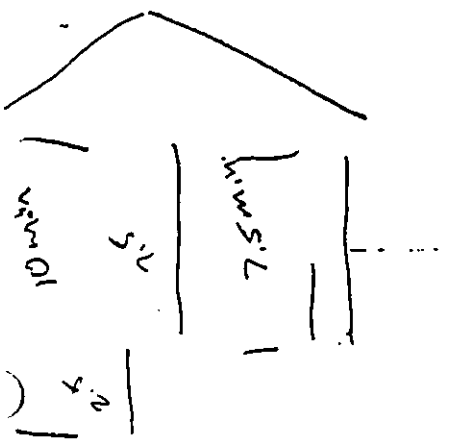
Schematic of Cross Section

Port	Traverse Point #		Distance From end of Port (in) Port Length: ___ "	Velocity Pressure (in WC)	Velocity Pressure Range	Calculated Data
A	1		3.58	.46		$\bar{v}$ = 52.98
	2		4.39	.52		M% = 35
	3		6.00	.58		M.wt. = 25.5
	4		8.31	.66		ACFM = 6930
	5		14.68	.75		SCFM = 5076
	6		17.01	.73		DSCFM = 3299
	7		19.01	.72		
	8		19.92	.68		Comments:
	9					Pretest
	10					8:30 A.M.
	11					
	12					
B	1		3.58	.44		
	2		4.39	.52		
	3		6.00	.56		
	4		8.31	.59		
	5		14.68	.65		
	6		17.01	.70		
	7		19.01	.70		
	8		19.92	.62		
	9					
	10					
	11					
	12					
				$\sqrt{\Delta P}$ = .783		CAD#: E7116D38

P.P. %	6.1. TDS. $\bar{x}$	TDS P.P. Flow
71.9		
71.8	71.85	21.666
71.3	71.67	21.53
70.3	71.33	21.28
70.7	71.03	21.06
70.7	71.25	20.85
71.0	70.68	20.80
70.7	70.78	20.87
70.0	70.66	20.75
71.0	70.68	20.80
71.0	70.68	20.80
71.0	70.75	20.85
71.0		
65.8 * Not used.		
71.6	71.15	21.14
70.5	71.03	21.06
70.1	70.80	20.89
65.4 * Not used		
70.6	70.55	20.71
69.9	70.13	20.42
71.2	70.50	20.67
71.2	70.56	20.72
72.0	71.10	21.10
70.1	71.13	21.13
6625 (?)		

6.3.

'C' Pulp Drier
2/22/93
Test #1



#1 Boiler

OPERATING DATA SUMMARY FOR COMBUSTION SOURCES

Company Name: American Crystal Sugar Company
Date of Performance Test: Feb. 22, 1994
Summary prepared by: Brian Hilfenhaus (Signature)

A. Fuel Input

1. Itemize all fuels and materials that are added to the combustion process during the test period. Attach ultimate/proximate analysis of the fuel.

TEST -	FUEL TYPE & ORIGIN (e.g. Eastern Coal)	RATE OF FUEL INPUT (list units)	MOISTURE CONTENT (as received)	HEAT CONTENT (e.g. BTU/LB, BTU/GAL) (as received)	HEAT INPUT (10^6 BTU/HR)
Run 1	Coal/Subbituminous	45TPH nom	25%	9,300	837
Run 2					
Run 3					

2. Are the above fuels substantially the same as those normally burned ? Yes
   If not, explain _____

3. Are the above fuels normally burned in the proportions shown above ? N/A
   If not, explain _____

4. Describe any changes anticipated for procurement of fuels within the next twelve (12) months.
   None

B. Equipment & Operating Data:

1. Furnace No. 1 - No. 1 Boiler ; EP #1
2. Furnace Manufacturer: B + W
3. Type of Firing: Spreader Stoker
4. Was the furnace operated under normal operating conditions? No.
   If not, explain Furnace was operated near maximum Capacity. Normal load is 60 to 75%.
5. Specify normal soot blowing frequency:
   a) source operating time blowing soot: 45 minutes/shift
   b) number of shifts per day 3

6.. Specify soot blowing times during the test: start 12:40 end 13:16
_____ _____
_____ _____

When was the last time before the test that you blew soot:
(date & time) 2/22/94 ; 11:15 A.M. Ended

7. Specify normal ash-pulling frequency:
   a) source operating time pulling ashes: 160 minutes/shift
   b) number of shifts per day 3

8. Specify ash pulling times during the test: start 12:50 end 14:20
   16:00 16:15
   _____ _____

When was the last time before the test that you pulled ashes:
(date & time) 2/22/94 ; 12:00 (almost continuously pulling w heavy load)

9. Date and procedures of last maintenance/cleaning of the boiler (please attach records)
11/09/93 to replace a coupling on FD Fan

C. Instrument Data

1. Include a copy of chart records during test for the combustion efficiency indices (CO, O_2, CO_2, combustibles, steam flow, air flow, etc.) Label as appropriate.

D. Air Pollution Control Equipment

1. Type of control equipment ESP / UOP 30999 32-1-6

2. Air pressure drop (range during test)
   Run 1. N/A Run 2. _____ Run 3. _____

3. Air flow (range during test)
   Run 1. _____ Run 2. _____ Run 3. _____

4. Was the control equipment operating normally? Yes
   If not, explain _____

5. Date and procedures of last maintenance/cleaning of control equipment.
Week of Feb. 7, 1994 - Replaced Sq 100 controller on Field #1 with an Sq 300.

NOTE: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. Rule pt. 7017.2035. The record of operating conditions must also be certified in accordance with Minn. Rule pt. 7017.2040, sub. 5. This form is to be submitted as part of the performance test report

Boilerhouse Stack Testing Data

Boiler # 1

Date: 2/22/94

Time	Steam psi	Steam C	Steam lbs/hr	Steam Total m lbs	Boiler Feed Water GPM	Electrostatic Precipitator Secondary Volts and Amps Field 1 Amps	Field 1 KVolts	Field 2 Amps	Field 2 KVolts	Field 3 Amps	Field 3 KVolts	Inlet Temp	CEMS SO2	CEMS CO2	CEMS CO	CEMS O2	CEMS Opacity	CEMS lbs/ million btu	OVER Fire Air	Coal Flow	Air Steam
12:00	395	540	242	12,703	229	.03	24	.06	24	.18	25		145	10.90	518		3.44	.40	23.1	46.0	95.9
12:30	399	540	240	13,516	234	.03	24	.08	24	.36	28		135	10.10	545		2.30	.30	17.2	46.0	93.8
13:00	393	540	237			.03	24	.08	26	.38	30	454	137	10.1	498		2.10	.40	18.0	50.2	97.6
13:30	403	540	248	15,983	243	.02	23	.12	26	.38	30	455	141	10.9	482		2.00	.30	17.9	46.5	93.8
14:00	402	540	242	17,207	229	.02	24	.08	24	.28	28	454	141	10.0	405		2.00	.41	16.4	45.8	93.5
14:30	405	540	239	18,660	240	.03	20	.08	24	.24	24		142	11.0	474		1.50	.41		45.1	
15:00	401	540	254	594	243	.02	25	.12	26	.28	30	450	139	11.0	447		1.60	.39	17.8	45.1	92.9
15:30	396	540	251	1883	234	.03	25	.11	24	.26	28	448	135	10.4	300		1.70	.40	15.2	45.0	94.7
16:00	393	550	249	3356	240	.02	23	.10	25	.26	24	454	138	10.6	398		1.50	.30	14.0	45.1	92.7
16:30	409	550	227	4243	232	.03	24	.06	22	.30	28	452	142	10.9	406		1.40	.30	15.5	45.1	92.7
17:00	402	540	240	5241	238	.04	22	.10	24	.38	29	456	134	10.3	534		1.50	.39	18.2	45.1	94.5

ESP	
Spark Rate	/min
Rapping Cycle	
Times	Start
Soot Blowing	12:40
Ash Pulling	12:50

Field

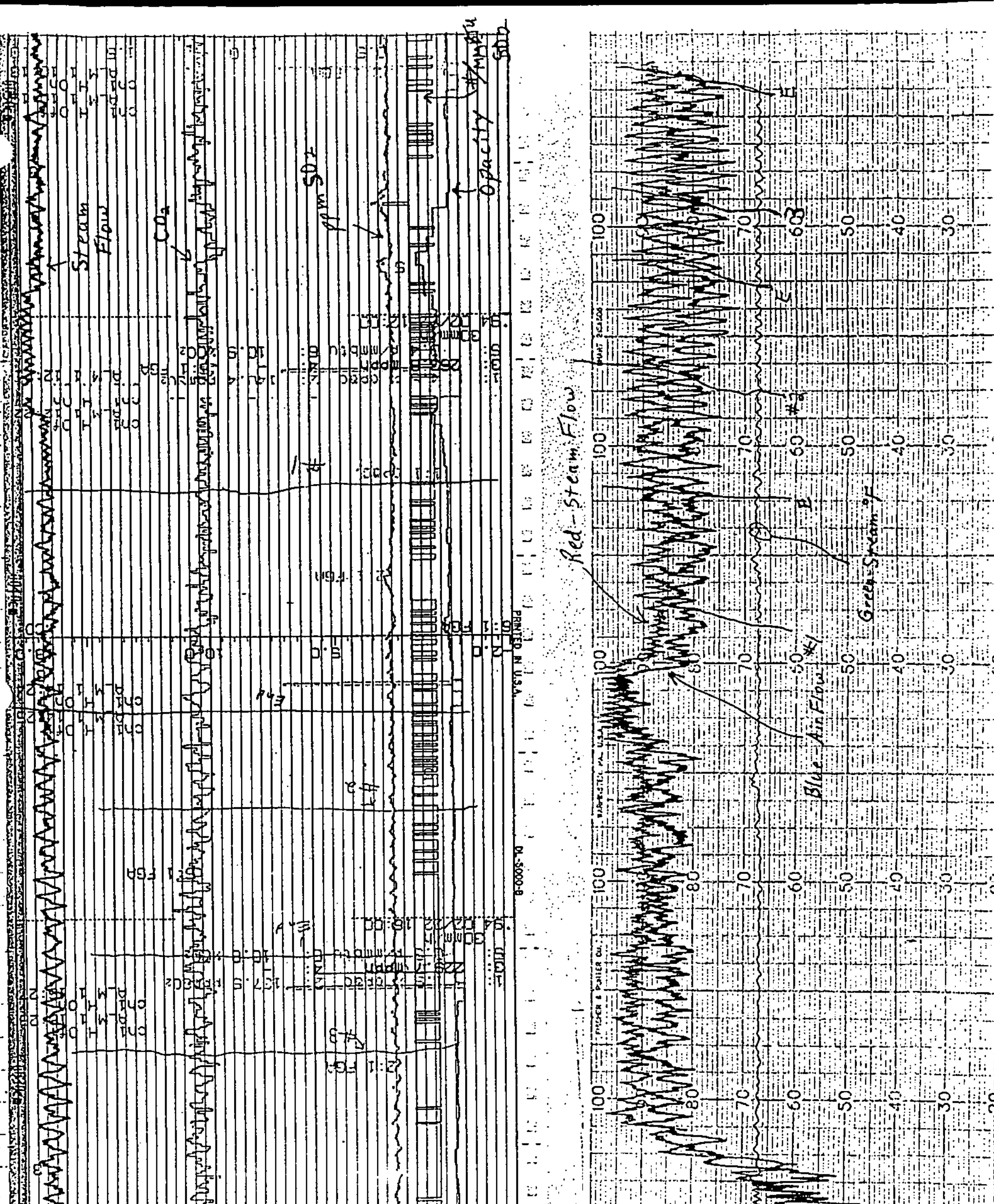
1	2	3
16	14	20

End
13:16
14:20
5:15
4:00

Comments: All Sg300's are now controlling precipitators. Opacities have been low. Load to the factory is up and down on #2. This makes it difficult to keep the load steady on #1 Boiler

precips + Chains

	Run 1	Run 2	Run 3
Start	12:20	14:20	16:10
End	13:31	14:28	17:14


Steam Flow
CO2
ppm SO2
Opacity
PRINTED IN U.S.A.
Red - Steam Flow
Blue Air Flow
Green Steam °F
End
Stack Tests - Boiler #1
2/22/94
EGF

#2 Boiler

OPERATING DATA SUMMARY FOR COMBUSTION SOURCES

Company Name: American Crystal Sugar Co.
Date of Performance Test: Feb. 23, 1994
Summary prepared by: Bruce Kiefenheim (Signature)

A. Fuel Input

1. Itemize all fuels and materials that are added to the combustion process during the test period. Attach ultimate/proximate analysis of the fuel.

