

Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources*. AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

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1492
USS CLAIRTON WORKS
COMPLIANCE DEMONSTRATION
#13 BATTERY COMBUSTION STACK

Prepared for:

USS CLAIRTON WORKS
A DIVISION OF USX CORPORATION
CLAIRTON, PA

Prepared by:

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
3000 TECH CENTER DRIVE
MONROEVILLE, PA 15146

PROJECT NUMBER: 605033-01

APRIL 1992



USS
Clairton Works
400 State Street
Clairton, PA 15025

~~6-1-80~~
~~AHF~~
~~WGG/muc~~
04/24/30

RECEIVED

April 20, 1992

APR 22 1992

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Department of Environmental Resources
Bureau of Air Quality Control
Executive House - 2nd & Chestnut Sts.
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Deputy Director
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301 Thirty-ninth Street
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Region III
841 Chestnut Building
Philadelphia, PA 19017

Office of Chief Counsel
Western Region
Department of Environmental Resources
400 Waterfront Drive
Pittsburgh, PA 15222-4745

Gentlemen:

Subject: Compliance Demonstration
Clairton Battery #13

Please find enclosed with this letter the report on Battery #13 compliance mass emission stack test, conducted at USS Clairton Works, Division of USX Corporation, on March 12, 1992.

Please refer questions concerning this report to William C. Graeser at 233-1467.

Very truly yours,

G. T. Weber, Jr.
General Manager
USS Clairton Works

GTW/BAC
Attachment

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ABSTRACT

On March 12, 1992, a compliance test program was conducted for USS Clairton Works, Clairton, PA, on the #13 Battery Combustion Stack. The purpose of the testing was to determine the (1) concentration and mass emission rates of particulate matter, and (2) presence and extent of visible emissions from the stack as required by the Amended Mon Valley Consent Decree, Paragraph V. A. (6) and Appendix 4. A.

The allowable particulate matter concentration, as required by the Amended Mon Valley Consent Decree, is 0.015 gr/dscf. The results of three test runs produced an average particulate matter concentration and emission rate of 0.007 gr/dscf and 2.05 lb/hr, respectively. Thus, the particulate matter emissions from the stack are in compliance. The Amended Mon Valley Consent Decree requires that visible emissions shall not equal or exceed 20 percent opacity for a period or periods aggregating in excess of 3 minutes in any 60-minute period and shall never equal or exceed 60 percent opacity. No visible emissions were observed from the stack during any of the three tests. Thus, the visible emissions are in compliance.

1.0 INTRODUCTION

On March 12, 1992, a compliance test program was conducted for USS Clairton Works, Clairton, PA, on the #13 Battery Combustion Stack. The purpose of the testing was to determine the (1) concentration and mass emission rate of particulate matter, and (2) presence and extent of visible emissions from the stack as required by the Amended Mon Valley Consent Decree, Paragraph V. A. (6) and Appendix 4. A.

Testing was performed by the Air Quality Engineering Division of Keystone Environmental Resources, Inc. (Keystone). The test crew was comprised of Richard Casselberry, Samuel Woodring, and David Beranek. Visible emissions determinations were performed by Charles Davis of Environmental Technical Services (ETS). Keystone and ETS are sister companies of the Chester Environmental Group. All test procedures were witnessed by Phil Lawrence of the Allegheny County Health Department Bureau of Air Pollution Control (BAPC).

2.0 METHODOLOGIES

Particulate matter sampling was performed in accordance with EPA Stationary Source Sampling Methods 1 through 5 and Sections 139.11 and 139.12 of the Pennsylvania Department of Environmental Resources (PA DER) Source Testing Manual. Three two-hour tests were executed during normal operating conditions. Greater than 50 dry standard cubic feet of sample gas was collected during each test run.

The process exhausts through a 120 inch diameter stack. A total of 24 traverse points (12 per diameter) were sampled; the traverse points were calculated in accordance with EPA Method 1. Sampling was conducted through four equally spaced ports, with six traverse points sampled per port. Each point was sampled for 5 minutes, thus bringing the total sampling time to 120 minutes. A schematic diagram of the stack and traverse points can be found in Figure 2-1.

In accordance with EPA Method 2, velocities and volumetric flow rates of the exhaust gas were determined using a calibrated S type pitot tube. Positive and negative pitot lines were leak-checked at the beginning and end of each test run. Gas velocity differential pressures along with stack gas temperatures were recorded at each sampling point.

At the beginning and end of each test, gas concentrations of CO₂, O₂, and N₂ (by difference) were determined with the use of a Fyrite apparatus as specified by EPA Method 3. Gas concentrations were used to obtain molecular weight of the process gas.

Percent moisture content, by volume, of the exhaust gas was determined by measuring the weight gain of the four sample train impingers in accordance with EPA Method 4.

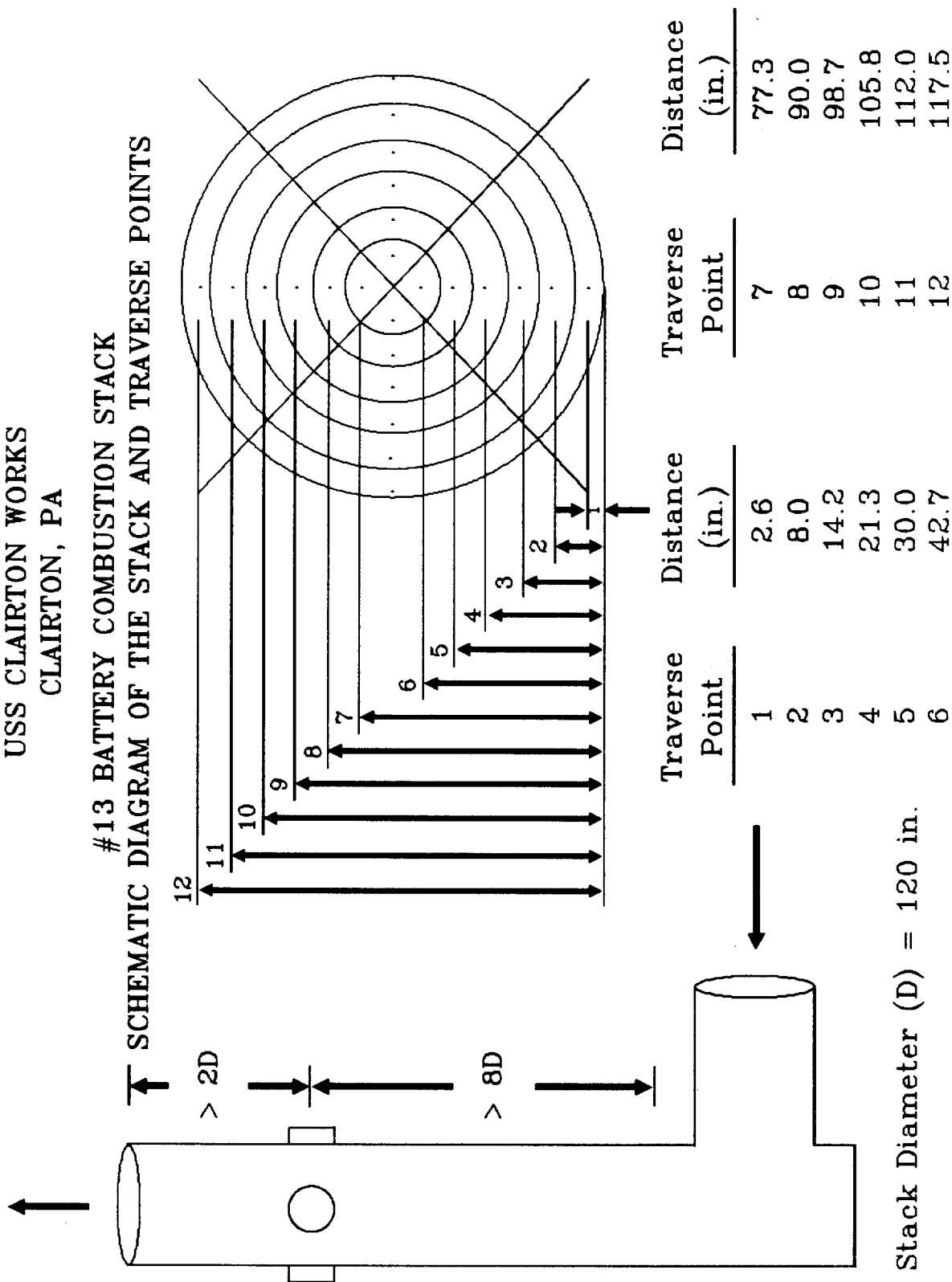
As specified by EPA Method 5, each sample train was assembled as required by the method, leak-checked on site at the beginning and end of each test run, and operated such that isokinetic conditions were maintained. Clean up of the sampling train included a water rinse followed by an acetone rinse of both the front-half and back-half components of the sample train, as per Section 139.12 of the PA DER particulate matter test methods. The water soluble and water insoluble portions of the front-half of the sampling train was determined as a total; that is, the water rinse was not filtered to determine soluble and

FIGURE 2-1

USS CLAIRTON WORKS
CLAIRTON, PA

#13 BATTERY COMBUSTION STACK

SCHEMATIC DIAGRAM OF THE STACK AND TRAVERSE POINTS



insoluble portions. Front-half acetone and water rinses were evaporated to dryness, desiccated, and weighed to a constant weight. The water soluble and water insoluble portions of the back-half were determined separately in accordance with Section 139.12 of the PA DER Source Testing Manual. The back-half water rinses and first three impinger solutions were combined and then filtered under suction through a preweighed 0.22 micrometer membrane filter. The filter used to capture the insoluble material was dried, desiccated, and weighed to a constant weight. After filtration, the soluble back-half water was extracted with chloroform and ethyl ether. The extracts were evaporated to dryness, desiccated, and weighed to a constant weight. The filtrate, or remaining water from the extraction process, was then submitted for sulfate analysis via ion chromatography. Back-half acetone rinses were evaporated to dryness, desiccated, and weighed to a constant weight. Sample train filters were desiccated for 24 hours, and particulate matter weight was determined gravimetrically. Rinse residue weights and filter weights were measured to the nearest 0.1 mg. One acetone blank and one deionized distilled water blank was prepared in the same manner as the test sample rinses. The blank residue weights were subtracted from the test sample residue weights. After blank correction, front-half water and acetone rinse residue weights, sample train filter weights, and back-half water insoluble filter weights were used to determine total particulate matter catch.

All visible emissions determinations were performed in accordance with EPA Stationary Source Sampling Method 9. Visible emission readings were recorded for the duration of each particulate matter test.

3.0 RESULTS

All testing was performed during periods of normal plant operation. To validate this, copies of the operational data can be found in Appendix A.

All sampling equipment was calibrated and operated in accordance with EPA Stationary Source Sampling Methods 1 through 5. Copies of the pre-test calibration results, post-test calibration results, and the results of an audit conducted with a critical orifice provided by the Allegheny County Health Department BAPC can be found in Appendix B.

Copies of the field data sheets for the particulate matter sampling can be found in Appendix C. The emissions calculations for each test can be found in Appendix D.

The test results have been summarized in Table 3-1. The results of the testing showed an average particulate matter concentration and emission rate of 0.007 grains per dry standard cubic feet (gr/dscf) and 2.05 pounds per hour (lb/hr), respectively. As promulgated by the Amended Mon Valley Consent Decree, Paragraph V.A.(6), the allowable particulate matter concentration for #13 Battery Combustion Stack is 0.015 gr/dscf (a Lowest Achievable Emission Rate (LAER) standard). Thus, the particulate matter emissions from the stack are in compliance.