TEST __ -	FUEL TYPE & ORIGIN (e.g. Eastern Coal)	RATE OF FUEL INPUT (list units) Nominal	MOISTURE CONTENT (as received)	HEAT CONTENT (e.g. BTU/LB, BTU/GAL) (as received)	HEAT INPUT (10^6 BTU/HR)
Run 1	Coal/Subbituminous	40.3 TPH	25%	9,300	750
Run 2					
Run 3					

2. Are the above fuels substantially the same as those normally burned? Yes
   If not, explain _____

3. Are the above fuels normally burned in the proportions shown above? N/A
   If not, explain _____

4. Describe any changes anticipated for procurement of fuels within the next twelve (12) months.
   None

B. Equipment & Operating Data:

1. Furnace No. 2 Boiler ; EP # 2
2. Furnace Manufacturer: B + W
3. Type of Firing: Spreader Stoker
4. Was the furnace operated under normal operating conditions? No
   If not, explain Furnace was near maximum capacity during tests. Normal rate is 60-75% Capacity.
5. Specify normal soot blowing frequency:
   a) source operating time blowing soot: 45 minutes/shift
   b) number of shifts per day 3

6.. Specify soot blowing times during the test: start 11:05 end 11:35

When was the last time before the test that you blew soot:
(date & time) 11/23/94 ; 2:00 a.m.

7. Specify normal ash-pulling frequency:
   a) source operating time pulling ashes: 160 minutes/shift
   b) number of shifts per day 3

8. Specify ash pulling times during the test: start 11:05 end 11:30
   13:00 13:40
   13:40 14:15

When was the last time before the test that you pulled ashes:
(date & time) 11/23/94 ; 6:00 am

9. Date and procedures of last maintenance/cleaning of the boiler (please attach records)
   August 1993 - Summer shut down

C. Instrument Data

1. Include a copy of chart records during test for the combustion efficiency indices (CO, O_2, CO_2, combustibles, steam flow, air flow, etc.) Label as appropriate.

D. Air Pollution Control Equipment

1. Type of control equipment ESP / UOP 30999 32-1-6

2. Air pressure drop (range during test)
   Run 1. N/A Run 2. _____ Run 3. _____

3. Air flow (range during test)
   Run 1. N/A Run 2. _____ Run 3. _____

4. Was the control equipment operating normally? Yes
   If not, explain _____

5. Date and procedures of last maintenance/cleaning of control equipment. Jan. 18, 1994
   New Sq 300 controllers replaced Sq 100's.

NOTE: This form provides only a summary of the operating conditions during the performance test. Additional and more detailed records are required to meet the requirements of Minn. Rule pt. 7017.2035. The record of operating conditions must also be certified in accordance with Minn. Rule pt. 7017.2040, sub. 5. This form is to be submitted as part of the performance test report

Boilerhouse Stack Testing Data

Date: 2-23-94 Boiler # 2

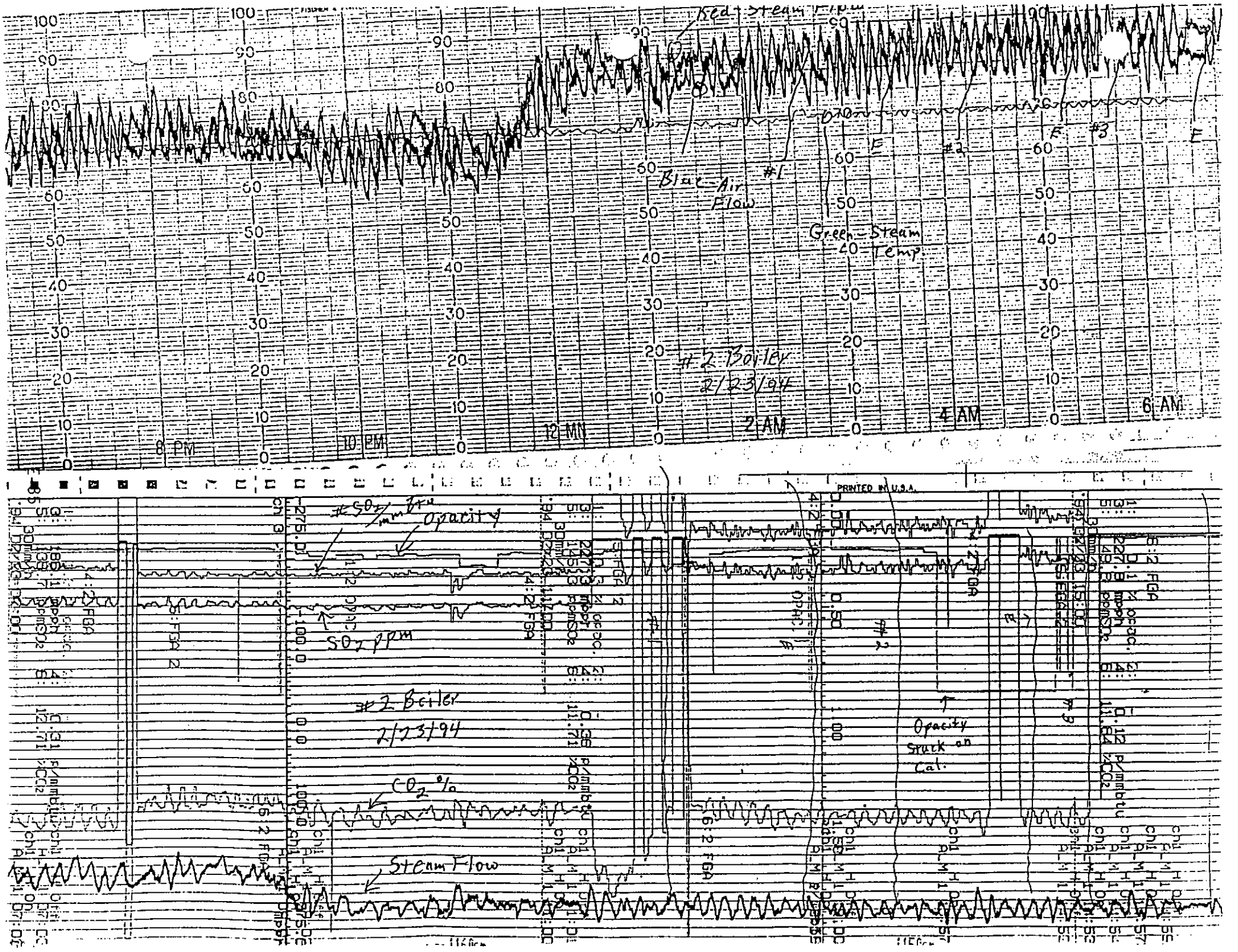
Time	Steam psi	Steam C	Steam lbs/hr	Steam Total m lbs	Boiler Feed Water GPM	Electrostatic Precipitator Secondary Volts and Amps Field 1 Amps	Field 1 Volts	Field 2 Amps	Field 2 Volts	Field 3 Amps	Field 3 Volts	Inlet Temp	CEMS SO2	CO2	CO	O2	Opacity	lbs/ million btu	OVER Fire Air	Coal Flow	Air Fuel	
11:00	393	550	230	8700	228	.24/.22	25/25	.06/.06	21/20	.26/.10	22/24	425	72.3	12.99	263		2.7	.17	5.2	403	99	
11:30	398	550	249	9800	239	.18/.20	26/26	.06/.06	22/22	.26/.12	22/22		68.4	12:39	317		3.3	.19	4.9	40.3	97.8	
12:00	402	550	241	10,900	227	.24/.26	26/26	.08/.07	21/23	.26/.10	21/23	423	76	12.12	302		2.5	.18	4.9	40.3	97.5	
12:30	399	540	241	12,100	238	.26/.24	25/25	.06/.06	21/21	.26/.10	22/24	430	69	12.13	264		2.5	.16	5.4	40.3	99.9	
13:00	400	540	238		230	.24/.24	25/25	.08/.06	21/21	.26/.11	22/24		73	11.84	279		2.9	.16	4.9	40.3	97.8	
13:30	412	540	239	14,480		.22/.26	25/27	.08/.08	20/20	.26/.11	22/24		71	12.78			span	.16	5.9	40.3	98.0	
14:00	406	550	235	16,000	225	.10/.14	25/25	.06/.06	22/22	.26/.09	22/24	426	51	12.71	321		span	.12	5.2	40.3		
14:30	406	540	233	17,000	230	.10/.22	23/23	.06/.06	22/22	.26/.10	22/23			12.52			0.7		5.4	40.3	96.0	
15:00	403	540	234	020	232							426		12.52			out of order		5.2	40.3	97.8	

	Field 1	2	3
ESP			
Spark Rate	6	20	20
Rapping Cycle			
Times			
Soot Blowing	11:05	11:35	
Ash Pulling	11:05	11:30	

Comments: Yesterdays tests were delayed 2hrs. because Interpolls technicians were working on a NOx analyzer for the pulp drier tests. ACS Instrument Technicism is working on the CO_2, SO_2 CEM's. That is probably why these readings are low for SO_2.
At 13:30 the opacity analyzer got stuck in the calibration span position. We think the stack tester may have bumped the ctl. knob on the transducer from operate to span. Put back to operate at 14:20 but #'s are now suspiciously low.

	Run 1	Run 2	Run 3
Start	11:05	12:50	14:15
End	11:09	13:53	14:17

Ash pulling 11:05 - 11:30
13:00 - 13:40
Air Heaters (chains) precips 13:40 - 14:15


Red Steam Flow
Blue Air Flow
Green Steam Temp.
#1
#2
#3
#2 Boiler
2/23/94
6 PM
10 PM
12 MN
2 AM
4 AM
6 AM
PRINTED IN U.S.A.
#SO2/mmBtu
Opacity
SO2 ppm
#2 Boiler
2/23/94
CO2 %
Steam Flow
Opacity Stuck on Cal.

RAPPER SETTINGS
February 24, 1994

BOILER #1

	Cycle Time	Lift
Inlet Grounded	8:00	7.5
Inlet High Voltage	5:00	5.5
Inlet Grounded	8:30	7.5
Middle Grounded	9:00	5.5
Middle High Voltage	5:00	5.5
Middle Grounded	9:30	5.5
Outlet Grounded	10:00	3.5
Outlet High Voltage	5:00	5.5
Outlet Grounded	10:30	3.5

BOILER #2

	Cycle Time	Lift
Inlet Grounded	8:00	7.5
Inlet High Voltage	5:00	5.5
Inlet Grounded	8:30	7.5
Middle Grounded	9:00	5.5
Middle High Voltage	5:00	5.5
Middle Grounded	9:30	5.5
		5.5
Outlet Grounded	10:00	3.5
Outlet High Voltage	5:00	5.5
Outlet Grounded	10:30	3.5

APPENDIX F

PROCEDURES

Particulate Loadings and Emission Rates

The particulate emission rates were determined per EPA Methods 1-5, CFR title 40, Part 60, Appendix A (revised July 1, 1987). In this procedure, a preliminary velocity profile of the gases in the flue is obtained by means of a temperature and velocity traverse. On the basis of these values, sampling nozzles of appropriate diameter are selected to allow isokinetic sampling, a necessary prerequisite for obtaining a representative sample.

The sampling train consists of a heated glass-lined sampling probe equipped with a Type S pitot and a thermocouple. The probe is attached to a sampling module which houses the all-glass in line filter holder in a temperature controlled oven. In addition, the sampling module also houses the impinger case and a Drierite drying column. The sampling module is connected by means of an umbilical cord to the control module which houses the dry test gasmeter, the calibrated orifice, a leakless pump, two inclined manometers, and all controls required for operating the sampling train.

Particulate samples were collected as follows: The sample gas was drawn in through the sampling probe isokinetically and passed through a 4-inch diameter Gelman Type A/E glass fiber filter. The particulates were removed at this point and collected on the filter. The gases then passed through an ice-cooled impinger train and a desiccant-packed drying column which quantitatively absorb all moisture from the sample gas stream after which the sample gas passes through the pump and the dry test gasmeter which integrates the sample gas flow throughout the course of the test. A calibrated orifice attached to the outlet of the gasmeter provides instantaneous flow rate data.

A representative particulate sample was acquired by sampling for equal periods of time at the centroid of a number of equal area regions in the duct. The sampling rate is adjusted at each site such that an isokinetic sampling condition prevails. Nomographs are used to aid in the rapid determination of the sampling rate.

3a P1(1-5)

Particulate Loading and Emission Rates

After sampling is complete, the filter is removed and placed in a clean container. The nozzle and inlet side of the filter holder are quantitatively washed with acetone and the washings are stored in a second container. A brush is often used in the cleaning step to help dislodge deposits. The samples are returned to the laboratory where they are logged in and analyzed. The volume of the acetone rinse ("probe wash") is noted and then the rinse is quantitatively transferred to a tared 120 cc porcelain evaporating dish and the acetone evaporated off at 97-105 °F. This temperature is used to prevent condensation of atmospheric moisture due to the cooling effect induced by the evaporation of acetone. The acetone-free sample is then transferred to an oven and dried at 105 °C for 30 minutes, cooled in a desiccator over Drierite, and then weighed to the nearest .01 mg. The filter sample is quantitatively transferred to a 6-inch watch glass and dried in an oven at 105 °C for two hours. The filter and watch glass are then cooled in a desiccator and the filter weighed to the nearest .01 mg. All weighings are performed in a balance room where the relative humidity is hydrostatted to less than 50% relative humidity. Microscopic examination of the samples is performed if any unusual characteristics are observed. The weight of the acetone rinse is corrected for the acetone blank. The Drierite column is weighed on-site and the water collected by Drierite is added to the condensate so that the total amount of absorbed water may be ascertained.

Integrated flue gas samples for Orsat analysis were collected simultaneously with each pollutant sample. The samples were collected in 15-liter gas sampling bags at a constant flow rate throughout each particulate run. The bags were at a constant flow rate throughout each particulate run. The bags were then returned to the laboratory and analyzed by Orsat analysis. Standard commercially prepared solutions were used in the Orsat analyzer (sat. KOH for carbon dioxide and reduced methylene blue for oxygen).

Interpoll Laboratories
(612)786-6020

Condensible Organic Compounds Analysis

(State of Minnesota - MPCA Exhibit C)

Method II-8672-MN

Equipment: Separatory funnel - 500 cc with Teflon stopcock

Powder funnel - 75 mm ID with a 17 mm stem

Evaporating dish(es) - 200 cc or 250 cc beaker

Reagents: Diethyl ether - reagent grade

Chloroform - reagent grade

Sodium sulfate - (ACS) granular anhydrous

Toluene - (if 3% hydrogen peroxide is used to collect the samples)

Glass wool (Pyrex microfiber)

PREPARATION

1. Place 1 kg of granular anhydrous sodium sulfate in a shallow tray and heat to 200 °C for at least four hours. Store in a tightly sealed glass container.

2. Place a plug of clean glass wool in the stem of the powder funnel. The plug must be of sufficient size so that it is held snuggly in place by its own pressure. Add a one-inch layer of dry sodium sulfate.

SAMPLING

An all-glass impinger assembly is used in the back half of the EPA Method 5 sampling train when an organic wet catch is to be collected. The impinger assembly consists of a modified impinger, a Greenburg Smith impinger followed by another modified impinger. The third impinger should have a temperature measuring device at the outlet upstream of a final impinger or desiccant column to monitor the temperature of the outlet gas stream. Prior to the start of the test, each of the first two impingers should be charged with 100 g of Class I water. The Method 5 train should be operated as provided for in EPA Method 5. Ice should be added to the impinger bath to keep the temperature of the gas at the outlet at or less than 68 ^{o}F. After the post test leak check, the impinger train is removed and impinger contents poured into a tared all-glass sample bottle and closed with a Teflon-lined cap. The sample bottle is then weighed and the total condensate calculated by subtraction of the bottle tare weight and the weight of initial water added to the impingers (200 g). A label is affixed and the sample is returned to the laboratory for analysis. The sample should be stored at 4 ^{o}C if the analysis is not conducted within 48 hours.

ANALYSIS

I. Organics

Caution! Work in vented hood!!!

A. Organic Blank Determination

1. Pour 125 mL of ethyl ether and 125 mL of chloroform into a tared beaker.
2. Evaporate solvent in hood at 70 ^{o}F or less until no solvent remains.
3. Desiccate the sample in dish for two hours.
4. Weigh the sample to nearest 0.1 mg, record and report on Form LSC-036.

B. Organic Sample Determination

1. Test for peroxide in sample ether using KI strips. (If KI strip shows positive, contact your supervisor before proceeding.)
2. Transfer the sample solution quantitatively to a 500 mL separatory funnel. Use the first of three 25 mL chloroform aliquots to rinse the sample container.
3. Extract with three 25 mL portions of chloroform. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Bottom layer is chloroform.) Draw off the bottom layer, transferring the solvent with a funnel containing a plug of sodium sulfate into a tared beaker. (Do not draw off any of the aqueous layer.)

4. After the three chloroform extractions, use two 25 mL portions of chloroform to rinse the sodium sulfate, collecting the rinses in the same tared beaker as the extracts.

5. Next extract the sample three times with 25 mL aliquots of ethyl ether. (Shake and vent to release pressure about 4 to 5 times each.) Allow the phases to separate. (Top layer is ethyl ether.) Draw off the bottom layer (aqueous) into another separatory funnel taking less than 1 mL of the ethyl ether layer with. Decant the ethyl ether, passing it through sodium sulfate and collecting the ethyl ether in the same tared dish as the chloroform.

6. After the three ethyl ether extractions, take two 25 mL portions of ethyl ether and rinse the sodium sulfate collecting the rinses in the same tared beaker as the extracts.

7. Evaporate the solvents (chloroform and ethyl ether) in the tared beaker in the hood at 70 ^{o}F or less until no solvent remains. (Use no heat and have no sources of ignition in the hood when doing this procedure.) Do not evaporate so quickly as to allow evaporative cooling to lower the temperature of the container below the dew point of water, otherwise, water will be condensed out in the container.

8. Desiccate to constant weight (two hours). Record and report the final weight to the nearest 0.1 mg on Form LSC-036.

II. Inorganics

If inorganic residue information is required, the following procedure should be conducted:

A. Inorganic Blank Determination

1. Vent the remaining aqueous phase from the organic extraction in the hood to remove residual organic solvents (usually overnight).
2. Decant the impinger catch into a tared evaporating dish.
3. Evaporate all of the water in the sample in an oven at 100 ^{o}C. Take care not to boil to prevent bumping and loss of sample.
4. Cool the dried sample in the desiccator and desiccate until a constant weight is obtained.
5. Report the results to the nearest 0.1 mg on Form LSC-036.

B. Inorganic Sample Determination

Follow steps 1-5 in Section A above.

NOTES

1. For the organics determination, in the rare event that the impinger catch resulted from a Modified Method 6 determination (SO_2), whereby the solution contains dilute hydrogen peroxide ($\geq$ 3%), do <u>not</u> use ether as an extraction solvent. <u>Substitute toluene</u> for ethyl ether in Section I. (Ether in the presence of peroxide forms explosive hydroperoxide.)

2. In the organics determination, more than three extractions may be required to extract all of the organics. Additional extractions should be performed if the aqueous phase is still cloudy.

3. Special state requirements:

   <u>Michigan</u> - Total sample evaporated in tared evaporating dish on steam bath.

   <u>Iowa</u> - Organics and inorganics separately, as required.

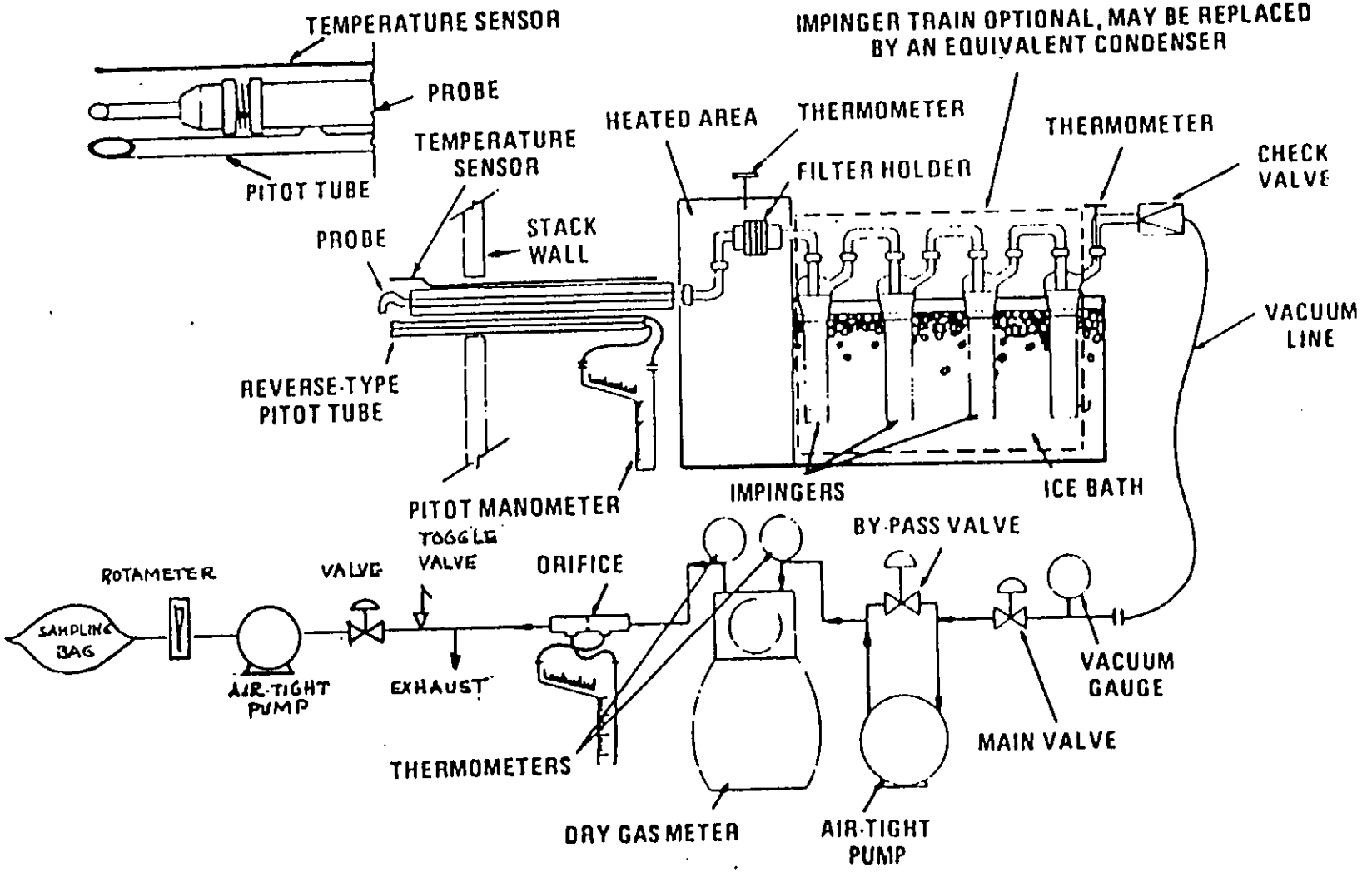
   <u>Wisconsin</u> - Use Method II-8672-WI.