Tables 3-1 also lists other pertinent stack and sampling parameters which include stack gas flow rate in units of actual cubic feet per minute (acfm) and standard cubic feet per minute (scfm), moisture content of the stack gas (percent by volume), stack gas temperature (°F), gas volume sampled for each test in units of dry standard cubic feet (dscf), and the isokinetics value for each test. The gas volume sampled for each 120 minute test was greater than 50 dry standard cubic feet. The isokinetics value is equal to the ratio of the average linear gas velocity sampled through the probe nozzle to the average stack gas velocity. An isokinetics value between 90 percent and 110 percent is considered acceptable. Isokinetic values for the three test runs were 92.0 percent, 90.4 percent, and 94.2 percent; therefore, all values were within the acceptable range. Actual test sampling times have also been included in Table 3-1.

TABLE 3-1

USS CLAIRTON WORKS
CLAIRTON, PA

#13 BATTERY COMBUSTION STACK
PARTICULATE MATTER EMISSIONS DATA

		Run 1	Run 2	Run 3	Average
Test Number		CLR-13BS-1	CLR-13BS-2	CLR-13BS-3	
Test Date		3/12/92	3/12/92	3/12/92	
<u>Mass Emission Rate and Concentration</u>					
Particulate Matter	(lb/hr)	1.969	2.171	2.023	2.054
	(gr/DSCF)	0.0068	0.0070	0.0072	0.0070
<u>Stack Conditions</u>					
Average Flow Rate	(ACFM)	68978	72367	65766	69037
Standard Flow Rate	(SCFM)	38694	41908	37777	39460
Temperature	(°F)	451.1	422.5	429.5	434.4
Moisture Content	(%)	12.9	13.2	12.9	13.0
<u>Sampling Conditions</u>					
Test times		9:20	11:55	14:34	
		to 9:50	to 12:25	to 15:04	
		9:54	12:30	15:09	
		to 10:24	to 13:00	to 15:39	
		10:27	13:05	15:44	
		to 10:57	to 13:35	to 16:14	
		11:00	13:40	16:18	
		to 11:30	to 14:10	to 16:48	
Sampling Time	(minutes)	120	120	120	
Sample Volume	(DSCF)	78.204	82.949	78.182	
Isokinetics	(%)	92.0	90.4	94.2	

Copies of the field data sheets for the visible emissions readings can be found in Appendix E. As promulgated by the Amended Mon Valley Consent Decree, Paragraph V. A. (6), the "visible emissions shall not equal or exceed 20 percent opacity for a period or periods aggregating in excess of 3 minutes in any 60-minute period and shall never equal or exceed 60 percent opacity." No visible emissions were observed during any of the three tests. Thus, the visible emissions are in compliance.

A summary table of the analytical results for sulfate analysis on the soluble back-half water can be found in Table 3-2. A copy of the analytical report for sulfate analysis can be found in Appendix F.

TABLE 3-2

**USS CLAIRTON WORKS
CLAIRTON, PA**

**#13 BATTERY COMBUSTION STACK
SULFATE ANALYSIS OF BACK-HALF WATER**

Test Number	Sulfate Concentration (mg/L)	Sample Volume (L)	Total Sulfate (mg)
CLR-13BS-1	23.64	900	21.28
CLR-13BS-2	19.93	750	14.95
CLR-13BS-3	17.03	900	15.33

**COMPLIANCE DEMONSTRATION
#13 BATTERY COMBUSTION STACK**

**USS CLAIRTON WORKS
CLAIRTON, PA**

**APPENDIX A
OPERATIONAL DATA**

CLAIRTON COKE AND COAL CHEMICAL WORKS

UNIT NO. 5

12 Hrs. Beginning 12:00 PM

DATE 3-72-12

REMARKS:

Definition of Signals

Condition of Pusher

HOURLY REPORT OF OPERATION

TIME	OVS PUSHED	OVS CHARGED	OVS SCHEDULED	TIME	OVS PUSHED	OVS CHARGED	OVS SCHEDULED	
10:00	0	0	2-2	5-6	5	4	8-7	
10:01	5	4	8-7	6-7	0	0	3-2	Total Ovs Pushed 33
10:02	4	4	7-7	7-8	3	3	5-5	Total Ovs Charged 31
2-4	2	3	5-6	8-9	3	3	6-6	
3-4	2	1	5-4	9-10	3	3	5-5	Pusherman
4-5	3	3	6-6	10-11	3	3	5-5	Battery Foreman (R. W. W. W.)
16	15			17	16			

UNITED STATES STEEL CORPORATION
CLAIRTON COKE AND COAL CHEMICAL WORKS

PUSHING AND CHARGING REPORT

UNIT NO. 15

12 Hrs. Beginning 12:00 AM

Date 3-12-92

BATTERY NO. <u>13A</u>				BATTERY NO. <u>13B</u>				BATTERY NO. _____			
OVEN NO.	TIME PUSHED	TIME CHARGED	NOTES	OVEN NO.	TIME PUSHED	TIME CHARGED	NOTES	OVEN NO.	TIME PUSHED	TIME CHARGED	NOTES
1				1				1			
3		11 13		3				3			
5	11 15	11 48		5				5			
7	11 50	11 57		7				7			
9	11 59	12 08		9				9			
11	12 10	12 47		11				11			
13	12 49	12 56		13				13			
15	12 58	1 03		15				15			
17	1 05	1 42		17				17			
19	1 44	1 49		19				19			
21	1 51	1 56		21				21			
23	1 58	2 34		23				23			
25	2 36	2 41		25				25			
27	2 43	3 44		27				27			
29	3 46	3 51		29				29			
31	3 53	4 29		31				31			
2	10 27	10 36		2	4 31	4 37		2			
4	10 38	10 44		4	4 39	4 44		4			
6	10 46	10 58		6	4 46	5 23		6			
8				8	5 25	5 30		8			
10				10	5 32	5 37		10			
12				12	5 39	6 17		12			
14				14	6 19	6 23		14			
16				16	6 25	6 30		16			
18				18	7 15	8 00		18			
20				20	8 02	8 09		20			
22				22	8 11	8 17		22			
24				24	8 19	9 20		24			
26				26	9 22	9 27		26			
28				28	9 29	9 46		28			
30				30	9 42	10 25		30			
1				1				1			
2				2				2			

REMARKS:

Condition of Signals

Condition of Pusher

HOURLY REPORT OF OPERATION

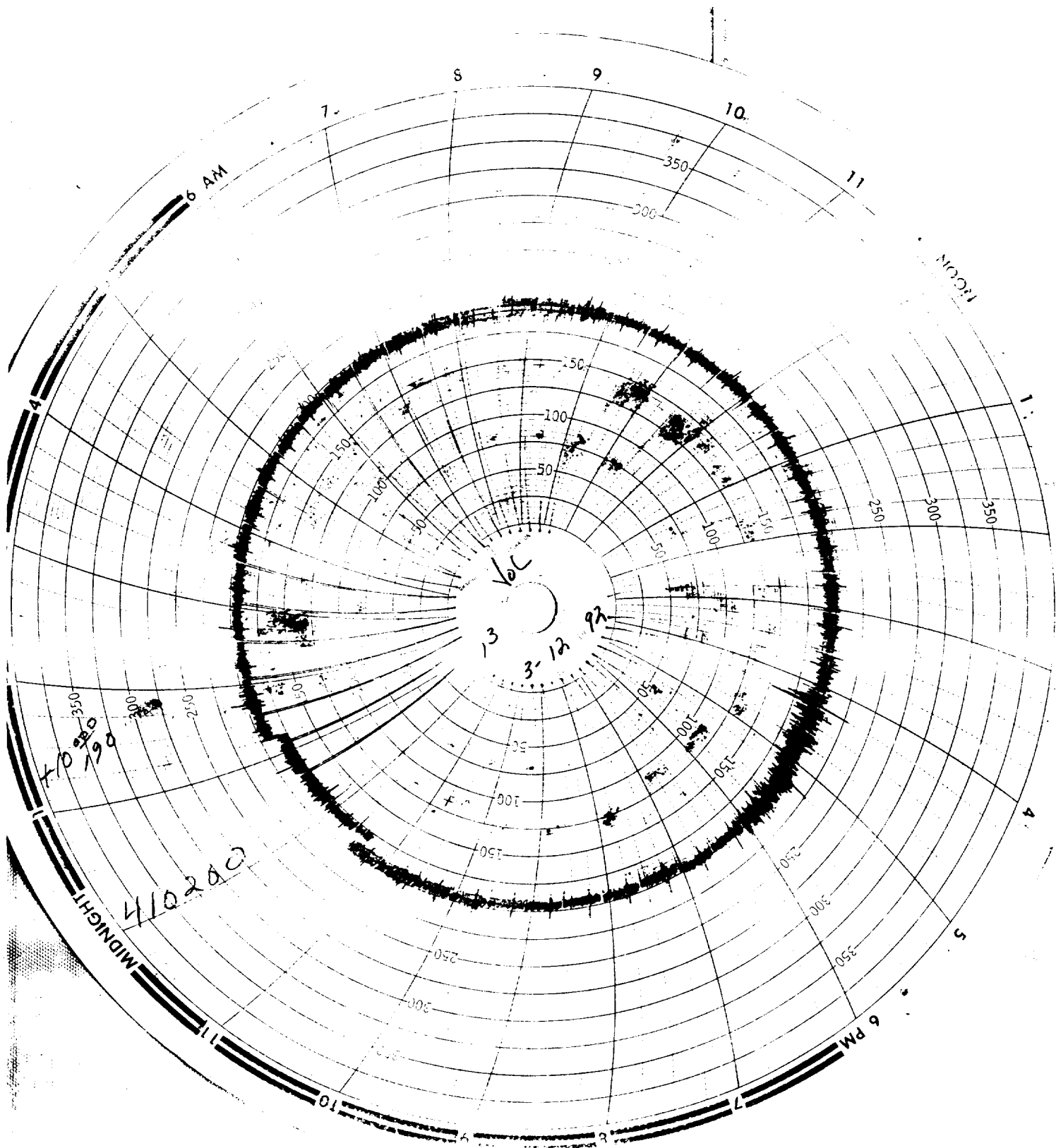
TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED	TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED
3 ⁰⁰	3	3		5 ⁰⁰	3	3	
3 ¹⁵	3	3		6 ⁰⁰	2	3	
3 ³⁰	4	4		7 ⁰⁰	1	0	
3 ⁴⁵	2	2		8 ⁰⁰	3	3	
4 ⁰⁰	2	2		9 ⁰⁰	3	3	
4 ¹⁵	3	3		10 ⁰⁰	3	4	
4 ³⁰	3	3		10 ¹⁵	15	16	
4 ⁴⁵	17	17					

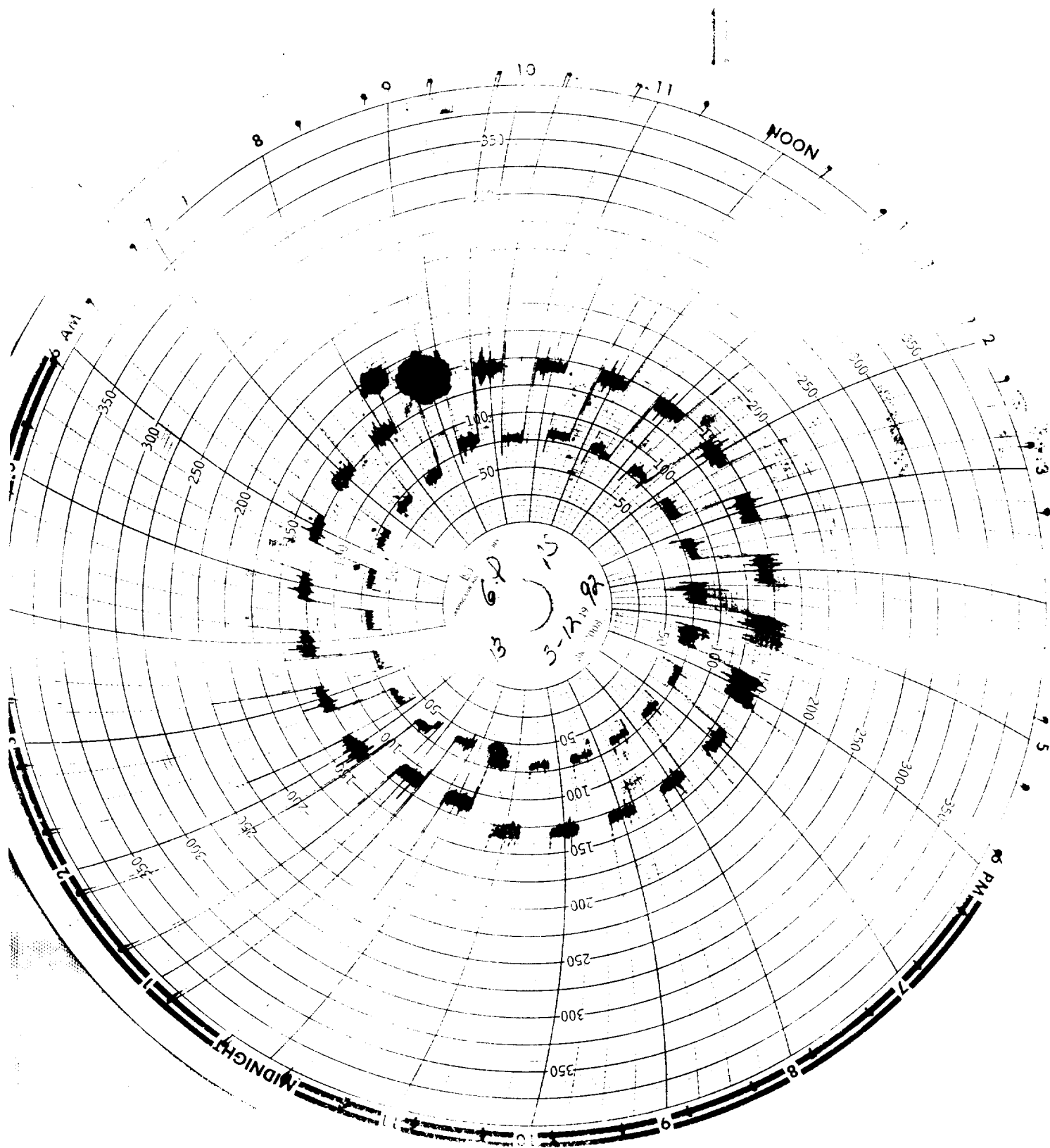
Total Ovens Pushed 32

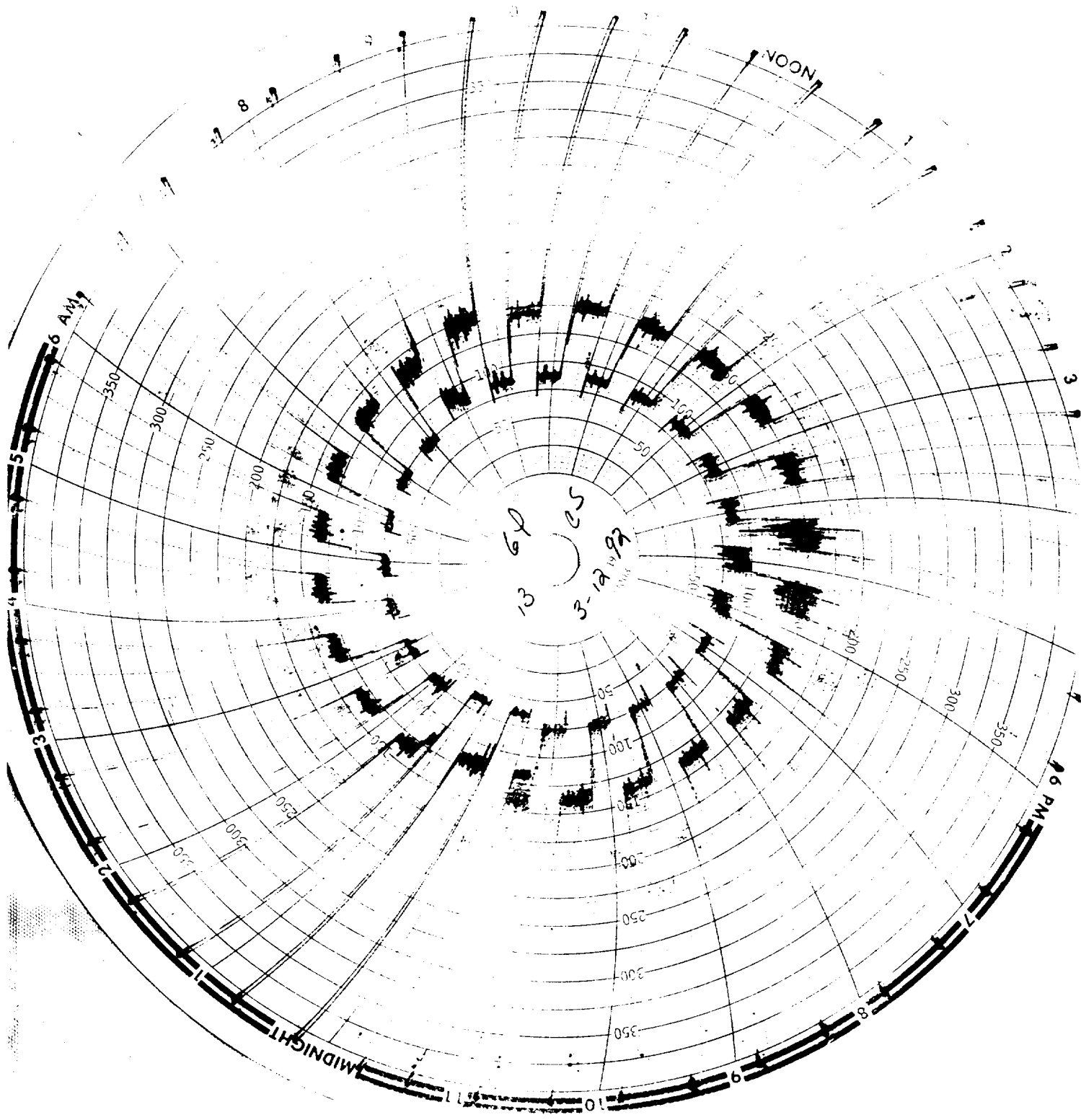
Total Ovens Charged 33

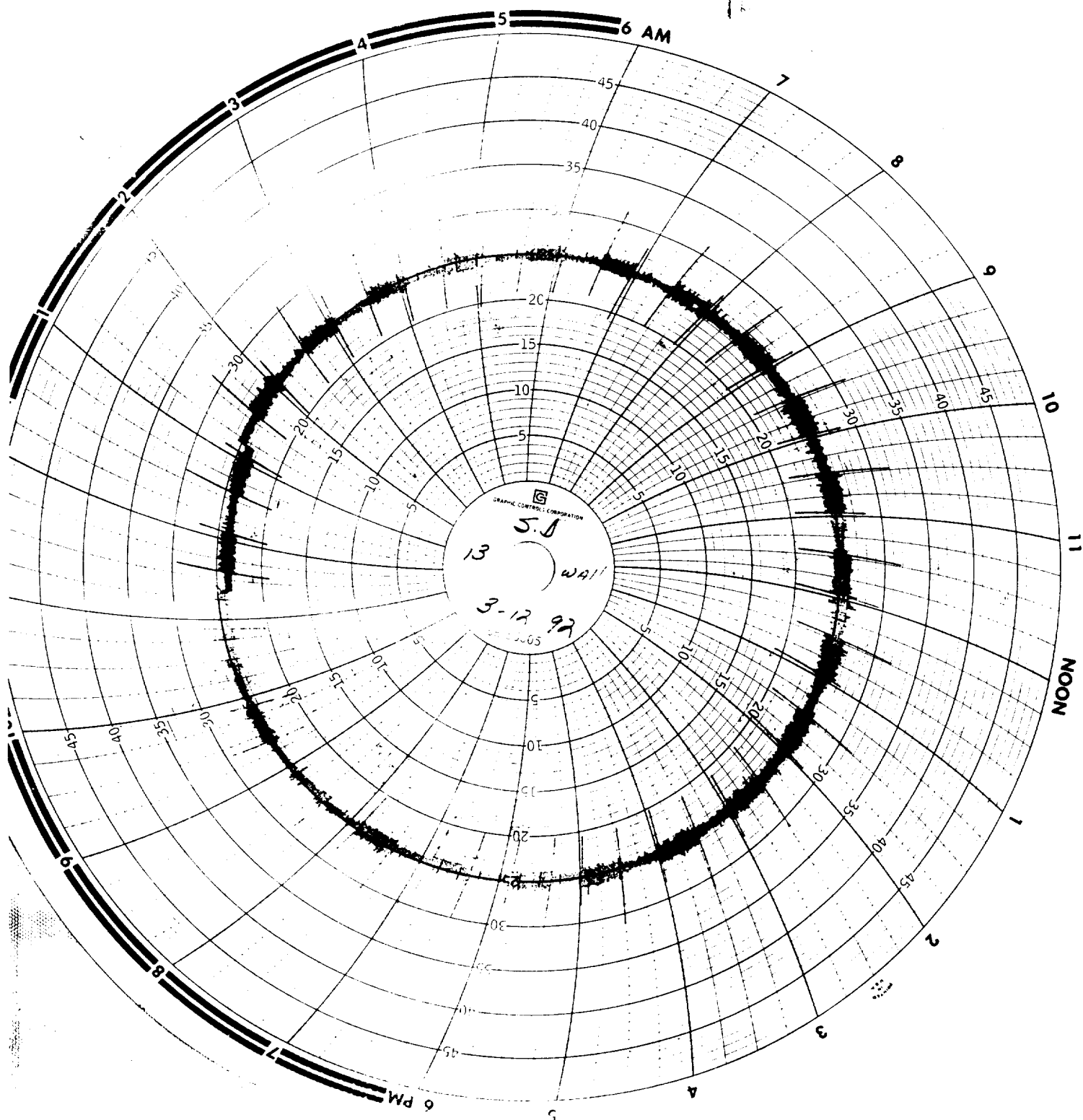
Pusherman

Battery Foreman R. V. ...