   <u>Rest of states</u> - Organics only.

REFERENCES

Proposed Standards of Performance for New Stationary Sources, Federal Register <u>36</u>(159) Part II, August 1, 1979.

Minnesota Pollution Control Agency, Exhibit C.



Particulate-sampling train.

IN SITU CASCADE IMPACTOR
PARTICLE SIZE DISTRIBUTION ANALYSES
FLOW SENSOR 7-STAGE IMPACTOR

The particulate mass-size distribution was determined by sampling isokinetically at one point in the flow stream using an EPA sampling train with a seven-stage cascade impactor attached to the in-stack end of the probe. The impactor aerodynamically classifies the particles in-situ according to their aerodynamic diameters and impacts the various size fractions out on successive stages. Particles larger than approximately 11 microns are collected in the nozzle, and in the preimpactor. Particles less than 11 but larger than 7.0 microns are collected on the first stage. Particles less than 7.0 but larger than 4.4 microns are collected on the second stage. Particles less than 4.4 but larger than 2.8 microns are collected on the third stage. Particles less than 2.8 but larger than 1.7 microns are collected on the fourth stage. Particles less than 1.7 but larger than 1.1 microns are collected on the fifth stage. Particles less than 1.1 but larger than 0.70 microns are collected on the sixth stage. Particles less than 0.70 but larger than 0.40 microns are collected on the seventh stage. Particles less than 0.40 microns are collected by filtration on a glass fiber filter which is located just downstream of the seventh stage. It should be noted that size ranges quoted in this report are valid only at room temperature and a flow rate of 0.5 ACFM. Samples collected at higher temperatures will result in cut points slightly larger than those quoted above. In all cases, temperature- and flow-corrected sizes are reported.

After collection is complete, the sampler is disconnected, cooled and all the particulate material in the nozzle and in the preimpactor washed into a polyethylene sample bottle. The solvent is evaporated and the total dry mass of particulates in the washing determined.

Particulates are impacted either on pre-weighed glass fiber impaction substrates or on the collection/support foil for each stage. If glass fiber substrates are used, they, as well as the final filter, are dried in a desiccator to constant weight and the mass of collected material on each determined. If the collection/support foil is used, then the foil for each stage is individually processed the same as the nozzle and preimpactor.

Flow

Flow determinations were carried out in accordance with EPA Method 2, CFR Title 40, Part 60, Appendix A (Revised July 1, 1987). A type S pitot was used to sense velocity pressure and an inclined manometer was used to measure velocity pressures. Gas temperatures were measured using a calibrated Type K thermocouple and digital temperature meter. Gas density (i.e. molecular weight) was calculated from the composition of the gas which was determined by Orsat.

Gas Flow Density

Gas compositions were determined as per Method 3 by Orsat analysis of an integrated gas sample collected from the stack during the oxides of nitrogen determinations. Standard commercially prepared solutions were used in the Orsat analyzer (sat. KOH for carbon dioxide and reduced methylene blue for oxygen).

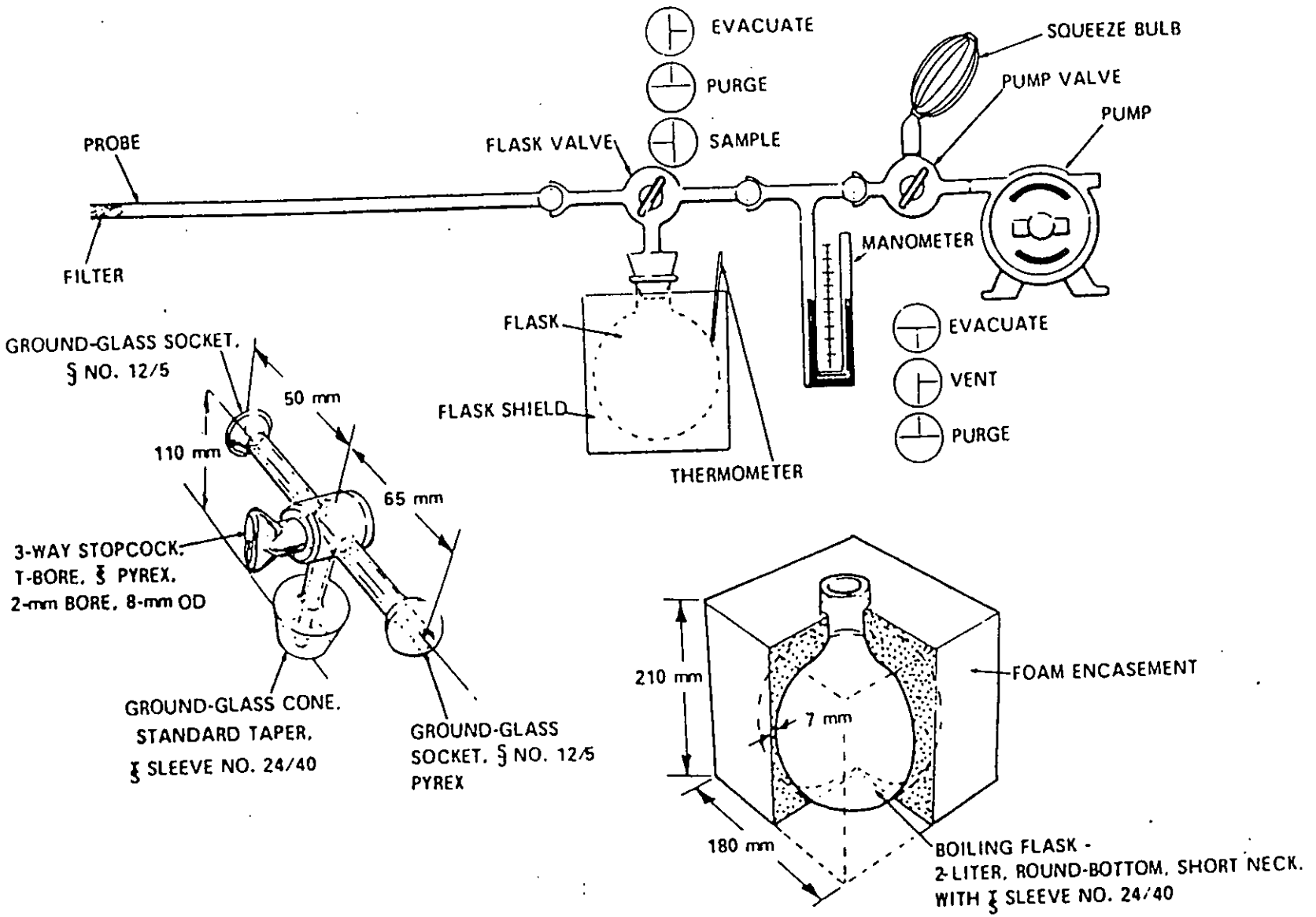
Oxides of Nitrogen

Oxides of nitrogen concentrations were collected in accordance with EPA Method 7 (see above-cited reference) with a specially designed all glass manifold and valving assembly and a heated stainless steel-lined probe. Samples were collected in two-liter evacuated insulated flasks which contained 25 cc of acidified peroxide solution (Method 7 reagent). Nine sets or more of three samples each were collected over a period of 4.5 to 5 hours.

The sampling train was leak checked through the probe at the beginning and end of the test and, in addition, the system leak checked at the time of evacuation of each flask. Before the samples were collected, the probe was purged to eliminate dead volume effects and to raise the temperature of the probe outlet and manifold assembly to minimize condensation of moisture. A plug of microfiber glass wool inserted in the probe inlet was used to prevent particulate material from entering into the flask. The temperature of the flask, vacuum in the

flask and barometric pressure at the time of sampling was recorded for each flask. After sampling was complete, as evidenced by the in-line vacuum gauge, the flask valve was closed, the flask assembly disconnected from the manifold/valve assembly and the flask shook for several minutes to promote oxidation and absorption. The recovered oxides of nitrogen samples were returned to the laboratory and analyzed immediately by ion chromatography as per EPA 7A.

The internal volume of each numbered flask assembly has been measured prior to initial use by filling with water, weighing before and after and then converting the weight of water to volume by means of the density of water at room temperature. Flask volumes are stored in the computer and recalled automatically in the computer calculation.



Sampling train, flask valve, and flask.

4.2 Performance Evaluation Tests. The owner of a lidar system shall subject such a lidar system to the performance verification tests described in Section 3, prior to first use of this method. The annual calibration shall be performed for three separate, complete runs and the results of each should be recorded. The requirements of Section 3.3.1 must be fulfilled for each of the three runs.

Once the conditions of the annual calibration are fulfilled the lidar shall be subjected to the routine verification for three separate complete runs. The requirements of Section 3.3.2 must be fulfilled for each of the three runs and the results should be recorded. The Administrator may request that the results of the performance evaluation be submitted for review.

5. *References*

5.1 The Use of Lidar for Emissions Source Opacity Determination, U.S. Environmental Protection Agency, National Enforcement Investigations Center, Denver, CO. EPA-330/1-79-003-R, Arthur W. Dybdahl, current edition [NTIS No. PB81-246662].

5.2 Field Evaluation of Mobile Lidar for the Measurement of Smoke Plume Opacity, U.S. Environmental Protection Agency, National Enforcement Investigations Center, Denver, CO. EPA/NEIC-TS-128, February 1976.

5.3 Remote Measurement of Smoke Plume Transmittance Using Lidar, C. S. Cook, G. W. Bethke, W. D. Conner (EPA/RTP). Applied Optics 11, pg 1742. August 1972.

5.4 Lidar Studies of Stack Plumes in Rural and Urban Environments, EPA-650/4-73-002, October 1973.

5.5 American National Standard for the Safe Use of Lasers ANSI Z 136.1-176, March 8, 1976.

5.6 U.S. Army Technical Manual TB MED 279, Control of Hazards to Health from Laser Radiation, February 1969.

5.7 Laser Institute of America Laser Safety Manual, 4th Edition.

5.8 U.S. Department of Health, Education and Welfare, Regulations for the Administration and Enforcement of the Radiation Control for Health and Safety Act of 1968, January 1976.

5.9 Laser Safety Handbook, Alex Mallow, Leon Chabot, Van Nostrand Reinhold Co., 1978.

Method 10—Determination of Carbon Monoxide Emissions From Stationary Sources

1. *Principle and Applicability*

1.1 Principle. An integrated or continuous gas sample is extracted from a sampling point and analyzed for carbon monoxide (CO) content using a Luft-type nondispersive infrared analyzer (NDIR) or equivalent.

1.2 Applicability. This method is applicable for the determination of carbon monoxide emissions from stationary sources only when specified by the test procedures for determining compliance with new source performance standards. The test procedure will indicate whether a continuous or an integrated sample is to be used.