**COMPLIANCE DEMONSTRATION
#13 BATTERY COMBUSTION STACK**

**USS CLAIRTON WORKS
CLAIRTON, PA**

APPENDIX B

CALIBRATION RESULTS

THREE POINT CALIBRATION

BOX #	1	BP	29.00
DATE	02-11-92	OPERATOR	RPC

	<u>WET TEST METER</u>						<u>DRY TEST METER</u>							METER CORRECT Y	ORIFICE COEFFICIENT	ORIFICE $\Delta H @$
	TIME (min)	TEMP TW	VOLUME VM	PRESSURE PW	TEMP IN TI	TEMP OUT TO	TEMP AVG TA	ORIFICE PD	VOLUME VD							
START HALF STOP	12.57	70.0	0.000 5.000	29.00	90.0	83.0	86.5	0.50	463.100 468.381							
CALCULATION	12.57	530.0	5.013	29.00			546.5	29.04	5.281				0.9775		1.767	
START HALF STOP	8.87	70.0	0.000 5.000	29.00	94.0	85.0	89.5	1.00	468.800 474.081							
CALCULATION	8.87	530.0	5.013	29.00			549.5	29.07	5.281				0.9816		1.750	
START HALF STOP	6.30	70.0	0.000 5.000	29.00	97.0	88.0	92.5	2.00	474.800 480.078							
CALCULATION	6.30	530.0	5.013	29.00			552.5	29.15	5.278				0.9850		1.756	
AVERAGE													0.9814		1.757	

BOX #	1	BP	28.75
DATE	3-30-92	OPERATOR	RPC

AVERAGE

PRE-TEST MAGNEHELIC CALIBRATION

BOX# 1
DATE 01-14-92
OPERATOR RPC

0 to 10" H2O RANGE

MAGNEHELIC ΔP	MANOMETER
0.50	0.50
1.00	1.05
2.00	2.00
4.00	4.00
6.00	6.00
8.00	8.00

0 to 0.50" H2O RANGE

MAGNEHELIC ΔP	MANOMETER
0.50	0.50
0.40	0.40
0.30	0.30
0.20	0.20
0.10	0.10

0 to 5" H2O RANGE

MAGNEHELIC DELTA H	MANOMETER
4.00	4.00
3.00	3.00
2.00	2.00
1.00	1.00
0.50	0.50

PRE-TEST LEAK CHECK

DATE 02-11-92
OPERATOR RPC

START CF	STOP CF	VOLUME CF	TIME (min)	LEAK RATE
461.970	462.152	0.182	10.000	-0.002
0.000	0.161	0.161		

PYROMETER CALIBRATION

DATE 04-28-88
OPERATOR AGL

mV input	TARGET TEMP °F	TEMP READING °F
0.18	40	40.0
0.40	50	50.0
0.84	70	70.0
1.29	90	90.0
1.74	110	110.0
2.66	150	150.0
3.82	200	200.0
6.09	300	301.0
8.31	400	400.0
10.57	500	500.0

PRE-TEST PYROMETER CHECK

DATE 01-14-92
OPERATOR RPC

mV input	TARGET TEMP °F	TEMP READING °F
0.18	40	40.0
0.40	50	50.0
0.84	70	69.0
1.29	90	89.0
1.74	110	109.0
2.66	150	149.0
3.82	200	200.0
6.09	300	300.0
8.31	400	400.0
10.57	500	500.0

POST-TEST MAGNEHELIC CALIBRATION

BOX# 1
DATE 3-30-92
OPERATOR RPC

0 to 10" H2O RANGE

MAGNEHELIC ΔP	MANOMETER
0.50	0.50
1.00	1.00
2.00	2.00
4.00	4.00
6.00	6.00
8.00	8.00

0 to 0.50" H2O RANGE

MAGNEHELIC ΔP	MANOMETER
0.50	0.50
0.40	0.40
0.30	0.30
0.20	0.20
0.10	0.10

0 to 5" H2O RANGE

MAGNEHELIC ΔH	MANOMETER
4.00	4.00
3.00	3.00
2.00	2.00
1.00	1.00
0.50	0.50

POST-TEST LEAK CHECK

DATE 3-30-92
OPERATOR RPC

START CF	STOP CF	VOLUME CF	TIME (min)	LEAK RATE
268.945	269.161	0.216	10.000	-0.004
0.000	0.190	0.180		

PYROMETER CALIBRATION

DATE 04-28-88
OPERATOR AGL

mV input	TARGET TEMP °F	TEMP READING °F
0.18	40	40.0
0.40	50	50.0
0.84	70	70.0
1.29	90	90.0
1.74	110	110.0
2.66	150	150.0
3.82	200	200.0
6.09	300	301.0
8.31	400	400.0
10.57	500	500.0

POST-TEST PYROMETER CHECK

DATE 3-30-92
OPERATOR RPC

mV input	TARGET TEMP °F	TEMP READING °F
0.18	40	40.0
0.40	50	50.0
0.84	70	70.0
1.29	90	89.0
1.74	110	109.0
2.66	150	150.0
3.82	200	200.0
6.09	300	301.0
8.31	400	400.0
10.57	500	499.0

QA ORIFICE AUDIT

AGENCY BAPC
DATE 10-28-91
OPERATOR RPC

RUN	1		2		3	
INITIAL CF	341.500		348.775		356.050	
FINAL CF	348.746		356.026		363.314	
DIFFERENCE	7.246		7.251		7.264	
TEMP INITIAL	IN	OUT	IN	OUT	IN	OUT
TEMP 5 MIN	80	78	80	80	81	80
TEMP 10 MIN	79	79	81	80	81	80
TEMP 15 MIN	80	79	81	80	81	80
TEMP AVG	TEMP R 79.25 539.25		TEMP R 80.375 540.375		TEMP R 80.5 540.5	
TIME MINUTES	15		15		15	
ORIFICE	IN WATE	IN HG	IN WATER	IN HG	IN WATER	IN HG
	0.70	0.05	0.70	0.05	0.70	0.05
BARA PRESSURE	29.11	29.16	29.11	29.16	29.11	29.16
AMBIENT TEMP.	F	C	F	C	F	C
	75.0	23.9	75.0	23.9	75.0	23.9
VACUUM IN HG	23		23		23	
STD CF	6.941		6.931		6.942	
DGM CAL Y	1.0033		1.0033		1.0033	
VOL SCF	0.1972		0.1969		0.1973	

KEYSTONE ENVIRONMENTAL RESOURCES

QA ORIFICE AUDIT

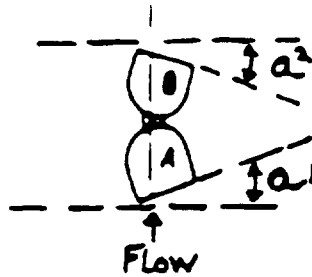
AGENCY BAPC DATE 4-7-92 B.P. 28.85
 OPERATOR KS BOX # 1

RUN	1	2	3
INITIAL CF	705.035	712.272	719.628
FINAL CF	712.272	719.628	727.118
DIFFERENCE	7.237	7.356	7.490
TEMP INITIAL	IN 76 OUT 72	IN 83 OUT 79	IN 93 OUT 87
TEMP 5 MIN	77 74	86 82	95 88
TEMP 10 MIN	79 75	88 84	96 89
TEMP 15 MIN	81 77	92 86	99 91
TEMP AVG	TEMP R 76.375 536.375	TEMP R 85 545	TEMP R 92.25 552.25
TIME MINUTES	15.00	15.00	15.00
ORIFICE P	IN WATER 0.67 IN HG 0.05	IN WATER 0.67 IN HG 0.05	IN WATER 0.67 IN HG 0.05
METER PRESSURE	28.90	28.90	28.90
AMBIENT TEMP.	F 70.0 C 21.1	F 70.0 C 21.1	F 70.0 C 21.1
VACUUM IN HG	19.0	19.0	19.0
DGM CAL Y	0.9814	0.9814	0.9814
STD CF	6.779	6.781	6.814
STD CUBIC METERS	0.1920	0.1920	0.1930

GEOMETRIC PITOT CALIBRATION

Caliper # XCF59
 Precheck ✓
 Post Check _____

Probe #: 10-2
 Date: 2-27-92
 Initials: TM

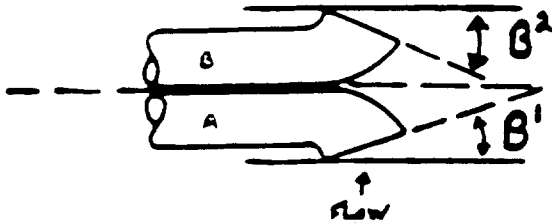


$a^1 = 5^\circ$
 $a^2 = 2^\circ$
 $B^1 = 1^\circ$
 $B^2 = 1^\circ$

$a^1, a^2 = < 10^\circ$
 $B^1, B^2 = < 5^\circ$

$F = 0.905''$

②

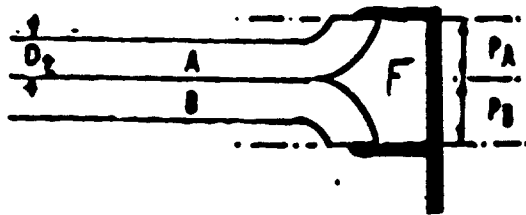


$\mu = 0.0078$
 $V = 0.0078$
 $W = 0.256$

$\mu = \leq 0.1250'' (\mu = F \tan \delta)$
 $V = \leq 0.03125'' (V = F \tan \theta)$
 $W \geq 0''$

$X = 0.926$
 $X \geq 0.750''$
 (3/4" using 1/2" nozzle)

③

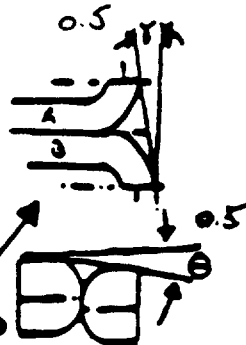
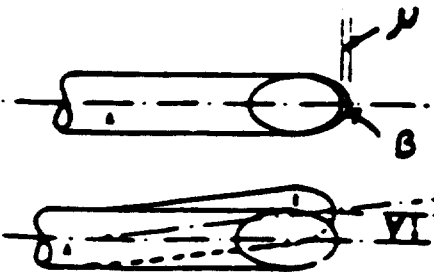


$1.05 D_t \leq \theta < 1.50 D_t$
 $P_A = P_B$
 $2.10 D_t \leq \theta < 3.00 D_t$

$Y = 5.770$
 $Z = 3.724$
 $D_t = 0.378$

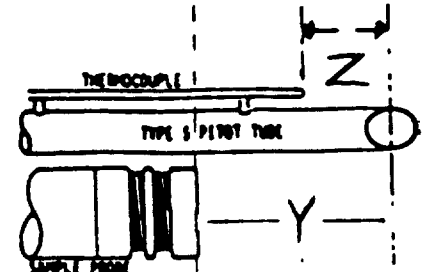
$Y \geq 3.0''$
 $Z \geq 2.0''$
 $D_t > .1875'' \text{ to } .375''$
 (3/16" to 3/8")

④

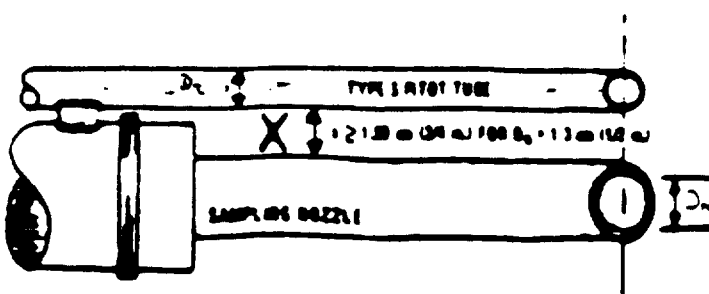


(δ, θ EXPRESSED IN DEGREES)

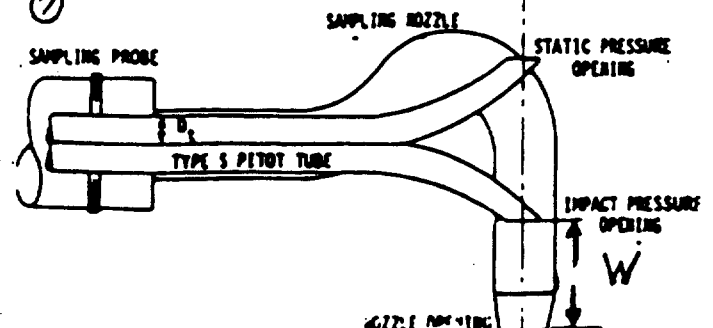
⑥



⑤



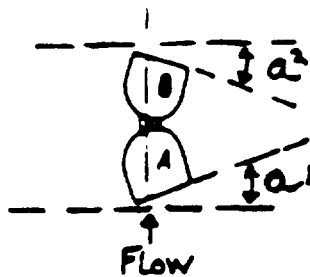
⑦



GEOMETRIC PITOT CALIBRATION

Caliper # XLE59
 Precheck ✓
 Post Check _____

Probe #: 10.3
 Date: 2-27-98
 Initials: SP



$$\begin{aligned} a^1 &= 5^\circ \\ a^2 &= 1^\circ \\ B^1 &= 2^\circ \\ B^2 &= 2^\circ \end{aligned} \quad \begin{aligned} &> a^1, a^2 = < 10^\circ \\ &> B^1, B^2 = < 5^\circ \end{aligned}$$

$$F = 0.994''$$

$$\mu = 0.0174$$

$$\mu \leq 0.1250^\circ (\mu = F \tan \theta)$$

$$V = 0.0174$$

$$V \leq 0.03125^\circ (V = F \tan \theta)$$

$$W = 0.180$$

$$W \geq 0''$$

$$X = 0.834$$

$$X \geq 0.750''$$

 (3/4" using 1/2" nozzle)

$$Y = 5.816$$

$$Y \geq 3.0''$$

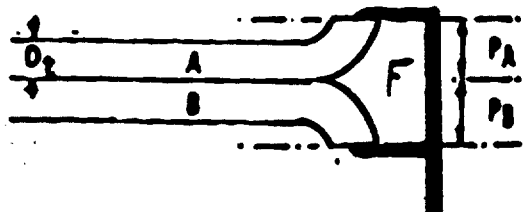
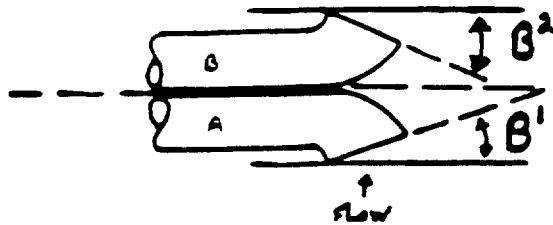
$$Z = 2.540$$

$$Z > 2.0''$$

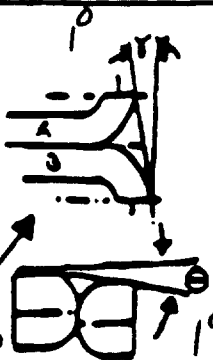
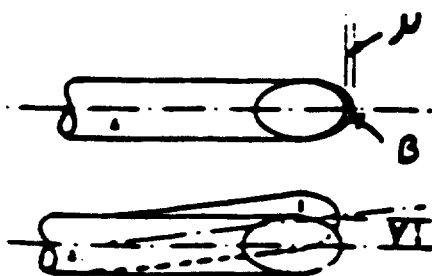
$$D_t = 0.377$$

$$D_t > .1875'' \text{ to } .375''$$

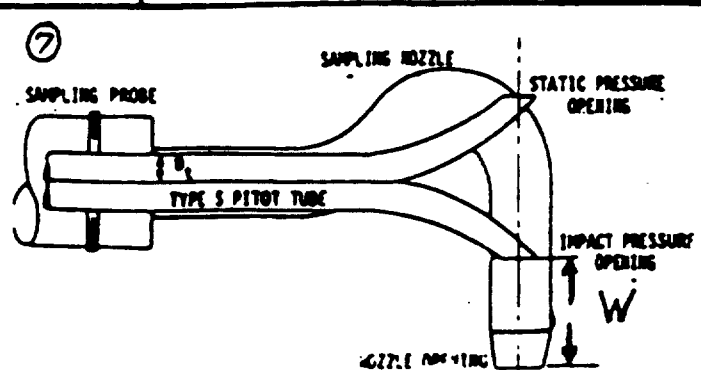
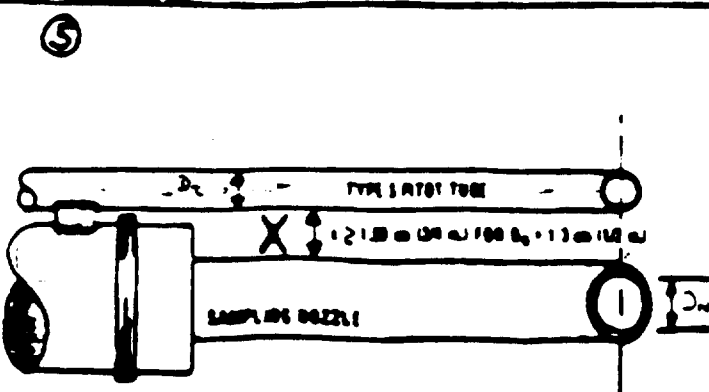
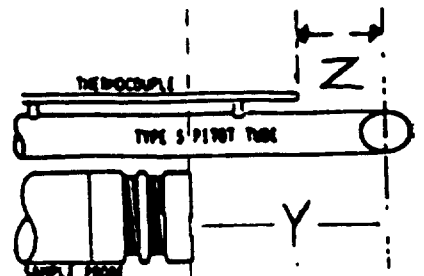
 (3/16" to 3/8")



$$\begin{aligned} 1.05 \theta_t &\leq \theta < 1.50 \theta_t \\ 2.10 \theta_t &\leq \theta < 3.00 \theta_t \end{aligned}$$



(θ, θ EXPRESSED IN DEGREES)

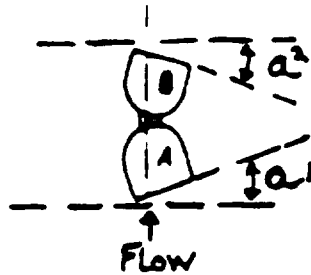


GEOMETRIC PITOT CALIBRATION

Caliper # XEF 59
 Precheck _____
 Post Check ✓

Probe #: 10-2
 Date: 3/31/92
 Initials: SSW

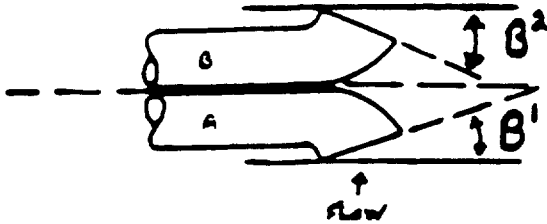
①



$a^1 = 2.0$
 $a^2 = 1.5$
 $B^1 = 1.0$
 $B^2 = 1.0$
 $F = .914$

$a^1, a^2 = < 10^\circ$
 $B^1, B^2 = < 5^\circ$

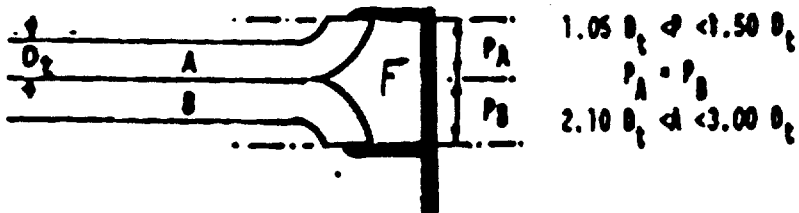
②



$\mu = .008$
 $V = .0115$
 $W = .245$
 $X = .945$

$\mu \leq 0.1250^\circ (\mu = F \tan \theta)$
 $V \leq 0.03125^\circ (V = F \tan \theta)$
 $W \geq 0$
 $X \geq 0.750$
 (3/4" using 1/2" nozzle)

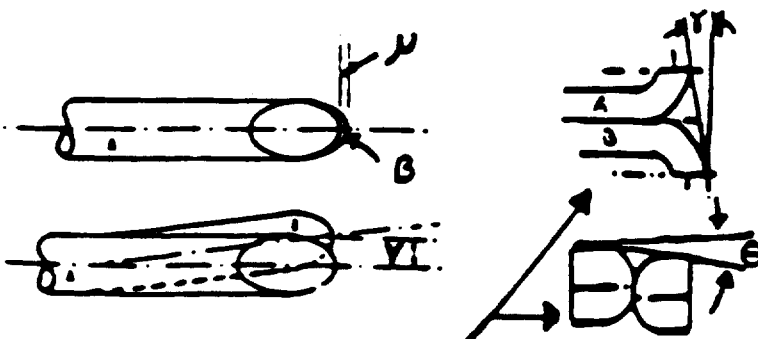
③



$Y = 6.0$
 $Z = 2.15$
 $D_1 = .256$

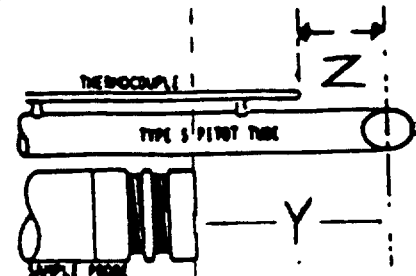
$Y \geq 3.0$
 $Z > 2.0$
 $D_1 > .1875$ to $.375$
 (3/16" to 3/8")

④

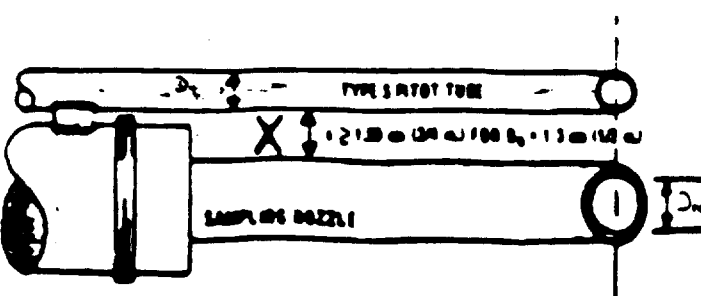


(θ, θ EXPRESSED IN DEGREES)