2. *Range and Sensitivity*

2.1 Range. 0 to 1,000 ppm.

2.2 Sensitivity. Minimum detectable concentration is 20 ppm for a 0 to 1,000 ppm span.

3. *Interferences*

Any substance having a strong absorption of infrared energy will interfere to some extent. For example, discrimination ratios for water (H_2O) and carbon dioxide (CO_2) are 3.5 percent H_2O per 7 ppm CO and 10 percent CO_2 per 10 ppm CO, respectively, for devices measuring in the 1,500 to 3,000 ppm range. For devices measuring in the 0 to 100 ppm range, interference ratios can be as high as 3.5 percent H_2O per 25 ppm CO and 10 percent CO_2 per 50 ppm CO. The use of silica gel and ascarite traps will alleviate the major interference problems. The measured gas volume must be corrected if these traps are used.

4. *Precision and Accuracy*

4.1 Precision. The precision of most NDIR analyzers is approximately ±2 percent of span.

4.2 Accuracy. The accuracy of most NDIR analyzers is approximately ±5 percent of span after calibration.

5. *Apparatus*

5.1 Continuous Sample (Figure 10-1).

5.1.1 Probe. Stainless steel or sheathed Pyrex[1] glass, equipped with a filter to remove particulate matter.

5.1.2 Air-Cooled Condenser or Equivalent. To remove any excess moisture.

5.2 Integrated Sample (Figure 10-2).

5.2.1 Probe. Stainless steel or sheathed Pyrex glass, equipped with a filter to remove particulate matter.

5.2.2 Air-Cooled Condenser or Equivalent. To remove any excess moisture.

5.2.3 Valve. Needle valve, or equivalent, to to adjust flow rate.

5.2.4 Pump. Leak-free diaphragm type, or equivalent, to transport gas.

5.2.5 Rate Meter. Rotameter, or equivalent, to measure a flow range from 0 to 1.0 liter per min (0.035 cfm).

[1] Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

5.2.6 Flexible Bag. Tedlar, or equivalent, with a capacity of 60 to 90 liters (2 to 3 ft^3). Leak-test the bag in the laboratory before using by evacuating bag with a pump followed by a dry gas meter. When evacuation is complete, there should be no flow through the meter.

5.2.7 Pitot Tube. Type S, or equivalent, attached to the probe so that the sampling rate can be regulated proportional to the stack gas velocity when velocity is varying with the time or a sample traverse is conducted.

5.3 Analysis (Figure 10-3).

5.3.1 Carbon Monoxide Analyzer. Nondispersive infrared spectrometer, or equivalent. This instrument should be demonstrated, preferably by the manufacturer, to meet or exceed manufacturer's specifications and those described in this method.

5.3.2 Drying Tube. To contain approximately 200 g of silica gel.

5.3.3 Calibration Gas. Refer to section 6.1.

5.3.4 Filter. As recommended by NDIR manufacturer.

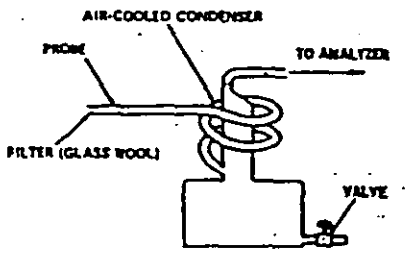


Figure 10-1. Continuous sampling train.

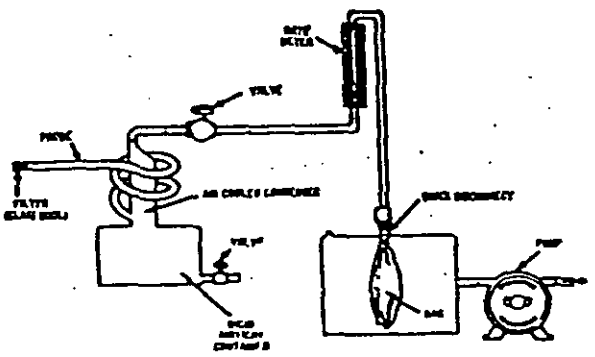


Figure 10-2. Integrated gas sampling train.

5.3.5 CO_2 Removal Tube. To contain approximately 500 g of ascarite.

5.3.6 Ice Water Bath. For ascarite and silica gel tubes.

5.3.7 Valve. Needle valve, or equivalent, to adjust flow rate

5.3.8 Rate Meter. Rotameter or equivalent to measure gas flow rate of 0 to 1.0 liter per min (0.035 cfm) through NDIR.

5.3.9 Recorder (*optional*). To provide permanent record of NDIR readings.

6. *Reagents*

6.1 Calibration Gases. Known concentration of CO in nitrogen (N_2) for instrument span, prepurified grade of N_2 for zero, and two additional concentrations corresponding approximately to 60 percent and 30 percent span. The span concentration shall not exceed 1.5 times the applicable source performance standard. The calibration gases shall be certified by the manufacturer to be within ±2 percent of the specified concentration.

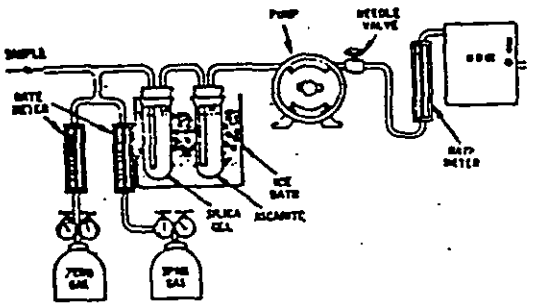


Figure 10-3. Analytical equipment.

6.2 Silica Gel. Indicating type, 6 to 16 mesh, dried at 175° C (347° F) for 2 hours.

6.3 Ascarite. Commercially available.

7. *Procedure*

7.1 Sampling.

7.1.1 Continuous Sampling. Set up the equipment as shown in Figure 10-1 making sure all connections are leak free. Place the probe in the stack at a sampling point and purge the sampling line. Connect the analyzer and begin drawing sample into the analyzer. Allow 5 minutes for the system to stabilize, then record the analyzer reading as required by the test procedure. (See section 7.2 and 8). CO_2 content of the gas may be determined by using the Method 3 integrated sample procedure, or by weighing the ascarite CO_2 removal tube and computing CO_2 concentration from the gas volume sampled and the weight gain of the tube.

7.1.2 Integrated Sampling. Evacuate the flexible bag. Set up the equipment as shown in Figure 10-2 with the bag disconnected. Place the probe in the stack and purge the sampling line. Connect the bag, making sure that all connections are leak free. Sample at a rate proportional to the stack velocity. CO_2 content of the gas may be determined by using the Method 3 integrated sample procedures, or by weighing the ascarite CO_2 removal tube and computing CO_2 concentra-

tion from the gas volume sampled and the weight gain of the tube.

7.2 CO Analysis. Assemble the apparatus as shown in Figure 10-3, calibrate the instrument, and perform other required operations as described in section 8. Purge analyzer with N_2 prior to introduction of each sample. Direct the sample stream through the instrument for the test period, recording the readings. Check the zero and span again after the test to assure that any drift or malfunction is detected. Record the sample data on Table 10-1.

8. *Calibration*

Assemble the apparatus according to Figure 10-3. Generally an instrument requires a warm-up period before stability is obtained. Follow the manufacturer's instructions for specific procedure. Allow a minimum time of 1 hour for warm-up. During this time check the sample conditioning apparatus, i.e., filter, condenser, drying tube, and CO_2 removal tube, to ensure that each component is in good operating condition. Zero and calibrate the instrument according to the manufacturer's procedures using, respectively, nitrogen and the calibration gases.

TABLE 10-1—FIELD DATA

	Comments
Location	
Test	
Date	
Operator	

Clock time	Rotameter setting, liters per minute (cubic feet per minute)

9. *Calculation*

Calculate the concentration of carbon monoxide in the stack using Equation 10-1.

$$C_{CO\ stack} = C_{CO\ NDIR}(1 - F_{CO_2})$$

Eq. 10-1

Where:

$C_{CO\ stack}$ = Concentration of CO in stack, ppm by volume (dry basis).

$C_{CO\ NDIR}$ = Concentration of CO measured by NDIR analyzer, ppm by volume (dry basis).

F_{CO_2} = Volume fraction of CO_2 in sample, i.e., percent CO_2 from Orsat analysis divided by 100.

10. Alternative Procedures

10.1 Interference Trap. The sample conditioning system described in Method 10A sections 2.1.2 and 4.2, may be used as an alternative to the silica gel and ascarite traps.

11. *Bibliography*

1. McElroy, Frank, The Intertech NDIR-CO Analyzer, Presented at 11th Methods Conference on Air Pollution, University of California, Berkeley, CA. April 1, 1970.
2. Jacobs, M. B., et al., Continuous Determination of Carbon Monoxide and Hydrocarbons in Air by a Modified Infrared Analyzer, J. Air Pollution Control Association, 9(2): 110-114. August 1959.
3. MSA LIRA Infrared Gas and Liquid Analyzer Instruction Book, Mine Safety Appliances Co., Technical Products Division, Pittsburgh, PA.
4. Models 215A, 315A, and 415A Infrared Analyzers, Beckman Instruments, Inc., Beckman Instructions 1635-B, Fullerton, CA. October 1967.
5. Continuous CO Monitoring System, Model A5611, Intertech Corp., Princeton, NJ.
6. UNOR Infrared Gas Analyzers, Bendix Corp., Ronceverte, WV

ADDENDA

A. PERFORMANCE SPECIFICATIONS FOR NDIR CARBON MONOXIDE ANALYZERS

Range (minimum)	0-1000 ppm.
Output (minimum)	0-10mV.
Minimum detectable sensitivity.	20 ppm.
Rise time, 90 percent (maximum).	30 seconds.
Fall time, 90 percent (maximum).	30 seconds.
Zero drift (maximum)	10% in 8 hours.
Span drift (maximum)	10% in 8 hours.
Precision (minimum)	±2% of full scale.
Noise (maximum)	±1% of full scale.
Linearity (maximum deviation)	2% of full scale.
Interference rejection ratio	CO_2—1000 to 1, H_2O—500 to 1.

B. *Definitions of Performance Specifications.*

Range—The minimum and maximum measurement limits.

Output—Electrical signal which is proportional to the measurement; intended for connection to readout or data processing devices. Usually expressed as millivolts or milliamps full scale at a given impedance.

Full scale—The maximum measuring limit for a given range.

Minimum detectable sensitivity—The smallest amount of input concentration that can be detected as the concentration approaches zero.

Accuracy—The degree of agreement between a measured value and the true value; usually expressed as ± percent of full scale.

Time to 90 percent response—The time interval from a step change in the input concentration at the instrument inlet to a reading of 90 percent of the ultimate recorded concentration.

Rise Time (90 percent)—The interval between initial response time and time to 90 percent response after a step increase in the inlet concentration.

Fall Time (90 percent)—The interval between initial response time and time to 90 percent response after a step decrease in the inlet concentration.

Zero Drift—The change in instrument output over a stated time period, usually 24 hours, of unadjusted continuous operation when the input concentration is zero; usually expressed as percent full scale.

Span Drift—The change in instrument output over a stated time period, usually 24 hours, of unadjusted continuous operation when the input concentration is a stated upscale value; usually expressed as percent full scale.

Precision—The degree of agreement between repeated measurements of the same concentration, expressed as the average deviation of the single results from the mean.

Noise—Spontaneous deviations from a mean output not caused by input concentration changes.

Linearity—The maximum deviation between an actual instrument reading and the reading predicted by a straight line drawn between upper and lower calibration points.

Method 10A—Determination of Carbon Monoxide Emissions in Certifying Continuous Emission Monitoring Systems at Petroleum Refineries

1. Applicability and Principle

1.1 Applicability. This method applies to the measurement of carbon monoxide (CO) at petroleum refineries. This method serves as the reference method in the relative accuracy test for nondispersive infrared (NDIR) CO continuous emission monitoring systems (CEMS's) that are required to be installed in petroleum refineries on fluid catalytic cracking unit catalyst regenerators [40 CFR Part 60.105(a)(2)].