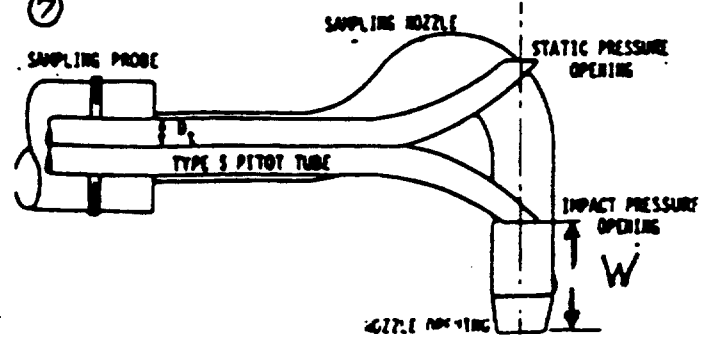
⑤



⑥



⑦

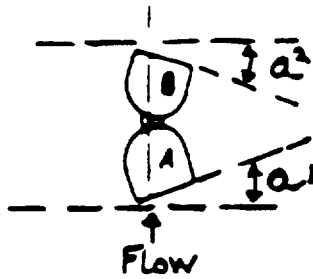


GEOMETRIC PITOT CALIBRATION

Caliper # XEF 59
 Precheck
 Post Check ✓

Probe #: 10-3
 Date: 3/31/92
 Initials: STW

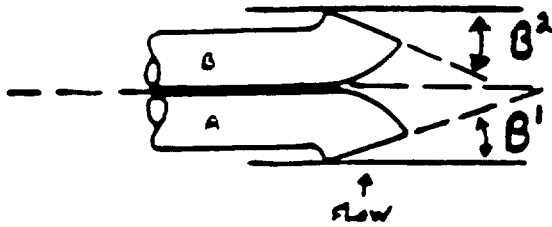
①



$a^1 = 3.0$
 $a^2 = 4.0$
 $B^1 = 1.5$
 $B^2 = 2.5$
 $F = 1.023$

$a^1, a^2 = < 10^\circ$
 $B^1, B^2 = < 5^\circ$

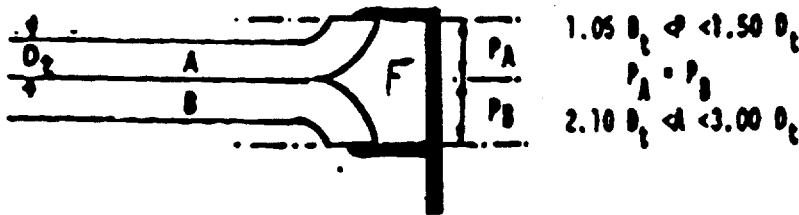
②



$\mu = 0.0268$
 $V = 0.0805$
 $W = .158$

$\mu \leq 0.1250^\circ (\mu = F \tan \delta)$
 $V \leq 0.03125^\circ (V = F \tan \theta)$
 $W \geq 0$

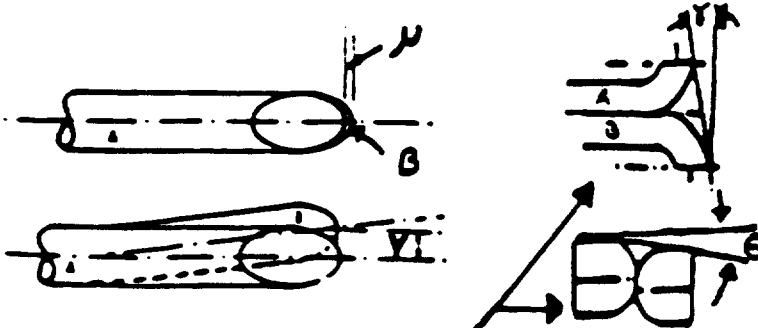
③



$X = 1.025$
 $Y = 6.0$
 $Z = 2.75$
 $D_1 = .287$

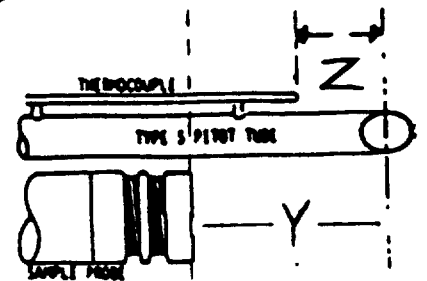
$X \geq 0.750$
 (3/4" using 1/2" nozzle)
 $Y \geq 3.0$
 $Z > 2.0$
 $D_1 > .1875$ to $.375$
 (3/16" to 3/8")

④

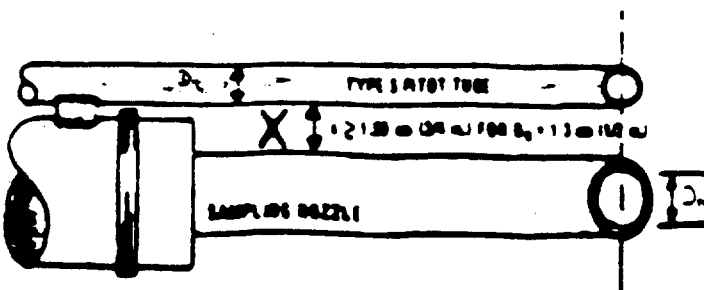


(γ, θ EXPRESSED IN DEGREES)

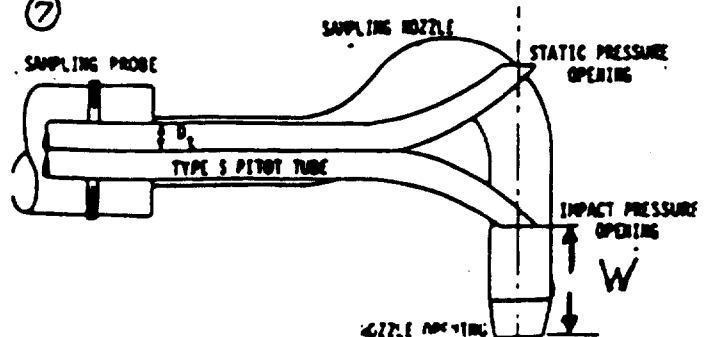
⑤



⑥



⑦



**COMPLIANCE DEMONSTRATION
#13 BATTERY COMBUSTION STACK**

**USS CLAIRTON WORKS
CLAIRTON, PA**

APPENDIX C

FIELD DATA SHEETS

STACK SAMPLING DATA SHEET

162

PLANT: USS Clinton DATE: 3-12-92 AHT: 1757 2-11-92 HOT BOX NO.: 1
 LOCATION: #13 Battery Stack TEST NO.: CLR-1385-1 METER CORRECTION: 0.9814 COLD BOX NO.: 1
 ACTIVITY NO.: 552 NOZZLE: 0.550 PITOT CORRECTION: 0.84 PROBE NO.: 10-2-12-12-92
 CONTROL BOX OPERATOR: DB STATIC PRESSURE PS: -1.2 CONTROL BOX NO.: 778 FILTER NO.: 778
 PROBE HANDLER: RC SU PORT DIRECTION: A, B NOMOGRAPH SET POINT: 120" STACK DIA.: 120"
 CLEAN UP: 29,05 BAROMETRIC PRESSURE: 29.05 LENGTHS OF UMBILICAL: 1 x 25' 1 x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H ₂ O	Orifice & H in. H ₂ O	Meter Temp In °F	Meter Temp Out °F	Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp. °C/°F	Hot Box °F	Comments
A 42.7	920	557.218	0.06	1.93	55	47	9.0	483	250	70.0 RATH	250	5.000 pt
30.0			0.045	1.74	55	47	8.5	486		<68°F		
21.3			0.04	1.54	56	47	8.5	492	250			
14.2			0.03	1.15	56	47	6.5	493		58	220	
8.0			0.03	1.15	56	47	6.0	490				
A 2.6	950	576.904	0.015	0.87	56	48	3.5	495	250	50	230	
B 42.7	954	576.904	0.03	1.15	57	50	5.0	483				
20.0			0.03	1.15	60	51	5.0	476	250			
21.3			0.03	1.15	59	51	5.0	448				
14.2			0.03	1.15	59	51	5.0	456	250			
8.0			0.025	0.98	59	51	4.5	463				9.0 H ₂ O = 16.5
B 2.6	1024	594.315	0.03	1.15	60	51	5.0	470	250			MW = 27.4

Impinger No.

Initial

Difference

1	2	3	4	5
711.2	625.4	467.4	648.8	
558.3	563.9	455.0	630.4	
152.9	61.5	12.4	18.4	

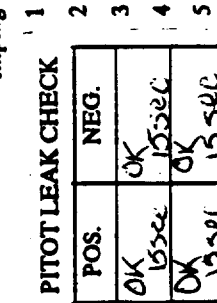
1	2	3	4	5
OK	OK	OK	OK	OK
13 sec	13 sec	13 sec	13 sec	13 sec

1	2	3	4	5
2.0	12.0			

1	2	3	4	5
CO ₂	O ₂	CO	N	

1	2	3	4	5
in. Hg.	Rate			
5.0	0.009			
10.0	0.008			

1	2	3	4	5
Before	After			





STACK SAMPLING DATA SHEET

PLANT USS Clanton DATE: 3-12-92 ALT@: 1,757 HOT BOX NO.: 1
LOCATION: 13 Battery Stack TEST NO.: CLR-1385-1 METER CORRECTION: 0.9841 COLD BOX NO.: 1
ACTIVITY NO.: 152 NOZZLE: 0.550 PITOT CORRECTION: 0.84 PROBE NO.: 10-2
CONTROL BOX OPERATOR: DB STATIC PRESSURE PS: 1.2 CONTROL BOX NO.: 1 FILTER NO.: 778
PROBE HANDLER: RC SW PORT DIRECTION: C/D NOMOGRAPH SET POINT: — STACK DIA.: 120"
CLEAN UP: — BAROMETRIC PRESSURE: 29.05 LENGTHS OF UMBILICAL 25' x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H ₂ O	Orifice Δ H in. H ₂ O	Meter Temp °F		Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp. °C/F	Hot Box °F	Comments
C 42.7	1027	594.915	0.045	1.74	1.74	52	6.5	473	250			
30.0			0.05	1.95	1.95	54	8.0	492				
21.3			0.035	1.37	1.37	54	5.5	425	250		230	
14.2			0.025	0.98	0.98	54	3.5	423				
8.0			0.03	1.17	1.17	54	3.5	402			230	
C 2.6	1057	612.842	0.015	0.59	0.59	53	3.5	423				
D 42.7	1100	612.842	0.05	1.95	1.95	53	8.0	416	250		230	
30.0			0.055	2.15	2.15	54	9.0	428				
21.3			0.06	2.34	2.34	55	10.0	454	250		230	
14.2			0.055	2.15	2.15	55	9.0	469				
8.0			0.05	1.95	1.95	54	8.5	443				
D 2.6	1130	637.049	0.045	1.76	1.76	55	8.5	463	250		230	

LEAK CHECK

	in. Hg.	Rate
Before		
After		

1 2

PITOT LEAK CHECK	
CO ₂	
O ₂	
CO	
N	

POS.	NEG.

Impinger No.

Final

Initial

Difference

1

2

3

4

5

STACK SAMPLING DATA SHEET

PLANT USS Clariton DATE: 3-12-92 AH@: 1.757 2-11-92 HOT BOX NO.: 3
 LOCATION: #13 Battery Stack TEST NO.: CLR-1365-2 METER CORRECTION: 0.9814 COLD BOX NO.: 3
 ACTIVITY NO.: NOZZLE: # 52 0 550 PITOT CORRECTION: 0.84 PROBE NO.: 10-3 (2-12-92)
 CONTROL BOX OPERATOR: RLK STATIC PRESSURE PS: -1.2 CONTROL BOX NO.: 779 FILTER NO.: 779
 PROBE HANDLER: DC PORT DIRECTION: DC NOMOGRAPH SET POINT: — STACK DIA.: 120"
 CLEAN UP: — BAROMETRIC PRESSURE: 29.05 LENGTHS OF UMBILICAL x 25' x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H ₂ O	Orifice A H in. H ₂ O	Meter Temp In °F	Meter Temp Out °F	Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp. °C/F	Hot Box °F	Comments
D 42.7	11:55	637.354	.05	1.97	197	57	12.0	399	250	48°F	250	
300			.05	1.97	177	58	12.0	399	—			
21.3			.045	1.77	177	57	12.0	408	250	45	240	
14.2			.05	1.97	177	57	12.0	438				
8.0			.04	1.58	189	57	11.5	420	250	45	240	
2.6	12:25	658.436	.03	1.18	118	57	8.5	328				
42.7	12:30	658.436	.05	2.02	2.02	53	12.0	457	250	46	245	
300			.045	1.81	1.8	64	12.0	475				
21.3			.045	1.81	1.81	60	12.0	425	255	48	250	
14.2			.04	1.61	1.61	60	10.5	397				
8.0			.035	1.41	1.41	59	9.5	391	250	47	250	16.5
2.6	13:00	679.430	.035	1.41	1.41	60	9.5	400				77.4

LEAK CHECK			PITOT LEAK CHECK			Impinger No.			Final Initial Difference		
Before	in. Hg.	Rate	1	2	3	1	2	3	Final	Initial	Difference
After	5.0	0.012	CO ₂	3.0	3.0	1	2	3	659.8	541.9	157.9
	13.0	0.017	O ₂	12.5	12.5	2	3	4	641.0	582.5	58.5
			CO			3	4	5	485.4	458.7	16.7
			N			4	5		693.6	659.5	34.1



Ag 2008

STACK SAMPLING DATA SHEET

PLANT: USS - CLAIRTON DATE: 03-12-92 AH@: 1757 (02-11-92) HOT BOX NO.: 3
LOCATION: #13 BATTERY SITE TEST NO.: CLR-1385-2 METER CORRECTION: -9814 COLD BOX NO.: 3
ACTIVITY NO.: NOZZLE: #52-550 PITOT CORRECTION: -84 PROBE NO.: 10-3
CONTROL BOX OPERATOR: LIC STATIC PRESSURE PS: -1.2 CONTROL BOX NO.: 1 FILTER NO.: 779
PROBE HANDLER: B.A PORT DIRECTION: B.A NOMOGRAPH SET POINT: — STACK DIA.: 130"
CLEAN UP: BAROMETRIC PRESSURE: 29.05 LENGTHS OF UMBILICAL: — x 25' — x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H ₂ O	Orifice all in. H ₂ O	Reg.	Act.	Meter Temp In	Out	Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp. °C/°F	Hot Box °F	Comments
B 42.7	1305	679.430	.045	1.81	1.81	1.81	57	53	12.5	423	250	42.8	250	
30.0			.045	1.81	1.81	1.81	61	54	12.5	439				
31.3			.045	1.81	1.81	1.81	63	55	12.5	456	250	40	255	
14.2			.035	1.41	1.41	1.41	62	50	9.5	465				
8.0			.035	1.41	1.41	1.41	62	50	9.5	461	250	42	255	
B 2.6	1335	700.110	.03	1.21	1.21	1.21	62	56	7.5	450				
A 42.7	1340	700.110	.05	2.02	2.02	2.02	60	54	12.5	422	250	40	255	
30.0			.05	2.02	2.02	2.02	62	55	12.5	412				
21.3			.045	1.81	1.81	1.81	62	55	12.0	420	250	40	255	
14.2			.045	1.81	1.81	1.81	61	54	12.0	412				
8.0			.04	1.61	1.61	1.61	60	54	10.0	400	250	40	250	probe 16.5%
A 2.6	1410	722.141	.035	1.41	1.41	1.41	63	53	8.5	400				wt 274

LEAK CHECK

	in. Hg.	Rate
Before		
After	13.0	40.017

PITOT LEAK CHECK

	1	2	3
CO ₂	3.0	3.0	3.0
O ₂	12.5	12.5	12.5
CO	0.2	0.2	0.2
N	14.5	14.5	14.5

Impinger No. Final Initial Difference

1 2 3 4 5

1 of 2



STACK SAMPLING DATA SHEET

PLANT USS-CLARKTON DATE: 03-72-92 1100 1,757 (02-1-92) HOT BOX NO.: 7
 LOCATION: #13 BA 1721 2nd TEST NO.: 018-1385-3 METER CORRECTION: 9.814 COLD BOX NO.: 7
 ACTIVITY NO.: 550 #50 NOZZLE: 550 PITOT CORRECTION: 0.84 PROBE NO.: 10-2 (212-92)
 CONTROL BOX OPERATOR: 06 STATIC PRESSURE PS: -1.2 CONTROL BOX NO.: 1 FILTER NO.: 725
 PROBE HANDLER: SW, RC FORT DIRECTION: A, B NOMOGRAPH SET POINT: - STACK DIA.: 12.0"
 CLEAN UP: BAROMETRIC PRESSURE: 29.05 LENGTHS OF UMBILICAL x 25' x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H ₂ O	Orifice All in. H ₂ O	Meter Temp °F	Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp. °C/F	Hot Box °F	Comments
				Reg. Act.	In. Out						
A	42.7	722A67	0.05	1.88	1.88	57	54	5.0	477	250	5 mi/pt
	30.0		0.05	1.88	1.88	63	55	5.0	402		
	21.3		0.04	1.50	1.50	64	54	4.5	411	250	Installed new heater cone
	14.2		0.04	1.50	1.50	64	54	4.5	405		
	8.0		0.03	1.13	1.13	64	55	3.5	380	250	
A	3.6	743.262	0.03	1.13	1.13	64	56	3.5	387		
B	42.7	743.262	0.045	1.69	1.69	60	55	5.0	426	250	
	30.0		0.035	1.41	1.41	65	56	5.0	453		
	31.3		0.04	1.61	1.61	65	56	5.0	458	250	
	14.2		0.035	1.41	1.41	66	56	5.0	464		
	8.0		0.035	1.41	1.41	65	56	4.5	448	250	MW=27.4
B	3.6	763.837	0.015	0.61	0.61	63	56	2.5	452		%H ₂ O = 16.5

LEAK CHECK

	in. Hg.	Rate
Before	5.0	0.010
After	6.0	0.007

PITOT LEAK CHECK

POS.	NEG.
OK	OK
15 sec	15 sec
OK	OK
15 sec	15 sec

Impinger No.	Final	Initial	Difference
1	712.0	544.1	167.9
2	614.8	562.3	52.5
3	441.1	435.1	6.0
4	676.2	658.0	18.2
5			



STACK SAMPLING DATA SHEET

PLANT 15X-CLARITOR DATE: 03-12-92 ΔH@: 1.757 (02-11-92) HOT BOX NO.: 7
LOCATION: 13 WATER ST TEST NO.: 412-1335-3 METER CORRECTION: 9814 COLD BOX NO.: 7
ACTIVITY NO.: 0.550 NOZZLE: 1.52 PITOT CORRECTION: 84 PROBE NO.: 10-2
CONTROL BOX OPERATOR: 1.2 CONTROL BOX NO.: 1 FILTER NO.: 725
PROBE HANDLER: 0.0 PORT DIRECTION: 0.0 NOMOGRAPH SET POINT: — STACK DIA.: 120"
CLEAN UP: 39.05 BAROMETRIC PRESSURE: 39.05 LENGTHS OF UMBILICAL: 25' x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H ₂ O	Orifice a H in. H ₂ O Req. Act.	Meter Temp °F In Out	Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp. °C/°F	Hot Box °F	Comments
C 42.7	1544	763.837	0.03	1.21	59	86	360	250		230	
30.0			0.025	1.01	63	55	390				
31.3			0.03	1.21	64	55	392			250	
14.2			0.025	1.01	64	56	392	250			
3.0			0.02	0.81	64	56	385			250	
C 2.6	1614	781.340	0.02	0.81	64	56	390				
D 42.7	1618	781.340	0.055	2.24	63	56	442	250		260	
30.0			0.055	2.24	67	56	468				
21.3			0.05	2.04	68	57	475	250		250	
14.2			0.04	1.63	69	57	480				
3.0			0.025	1.01	66	57	487	250		240	
D 2.6	1648	802.915	0.02	0.81	65	57	490				

LEAK CHECK

	in. Hg.	Rate
Before		
After		

PITOT LEAK CHECK

	1	2
CO ₂	123.0	98.8
O ₂	12.5	
CO		
N		

Impinger No.	Final	Initial	Difference
1			
2			
3			
4			
5			

**COMPLIANCE DEMONSTRATION
#13 BATTERY COMBUSTION STACK**

**USS CLAIRTON WORKS
CLAIRTON, PA**

APPENDIX D

EMISSIONS CALCULATIONS

KEYSTONE ENVIRONMENTAL RESOURCES
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA
#13 BATTERY STACK

DATE:3-12-92
CHARGE #: ...150-605033
TEST #:CLR-13BS-3

1. EMISSION RESULTS

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.00717	2.02322

2. STACK CONDITIONS

FLOW (ACFM)	65766.
(SCFM)	37777.
MOISTURE CONTENT (%)	12.85
STACK TEMPERATURE (F)	429.8

3. SAMPLING CONDITIONS

SAMPLE TIME (MIN.)	120.0
SCFD GAS SAMPLED	78.182
PERCENT ISOKINETIC	94.21

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA #13 BATTERY STACK
CLR-13BS-3 3-12-92

FIELD DATA AND VELOCITY CALCULATIONS

POINT	TIME	METER READING (DRY) CF	DELTA P IN. H2O	ORIFICE DELTA H		METER TEMP DEG F		VACUUM IN. HG.	STACK TEMP DEG	CORRECTED VELOCITY FFT/SEC
				REQ	ACT	IN	OUT			
42.7A	1434.0	722.467	.050	1.88	1.88	57.	54.	5.0	477.	17.3
30.0			.050	1.88	1.88	63.	55.	5.0	402.	16.6
21.3			.040	1.50	1.50	64.	54.	4.5	411.	15.0
14.2			.040	1.50	1.50	64.	54.	4.5	405.	14.9
8.0			.030	1.13	1.13	64.	55.	3.5	380.	12.7
2.6A	1504.0	743.262	.030	1.13	1.13	64.	56.	3.5	387.	12.8
42.7B	1509.0	743.262	.045	1.69	1.69	60.	55.	5.0	426.	16.0
30.0			.035	1.41	1.41	65.	56.	5.0	453.	14.3
21.3			.040	1.61	1.61	65.	56.	5.0	458.	15.4
14.2			.035	1.41	1.41	66.	56.	5.0	464.	14.4
8.0			.035	1.41	1.41	65.	56.	4.5	448.	14.3
2.6B	1539.0	763.837	.015	.62	.61	63.	56.	2.5	452.	9.4
42.7C	1544.0	763.837	.030	1.21	1.21	59.	56.	3.5	360.	12.6
30.0			.025	1.01	1.01	63.	55.	3.5	390.	11.7
21.3			.030	1.21	1.21	64.	55.	4.0	392.	12.8
14.2			.025	1.01	1.01	64.	56.	4.0	392.	11.7
8.0			.020	.81	.81	64.	56.	3.0	385.	10.4
2.6C	1614.0	781.340	.020	.81	.81	64.	56.	3.0	390.	10.4
42.7D	1618.0	781.340	.055	2.24	2.24	63.	56.	6.0	442.	17.9
30.0			.055	2.24	2.24	67.	56.	6.0	468.	18.1
21.3			.050	2.04	2.04	68.	57.	6.0	475.	17.3
14.2			.040	1.63	1.63	69.	57.	5.5	480.	15.5
8.0			.025	1.01	1.01	66.	57.	3.5	487.	12.3
2.6D	1648.0	802.915	.020	.81	.81	65.	57.	3.0	490.	11.0