1.2 Principle. An integrated gas sample is extracted from the stack, passed through an alkaline permanganate solution to remove sulfur and nitrogen oxides, and collected in a Tedlar bag. The CO concentration in the sample is measured spectrophotometrically using the reaction of CO with p-sulfaminobenzoic acid.

1.3 Range and Sensitivity.

1.3.1 Range. Approximately 3 to 1800 ppm CO. Samples having concentrations below 400 ppm are analyzed at 425 nm, and samples having concentrations above 400 ppm are analyzed at 600 nm.

1.3.2 Sensitivity. The detection limit is 3 ppm based on three times the standard deviation of the mean reagent blank values.

1.4 Interferences. Sulfur oxides, nitric oxide, and other acid gases interfere with the colorimetric reaction. They are removed by passing the sampled gas through an alkaline potassium permanganate scrubbing solution. Carbon dioxide (CO_2) does not interfere, but, because it is removed by the scrubbing solution, its concentration must be measured independently and an appropriate volume correction made to the sampled gas.

1.5 Precision, Accuracy, and Stability.

1.5.1 Precision. The estimated intralaboratory standard deviation of the method is 3 percent of the mean for gas samples analyzed in duplicate in the concentration range of 39 to 412 ppm. The interlaboratory precision has not been established.

1.5.2 Accuracy. The method contains no significant biases when compared to an NDIR analyzer calibrated with National Bureau of Standards (NBS) standards.

1.5.3 Stability. The individual components of the colorimetric reagent are stable for at least 1 month. The colorimetric reagent must be used within 2 days after preparation to avoid excessive blank correction. The samples in the Tedlar [1] bag should be stable for at least 1 week if the bags are leak-free.

2. Apparatus

2.1 Sampling. The sampling train is shown in Figure 10A-1, and component parts are discussed below:

[1] Mention of trade names or commercial products in this publication does not constitute the endorsement or recommendation for use by the Environmental Protection Agency.

APPENDIX G

CALCULATION EQUATIONS

CALCULATION EQUATIONS

METHOD 2

$$\overline{V_s} = 85.48\ C_p\ (\sqrt{\Delta p})_{avg}\ \sqrt{\frac{T_{s(avg)}}{P_s\ M_s}}$$

$$Q_{s,\,d} = 60(1\ -B_{ws})\ \overline{V_s}\ A\ (\frac{528}{T_{s\ (avg)}})\ (\frac{P_s}{29.92})$$

$$Q_a = 60\ \overline{V_s}\ A$$

$$\dot{m}_g = \frac{4.995\ Q_{s,\,d}\ G_d}{1\ -\ B_{ws}}$$

$$RH* = 100\ (vp_{twb}\ -\ 0.0003641\ P_s\ (T_{db}\ -\ T_{wb})/vp_{tdb})$$

$$B^*_{ws} = RH(vp_{tdb})/P_s$$

$$\rho = \frac{4.585\ x\ 10^{-2}\ P_s M_s}{T_s\ (avg)}$$

*Alternate equations for calculating moisture content from wet bulb and dry bulb data.

12-2893-G:\STACK\WP\METHODS\EQ.M5

P_s	=	Absolute pressure of stack gas, IN. HG.
P_{std}	=	Standard absolute pressure, 29.92 IN. HG.
A_a	=	Actual volumetric stack gas flow rate, ACFM
$Q_{s,\,d}$	=	Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM
RH	=	Relative humidity, %
T_{db}	=	Dry bulb temperature of stack gas, °F
T_{wb}	=	Wet bulb temperature of stack gas, °F
$T_{m(avg)}$	=	Absolute average dry gas meter temperature, °R
$T_{s(avg)}$	=	Absolute average stack temperature, °F
T_{std}	=	Standard absolute temperature, 528 °F (68 °F)
θ	=	Total sampling time, min.
V_{lc}	=	Total volume of liquid collected in impingers and silica gel, ml
V_m	=	Volume of gas sample as measured by dry gas meter, CF
$V_{m(std)}$	=	Volume of gas sample measured by the dry gas meter corrected to standard conditions, DSCF
$V_{w(std)}$	=	Volume of water vapor in the gas sample corrected to standard conditions, SCF
$\bar{V}_s$	=	Average actual stack gas velocity, FT/SEC
vp_{tdb}	=	Vapor pressure at Tdb, IN. HG.
vp_{twb}	=	Vapor pressure at Twb, IN. HG.
$\overline{\Delta H}$	=	Average pressure differential across the orifice meter, IN. WC.
ΔP	=	Velocity pressure of stack gas, IN. WC.
γ	=	Dry test meter correction coefficient, dimensionless
ρ	=	Actual gas density, LB/ACF

CALCULATION EQUATIONS

METHOD 3

$$\%EA = \frac{100(\%O_2 - 0.5\%\ CO)}{0.264\%\ N_2 - \%O_2 + 0.5\%\ CO}$$

$$M_d = 0.44(\%CO_2) + 0.32\ (\%O_2) + 0.28\ (\%N_2 + \%CO)$$

$$M_s = M_d\ (I - B_{ws}) + 0.18\ B_{ws}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

CALCULATION EQUATIONS

METHOD 5

$$V_{m(std)} = 17.65\ V_m\ \gamma\ \left(\frac{P_{bar} + \overline{\Delta H}/13.6}{T_{m(avg)}}\right)$$

$$V_{w(std)} = 0.0472\ V_{lc}$$

$$B_{ws} = \frac{V_{w(std)}}{V_{w(std)} + V_{m(std)}}$$

$$I = 0.0944\ \left(\frac{T_{s(avg)}\ V_{m(std)}}{P_s\ V_s\ A_n\ \theta\ (1 - B_{ws})}\right)$$

$$C_s = \frac{15.43\ M_p}{V_{m(std)}}$$

$$C_a = \frac{272.3\ M_p\ P_s}{T_{s(avg)}\ (V_{w(std)} + V_{m(std)})}$$

$$(\dot{m}_p)_1 = 8.5714\ x\ 10^{-3}\ C_s\ Q_{s,d}$$

$$(\dot{m}_p)_2 = \frac{1.3228\ x\ 10^{-1}\ M_p\ A}{\theta\ A_n}$$

$$\dot{m}_p = \frac{(\dot{m}_p)_1 + (\dot{m}_p)_2}{2}$$

122893-G:\STACK\WP\METHODS\EQ.M5

SYMBOLS

A	=	Cross Sectional area of stack, SQ. FT.
A_n	=	Cross sectional area of nozzle, SQ. FT.
B_{ws}	=	Water vapor in gas stream, proportion by volume
C_p	=	Pitot tube coefficient, dimensionless
C_a	=	Concentration of particulate matter in stack gas, wet basis, GR/ACF
C_s	=	Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, GR/DSCF
EA	=	Excess air, percent by volume
γ	=	Dry test meter correction factor, dimensionless
G_d	=	Specific gravity (relative to air), dimensionless
I	=	Isokinetic variation, percent by volume
M_d	=	Molecular weight of stack gas, dry basis, g/g - mole.
$\dot{m}_g$	=	Mass flow of wet flue gas, LB/HR
$\dot{m}_p$	=	Particulate mass flow, LB/HR
M_s	=	Molecular weight of stack gas, wet basis, g/g, mole.
M_p	=	Total amount of particulate matter collected, g
P_{bar}	=	Atmospheric pressure, IN. HG. (uncompensated)
P_g	=	Stack static gas pressure, IN. WC.
P_s	=	Absolute pressure of stack gas, IN. HG.
P_{std}	=	Standard absolute pressure, 29.92 IN. HG.
A_a	=	Actual volumetric stack gas flow rate, ACFM
$Q_{s,d}$	=	Dry volumetric stack gas flow rate corrected to standard conditions, DSCFM
RH	=	Relative humidity, %
T_{db}	=	Dry bulb temperature of stack gas, °F

122893-G:\STACK\WP\METHODS\EQ.M5

T_{wb}	=	Wet bulb temperature of stack gas, °F
$T_{m(avg)}$	=	Absolute average dry gas meter temperature, °R
$T_{s(avg)}$	=	Absolute average stack temperature, °R
T_{std}	=	Standard absolute temperature, 528 °F (68 °F)
θ	=	Total sampling time, min.
V_{lc}	=	Total volume of liquid collected in impingers and silica gel, ml
V_m	=	Volume of gas sample as measured by dry gas meter, CF
$V_{m(std)}$	=	Volume of gas sample measured by the dry gas meter corrected to standard conditions, *DSCF*
$V_{w(std)}$	=	Volume of water vapor in the gas sample corrected to standard conditions, SCF
$\bar{V}_s$	=	Average actual stack gas velocity, FT/SEC
vp_{tdb}	=	Vapor pressure at T_{db}, IN. HG.

122893-G:\STACK\WP\METHODS\EQ.M5

CALCULATION EQUATIONS

METHOD 7

$$V_{m(std)} = 17.64\ (V_f - 25)\ [\frac{p_f}{T_f} - \frac{P_i}{T_i}]$$

$$C_s = 6.243\ x\ 10^{-5}\ \frac{M}{V_{m(std)}}$$

$$E = \frac{2090\ C_s F}{20.9 - \overline{B}_{o_2}}$$

$$C_s\ (GR/DSCF) = 7000\ C_s$$

$$C_s\ (MG/DSCM) = 1.60186\ x\ 10^7\ C_s$$

$$C_s\ (ppm\text{-}dry) = 8.37552\ x\ 10^6\ C_s$$

$$C_s\ (ppm\text{-}3\%\ O_2) = 8.37552\ x\ 10^6\ C_s\ \{1 + [\frac{\overline{B}'_{o_2} - 3}{20.9 - B'_{o_2}}]\}$$

$$C_s\ (ppm\text{-}wet) = 8.37552\ x\ 10^6\ C_s\ (1 - \frac{MC}{100})$$

G:\STACK\WP\METHODS\EQ.M7

SYMBOLS

$\bar{B}\ O_2$	=	Average oxygen content in flue gas, % v/v
C_s	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, LB/DSCF
C_s (GR/DSCF)	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, GR/DSCF
C_s (MG/DSCM)	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to standard conditions, MG/DSCM
E	=	Emission factor, LB/10^6BTU
F	=	F-Factor for given fuel type, DSCF/10^4BTU
M	=	Mass of nitrogen oxides as nitrogen dioxide in gas sample, ug
MC	=	Moisture content of flue gas, %
P_f	=	Final absolute pressure in flask, IN. HG
P_i	=	Initial absolute pressure in flask, IN. HG
C_s (ppm-dry)	=	Concentration of nitrogen oxides in flue gas, dry basis, (v/v), ppm
C_s (ppm-3% O_2)	=	Concentration of nitrogen oxides in flue gas, dry basis, corrected to 3% O_2, (v/v) ppm
C_s (ppm-wet)	=	Concentration of nitrogen oxides in flue gas, wet basis, (v/v), ppm
T_f	=	Final absolute temperature in flask, °R
T_i	=	Initial absolute temperature in flask, °R
V_f	=	Volume of flask and valve, cc
$V_{m(std)}$	=	Sample volume at standard conditions, dry basis, cc

G:\STACK\WP\METHODS\EQ.M7

CALCULATION EQUATIONS

METHOD 10

$$CO\cdot PPM\cdot DRY = CO_{CO_2} \text{ - } free,\ dry,\ avg\ (1 - CO_2,\ d/100)$$

$$CO\cdot PPM\cdot WET = CO\cdot PPM\cdot DRY\ (1 - MC/100)$$

$$GR/DSCF = 5.0885\ X\ 10^{-4}\ (CO\cdot PPM\cdot DRY)$$

$$mg/dscm = 1.165\ (CO\cdot PPM\cdot DRY)$$

$$\dot{m} = 8.5714\ x\ 10^{-3}\ (GR/DSCF)\ (Q_{s,d})$$

$$E = \frac{2.9857\ x\ 10^{-3}\ F_d\ (GR/DSCF)}{20.9 - O_{2,\,d}}$$

where:

CO_{CO_2} - *free, dry, avg*

= average of two determinations of carbon monoxide on a dry, CO_2 - free integrated flue gas sample reported in ppm by volume

$CO_{2,\,d}$ = carbon dioxide concentration of flue gas on a dry percent by volume basis

$O_{2,\,d}$ = oxygen concentration of flue gas on a dry percent by volume basis

G:\STACK\WP\METHODS\EQ.M10

MC	=	moisture content of flue gas on a percent by volume basis
CO·PPM·DRY	=	carbon monoxide concentration in ppm by volume on a dry basis
CO·PPM·WET	=	carbon monoxide concentration in ppm by volume on a wet or actual basis
GR/DSCF	=	concentration of carbon monoxide in flue gas on a grains per dry standard cubic foot basis (68 °F, 29.92 IN. HG.)
mg/dscm	=	concentration of carbon monoxide in flue gas on a milligrams per dry standard cubic meter basis (60 °F, 29.92 IN. HG.)
$\dot{m}$	=	emissions or mass rate of carbon monoxide on a LB/HR basis
$Q_{s,d}$	=	volumetric flow rate of flue gas in dry standard cubic feet per minute
E	=	emission factor of carbon monoxide in pounds of carbon monoxide emitted per million BTU heat input (LB/MMBTU)
F_d	=	F-Factor of respective fuel in dry standard cubic feet of exhaust gas at 0% oxygen per million BTU of heat input (DSCF/MMBTU)

APPENDIX H

TEST PLAN & PROTOCOL

COMPLIANCE TEST PLAN FOR MISCELANEOUS INDUSTRIAL SOURCES

AMERICAN CRYSTAL SUGAR COMPANY
EAST GRAND FORKS FACILITY

Permit No. 29B-92-OT-1

Permitee contact person: Bruce Keifenheim (218) 773-5114

MPCA Permit Engineer: Gregory Siems

Independent Testing Company: Interpoll Laboratories, Inc.

Sketches of each stack source point to be tested showing test port location, stack diameter, and other pertanent information are included with this plan.

1 WEEK #2 TESTS - NOV. 9,10,11, 1993

1.1 Tests are mandated by Table E, pg. 43 thru 44 of the referenced permit.

1.2 Tests will be performed on the below-listed sources:

- No. 1 Boiler	EP#1
- No. 2 Boiler	EP#2
- A Pulp Dryer	EP#3
- B Pulp Dryer	EP#4
- C Pulp Dryer	EP#5
- Pellet Cooler	EP#6
- Pellet Cooler	EP#7

2 No. 1 and No. 2 Boilers

2.1 Tests for PM, NO_x, and CO, and CEM certification for SO_2, CO, CO_2, and opacity meters.

Stack Tests

2.1 Three-one hour stack tests will be performed on each source.

2.2 Specified stack test determinations will consist of the following:

a. Volumetric flow rate and gas temperature determination - EPA Method 2.

b. Gas composition (three (3) one-hour integrated flue gas samplings with analysis for CO_2 and O_2 by Orsat on non-ambient sources only) - EPA Method 3.

c. Gas moisture content (three (3) one -hour determinations - EPA Method 4.

d. Particulate concentration and emission rate (three (3) one-hour determinations) - EPA Method 5. Condensible compounds will be collected during each determination and analyzed as per MN Rules Part 7005.0500.

e. Oxides of nitrogen concentration and emission rate (three (3) determinations; each determination: four 2-liter frab samples) - EPA Method 7A.

f. Carbon monoxide concentration and emission rate (three (3) one-hour determinations) - EPA Method 10.

CEM Tests

2.3 Each CEM Relative accuracy testing Audit (RATA) will consist of nine (9) determinations. Determinations will include moisture content if required.

2.4 Tests will be conducted in the manner specified in Exhibit B of the above referenced facility permit.

2.5 The following series of determinations will be performed at forty five (45) minute intervals on the No. 1 and No. 2 Boiler CEM Systems on each of two consecutive work days:

a. Gas composition (nine (9) 21-minute carbon dioxide determinations) -EPA Method 3A.
b. Gas moisture content (nine (9) 21-minute determinations if required) - EPA Method 4.
c. Sulfur dioxide concentration (nine (9) 21-minute determinations) - EPA Mehtod 6C.
d. Carbon monoxide concentrataion (nine (9) 21-minute monitoring) -EPA Method 10. The carbon monoxide concentration will be measured with a CO NDIR analyzer using the Meghod 10 Alternative Procedure Interference Trap (Section 10.1 - See also Method 10A Section 2.1.2 and 4.2). A slip stream of exhaust gas is passed through three Greenburg-Smith impingers, the first two of which contains 400 ml of alkaline permanganate and the third of which contains 250 ml. The sample is scrubbed at 300 ml/min. The carbon monoxide concentration in the scrubbed (CO_2-SO_2-and NOx-free) gas stream is read

with a carbon monoxide NDIR analyzer which is calibrated with 0, 30 and 60% f.s. CO in nitrogen standard gases with manufacturer specified accuracies of at least pluss or minus 2% of the stated values. The average CO_2 concentration from the Method 3A determination is then used to correct the measured CO_2-free CO concentrations back to actual CO_2 contents.

2.6 Transimissometer Audit will include:

a. Monitoring system check
b. Calibration error test
c. Response time test
d. Calculation of 24-hour zero drift and 24-hour span drift from records submitted by ACS.

2.7 CEM data recorded by the plant during each RATA shall be labeled with the Plant name, the CEM it was taken from, the serial number of the CEM, the date, as well as pollutant concentration and time units. The CEM recorded data must be submitted to the Interpoll Labs Field Engineer immediately after each RATA.

2.8 The autocalibrate mode will be deactivated during the RATA.

Boiler Tests-General

2.9 Unless otherwise noted, the determinations will be conducted according to the provisions of EPA Methods cited in CFR Title 40, Part 60, Appendix A (revised July 1, 1992) using equipment meeting the specifications therein.

2.10 The preliminary testing schedule is included with this report.

OPERATIONAL CONDITIONS OF BOILERS

2.11 Boilers will be under a normal load during testing.

2.12 Table I in Exhibit B page 8 and the table in Exhibit C (both in the facility permit) shall be included with the test report for CEM and stack tests.

2.13 Soot blowing (normal cycle) and ash pulling shall take place during one of the three one hour stack tests.

2.14 The test information submitted by ACS for inclusion in the test report shall include a description of any maintenance work done before the test and indicate how

frequent the maintenance is performed.

2.15 Data will be taken at half hour intervals during stack tests. Data shall include boiler temperatures, steam output rate, steam pressures, and CEM readings.

2.16 Data will be taken at half hour intervals on the Electrostatic Precipitator primary and secondary volts/amps, number of fields on line, and inlet flue gas temperature. Spark rate and rapping cycle will be recorded.

2.17 All continuous monitor strip charts for the boiler shall be submitted with the report. The charts will be dated, signed, and chart data will be explained.

2.18 Fuel samplig and analysis shall be performed according to ASTM Reference Methods. One sample will be taken for each test run consisting of coal taken from the stoker before and one half hour into each run. An independent testing laboratory will analyze samples for BTU/lb, sulfur, ash content, moisture content, and specific gravity.

3. PULP DRYERS

3.1 Three-two hour stack tests will be performed on each source.

3.2 Specified stack test determinations will consist of the following:

a. Volumetric flow rate and gas temperature determination - EPA Method 2.

b. Gas composition (three (3) two-hour integrated flue gas samplings with analysis for CO_2 and O_2 by Orsat - EPA Method 3.

c. Gas moisture content (three (3) two -hour determinations - EPA Method 4.

d. Particulate concentration and emission rate (three (3) two-hour determinations) - EPA Method 5. Condensible compounds will be collected during each determination and analyzed as per MN Rules Part 7005.0500.

e. Sulfur dioxide concentration and emission rate (three (3) two-hour determinations) - EPA Method 6 using the back half of the Method 5 sampling train.

f. Oxides of nitrogen concentration and emission rate (three (3) determinations; each determination: four

2-liter frab samples) - EPA Method 7A.

g. Visible emission - weather permitting (240 observations during a sixty minute period by an EPA-certified reader) -EPA Method 9.

h. Carbon monoxide concentration and emission rate (three (3) two-hour determinations) - EPA Method 10.

i. Total hydrocarbons (THC) concentration and emission rate (three (3) two-hour determinations) - EPA Method 25A using a Ratfisch Model RS55 HFID calibrated against propane in air standards.

3.3 Unless otherwise noted, the determinations will be conducted according to the provisions of EPA Methods cited in CFR Title 40, Part 60, Appendix A (revised July 1, 1992) using equipment meeting the specifications therein.

3.4 The preliminary testing schedule is included with this report.

OPERATIONAL CONDITIONS OF PULP DRYERS

3.5 Pulp dryers will be under a normal load during testing.

3.6 The table in Exhibit C in the facility permit shall be included with the test report for stack tests.

3.7 Soot blowing and ash pulling shall take place during one of the three two hour stack tests.

3.8 The test information submitted by ACS for inclusion in the test report shall include a description of any maintenance work done before the test and indicate how frequent the maintenance is performed.

3.9 Data will be taken at half hour intervals during stack tests. Data shall include pressed pulp input to dryer, FD, recycle, and ID damper positions, grate speedd, pressed pulp moisture, dryed pulp moisture, multiclone differential and inlet pressures, furnace and drum exit pressures, hopper filter differential pressure, and temperatures of the drum throat, exit, and recycle gas.

3.10 All continuous monitor strip charts for the boiler shall be submitted with the report. The charts will be dated, signed, and chart data will be explained.

3.11 Fuel samplig and analysis shall be performed according to

ASTM Reference Methods. One sample will be taken for each test run consisting of coal taken from the grate before and one half hour into each run. An independent testing laboratory will analyze samples for BTU/lb, sulfur, ash content, moisture content, and specific gravity.

4. PELLET COOLERS

4.1 Tests are mandated by Table E, pg. 44 of the referenced permit.

4.2 Tests will be performed on the below-listed sources:

- Pellet Cooler EP#6
- Pellet Cooler EP#7

4.3 Tests for particulate matter (PM) are required.

4.4 Three-one hour tests will be performed on each source.

4.5 PM determinations will consist of the following:

a. Volumetric flow rate and gas temperature determination - EPA Method 2.

b. Gas composition (three (3) one-hour integrated flue gas samplings with analysis for CO_2 and O_2 by Orsat - EPA Method 3.

c. Gas moisture content (three (3) one -hour determinations - EPA Method 4.

d. Particulate concentration and emission rate (three (3) one-hour determinations) - EPA Method 5. Condensible compounds will be collected during each determination and analyzed as per MN Rules Part 7005.0500.

4.6 Unless otherwise noted, the determinations will be conducted according to the provisions of EPA Methods cited in CFR Title 40, Part 60, Appendix A (revised July 1, 1992) using equipment meeting the specifications therein.

4.7 The preliminary testing schedule is included with this report

5. OPERATIONAL CONDITIONS OF SOURCES

Job: ACS/EGF

Month/Year: Nov 93

Team: 4

SUN	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SAT
DATE	Nov 8	Nov 9	Nov 10	Nov 11	Nov 12	
TEAM A (2)	TRAVEL & SET UP	C PULP DRYER PM, SO_2, CO NO_x ~~SO_2~~ CEM test No 2 Boiler	B PULP DRYER PM, SO_2, CO NO_x ~~SO_2~~ CEM test No 1 Boiler	A PULP DRYER PM, SO_2, CO NO_x ~~SO_2~~	TRAVEL	
TEAM B (2)	TRAVEL & SET UP	AM: No 1 BOILER PM, CO, NO_x PM: C PULP DRYER VOCs, VE	AM: No 2 BOILER PM, CO, NO_x PM: PULP DRYER VOCs, VE ! visible emissions	AM: PELLET COOLER #6 PM PM: A PULP DRYER VOCs, VE	AM: PELLET COOLER #7 PM PM: TRAVEL	

Port size

( ) = # personnel

H-7

5.1 The source points are part of a near-steady state sugar byproduct refining operation. Tests will proceed only when normal throughput is observed as determined by the dry pulp weigh belt.

2.2 During the three (3) one hour tests, operating data will be recorded at half hour intervals. This information will be included with the final test result submittal.

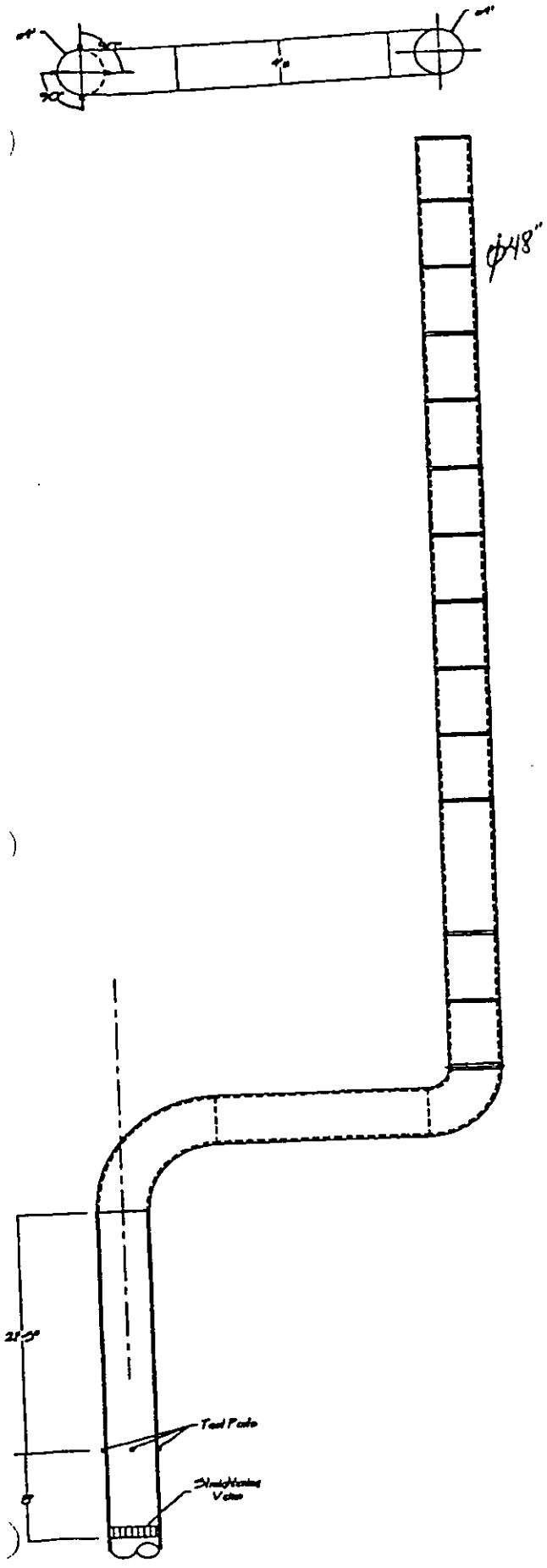
2.3 Process data will be recorded for pulp dryer total input, dry pulp output, and temperatures and pressures of the cooler.

2.4 Pollution Control operating conditions

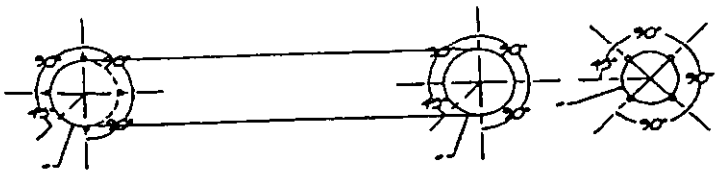
- Cyclones are in operation on the two coolers. Pressure differential data will be recorded during testing.

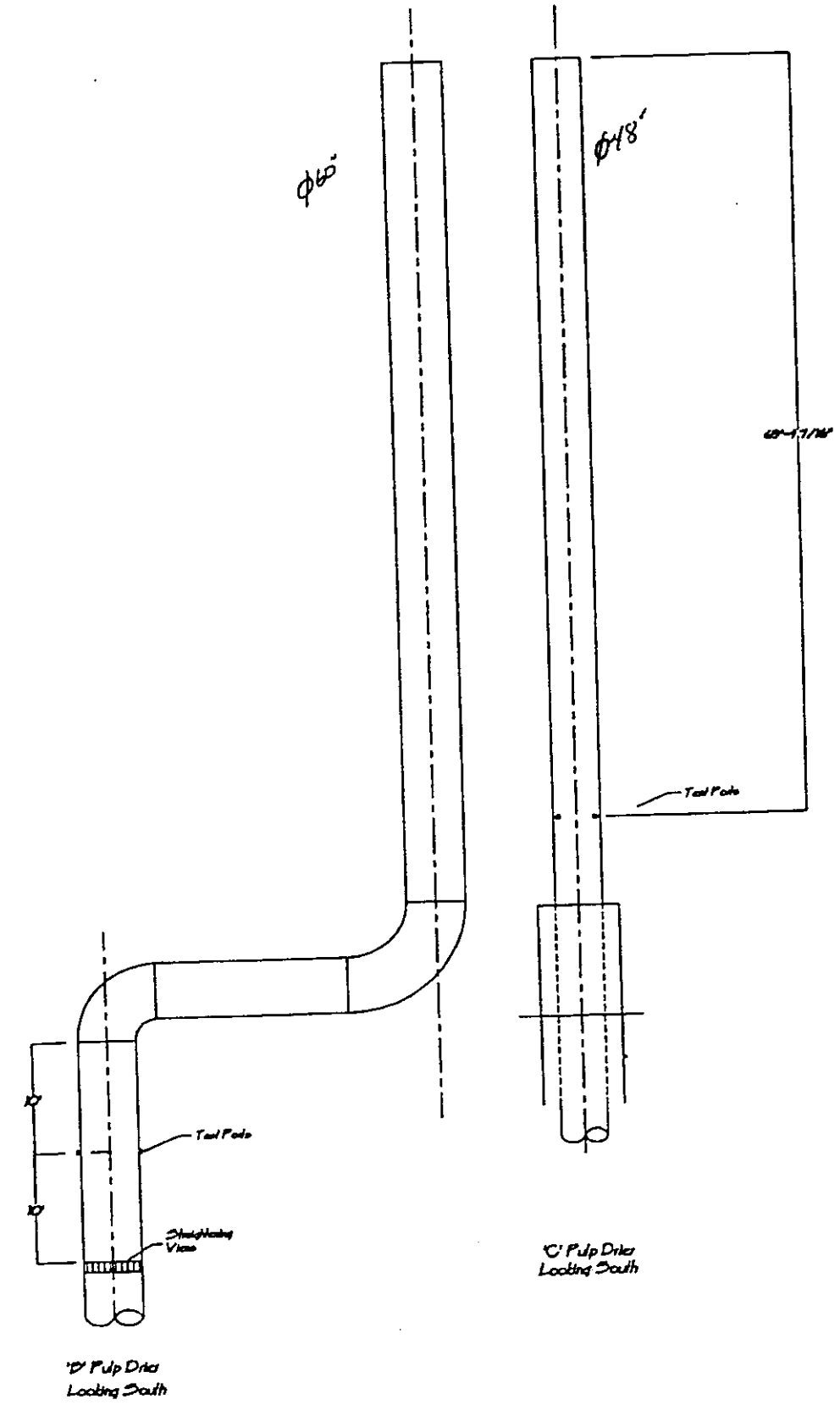
- The independent testing company will include physical data including stack temperatures and pressures.

2.5 Written comments will be included on the data sheets with refference to the overall condition of the operating and pollution control equipment, including last maintenance performed prior to the test, and the specific type of maintenance performed.



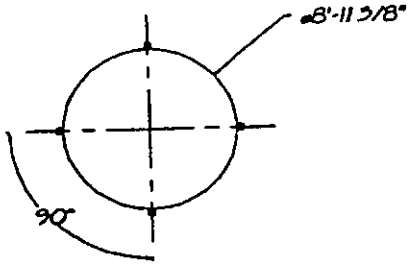
'K' Pup Diver Stack

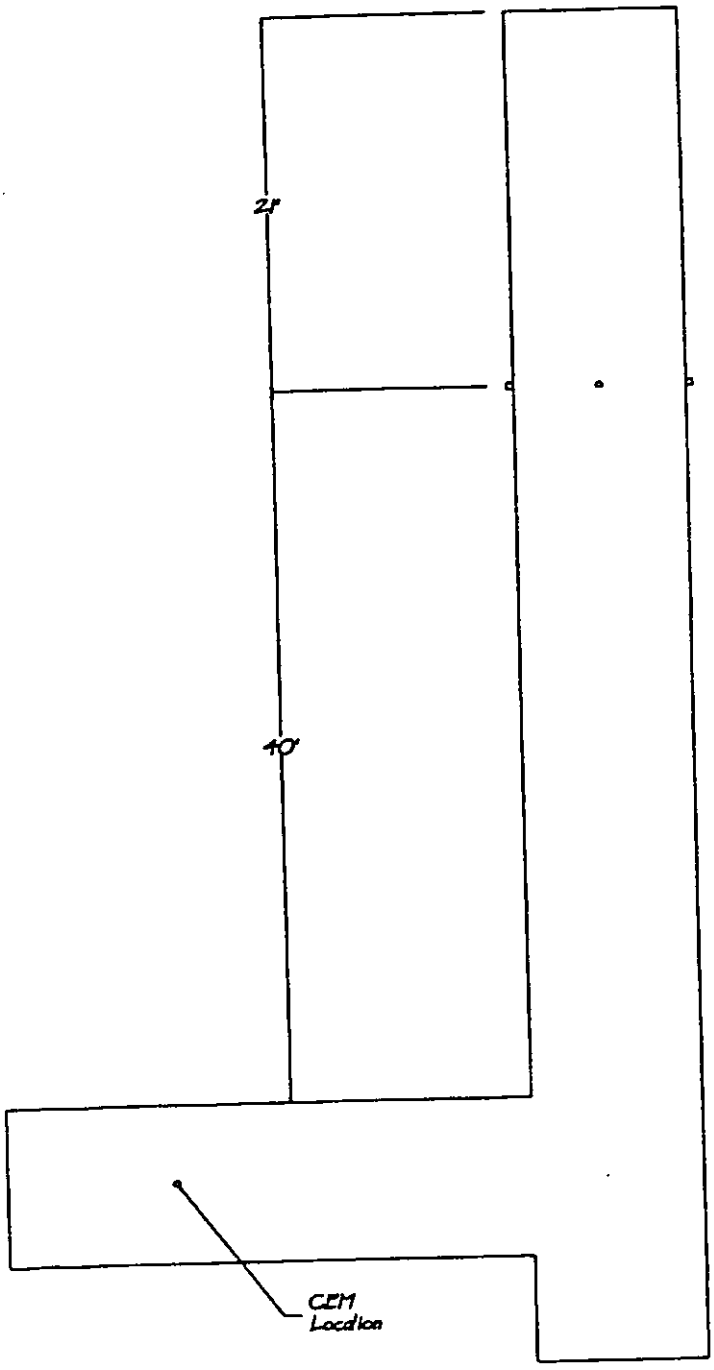




'D' Pulp Drier
Looking South

'C' Pulp Drier
Looking South





Boilerhouse Stack(s)
2 - Typical