O R S A T

CO2 3.0
O2 12.5
CO .0
N 84.5

IMPINGER NO. 1 167.9
2 52.5
3 6.0
4 .0
ABSORBED H2O 18.2

CONTROL BOX CALIBRATIONS

	FACTOR	DATE
ORIFICE	1.757	2-11-92
METER	0.9814	2-11-92
PITOT	0.84	2-12-92

LEAK CHECK

	RATE	IN. HG
INITIAL	0.010 CFM	5.0
FINAL	0.007 CFM	6.0

CONTROL BOX NO. 1

PROBE NO. 10-2

NOZZLE NO. 52

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA #13 BATTERY STACK
CLR-13BS-3 3-12-92

STACK SAMPLING CALCULATIONS

A.	BAROMETRIC PRESSURE IN. HG.....	29.05
B.	AVG. DELTA H (IN H2O).....	1.38
C.	METER PRESSURE (IN. HG.).....	29.15
D.	STATIC PRESSURE (IN. H2O).....	-1.20
E.	STATIC PRESSURE (IN. HG.).....	-.088
F.	STACK PRESSURE (IN. HG.) (A+E).....	28.96
G.	STACK DIAMETER (IN.).....	120.00
H.	STACK AREA (SQ. FT.).....	78.54
	NOZZLE DIAMETER.....	.5500
I.	NOZZLE AREA (SQ. FT.).....	.001650
J.	AVG. STACK TEMP (DEG. R.).....	889.8
K.	AVG. METER TEMP (DEG. R.).....	519.9
L.	CONDENSATE VOL. (ML).....	226.4
M.	ABSORBED H2O (ML).....	18.2
N.	TOTAL H2O (ML).....	244.6
O.	METERED GAS (CF).....	80.448
P.	GAS METER CORRECTION.....	.9814
Q.	CORRECTED METERED GAS (CF).....	78.952
R.	H2O GAS VOLUME (CF) (0.00267N(K/C).....	11.646
S.	TOTAL SAMPLED VOLUME (CF) (Q+R).....	90.598
T.	PERCENT H2O (100R/S).....	12.85
	THEORETICAL MAXIMUM.....	100.00
	PERCENT WATER USED.....	12.85
U.	SCFD GAS SAMPLED (528*Q*C/(29.9*K)).....	78.182

V. MOLECULAR WEIGHT OF STACK GAS

COMPONENT	ORSAT-DRY VOL. PCT./100		MOISTURE CORRECTION (1-T/100)		MOLECULAR WEIGHT	=	WEIGHT PER MOLE
CO2	.030	X	.8715	X	44.0	=	1.15
CO	.000	X	.8715	X	28.0	=	.00
O2	.125	X	.8715	X	32.0	=	3.49
N2	.845	X	.8715	X	28.2	=	20.77
H2O		X	T/100= .1285	X	18.0	=	2.31
MOLECULAR WEIGHT OF STACK GAS							= 27.72

W.	PITOT CORRECTION.....	.840
X.	AVERAGE CORRECTED VELOCITY (FPS).....	13.96
	[85.49*W*SQRT((J*DELTA P)/(V*F))]	
Y.	AVG. FLOW RATE (CFM) (X*H*60).....	65766.
Z.	STACK FLOW RATE (SCFM) (528*Y/J*F/29.92).....	37777.
	STACK FLOW RATE (DRY).....	32921.
AA.	SAMPLE TIME (SEC).....	7200.
BB.	PERCENT ISOKINETIC.....	94.21
	(J*100*U*29.92)/(528*X*AA*I*F*(1-T/100))	

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA #13 BATTERY STACK
CLR-13BS-3 3-12-92

PARAMETER	CYCLONE WT. (G)	MATL.ON FILTER(G)	INSOL.MATL. IN PROBE(G)	SOL.MATL. IN PROBE(G)
PARTICULATE	.00000	.00600	.00000	.03020

PARAMETER	INSOL.MATL. IN IMP. (G)	SOLUBLE MATL. IN IMP. (G)
PARTICULATE	.00020	.01030

PARTICULATE .04670

ALL MATLS. .04670

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.00717	2.02322

Emission rates are based on the PA method.
The soluble impinger weight is excluded from the calculations

KEYSTONE ENVIRONMENTAL RESOURCES
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA
#13 BATTERY STACK

DATE:3-12-92
CHARGE #: ...150-605033
TEST #:CLR-13BS-2

1. EMISSION RESULTS

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.00696	2.17115

2. STACK CONDITIONS

FLOW (ACFM)	72367.
(SCFM)	41908.
MOISTURE CONTENT (%)	13.19
STACK TEMPERATURE (F)	422.5

3. SAMPLING CONDITIONS

SAMPLE TIME (MIN.)	120.0
SCFD GAS SAMPLED	82.949
PERCENT ISOKINETIC	90.44

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA #13 BATTERY STACK
CLR-13BS-2 3-12-92

FIELD DATA AND VELOCITY CALCULATIONS

POINT	TIME	METER READING (DRY) CF	DELTA P IN.H2O	ORIFICE DELTA H		METER TEMP DEG F		VACUUM IN.HG.	STACK TEMP DEG	CORRECTED VELOCITY FFT/SEC
				REQ	ACT	IN	OUT			
42.7D	1155.0	637.354	.050	1.97	1.97	57.	52.	12.0	399.	16.6
30.0			.050	1.97	1.97	58.	52.	12.0	399.	16.6
21.3			.045	1.77	1.77	57.	51.	12.0	408.	15.8
14.2			.050	1.97	1.97	57.	51.	12.0	438.	17.0
8.0			.040	1.58	1.58	57.	51.	11.5	420.	15.0
2.6D	1225.0	658.436	.030	1.18	1.18	57.	51.	8.5	378.	12.7
42.7C	1230.0	658.436	.050	2.02	2.02	58.	53.	12.0	451.	17.1
30.0			.045	1.81	1.81	64.	50.	12.0	475.	16.5
21.3			.045	1.81	1.81	60.	54.	12.0	425.	16.0
14.2			.040	1.61	1.61	60.	54.	10.5	397.	14.8
8.0			.035	1.41	1.41	59.	54.	9.5	391.	13.8
2.6C	1300.0	679.430	.025	1.41	1.41	60.	53.	9.5	400.	11.8
42.7B	1305.0	679.430	.045	1.81	1.81	57.	53.	12.5	423.	16.0
30.0			.045	1.81	1.81	61.	54.	12.5	439.	16.1
21.3			.045	1.81	1.81	63.	55.	12.5	456.	16.3
14.2			.035	1.41	1.41	62.	56.	9.5	465.	14.4
8.0			.035	1.41	1.41	62.	56.	9.5	461.	14.4
2.6B	1335.0	700.110	.030	1.21	1.21	62.	56.	7.5	450.	13.3
42.7A	1340.0	700.110	.050	2.02	2.02	65.	54.	12.5	422.	16.8
30.0			.050	2.02	2.02	62.	55.	12.5	412.	16.7
21.3			.045	1.81	1.81	62.	55.	12.0	420.	16.0
14.2			.045	1.81	1.81	61.	54.	12.0	412.	15.9
8.0			.040	1.61	1.61	60.	54.	10.0	400.	14.9
2.6A	1410.0	722.141	.035	1.41	1.41	63.	55.	8.5	400.	13.9

O R S A T

CO2 3.0
O2 12.5
CO .0
N 84.5

IMPINGER NO. 1 157.9
2 58.5
3 16.7
4 .0
ABSORBED H2O 34.1

CONTROL BOX CALIBRATIONS

	FACTOR	DATE
ORIFICE	1.757	2-11-92
METER	0.9814	2-11-92
PITOT	0.84	2-12-92

LEAK CHECK

	RATE	IN.HG
INITIAL	0.012 CFM	5.0
FINAL	0.017 CFM	13.0

CONTROL BOX NO. 1

PROBE NO. 10-3

NOZZLE NO. 52

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA #13 BATTERY STACK
CLR-13BS-2 3-12-92

STACK SAMPLING CALCULATIONS

A.	BAROMETRIC PRESSURE IN. HG.....	29.05
B.	AVG. DELTA H (IN H2O).....	1.69
C.	METER PRESSURE (IN. HG.).....	29.17
D.	STATIC PRESSURE (IN. H2O).....	-1.20
E.	STATIC PRESSURE (IN. HG.).....	-.088
F.	STACK PRESSURE (IN. HG.) (A+E).....	28.96
G.	STACK DIAMETER (IN.).....	120.00
H.	STACK AREA (SQ. FT.).....	78.54
	NOZZLE DIAMETER.....	.5500
I.	NOZZLE AREA (SQ. FT.).....	.001650
J.	AVG. STACK TEMP (DEG. R.).....	882.5
K.	AVG. METER TEMP (DEG. R.).....	516.8
L.	CONDENSATE VOL. (ML).....	233.1
M.	ABSORBED H2O (ML).....	34.1
N.	TOTAL H2O (ML).....	267.2
O.	METERED GAS (CF).....	84.787
P.	GAS METER CORRECTION.....	.9814
Q.	CORRECTED METERED GAS (CF).....	83.210
R.	H2O GAS VOLUME (CF) (0.00267N(K/C).....	12.638
S.	TOTAL SAMPLED VOLUME (CF) (Q+R).....	95.848
T.	PERCENT H2O (100R/S).....	13.19
	THEORETICAL MAXIMUM.....	100.00
	PERCENT WATER USED.....	13.19
U.	SCFD GAS SAMPLED (528*Q*C/(29.9*K)).....	82.949

V. MOLECULAR WEIGHT OF STACK GAS

COMPONENT	ORSAT-DRY VOL.PCT./100	X	MOISTURE CORRECTION (1-T/100)	X	MOLECULAR WEIGHT	=	WEIGHT PER MOLE
CO2	.030	X	.8681	X	44.0	=	1.15
CO	.000	X	.8681	X	28.0	=	.00
O2	.125	X	.8681	X	32.0	=	3.47
N2	.845	X	.8681	X	28.2	=	20.69
H2O		X	T/100= .1319	X	18.0	=	2.37
MOLECULAR WEIGHT OF STACK GAS							= 27.68

W.	PITOT CORRECTION.....	.840
X.	AVERAGE CORRECTED VELOCITY (FPS).....	15.36
	[85.49*W*SQRT{(J*DELTA P)/(V*F)}]	
Y.	AVG. FLOW RATE (CFM) (X*H*60).....	72367.
Z.	STACK FLOW RATE (SCFM) (528*Y/J*F/29.92).....	41908.
	STACK FLOW RATE (DRY).....	36383.
AA.	SAMPLE TIME (SEC).....	7200.
BB.	PERCENT ISOKINETIC.....	90.44
	(J*100*U*29.92)/(528*X*AA*I*F*(1-T/100))	

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA #13 BATTERY STACK
CLR-13BS-2 3-12-92

PARAMETER	CYCLONE WT. (G)	MATL.ON FILTER(G)	INSOL.MATL. IN PROBE(G)	SOL.MATL. IN PROBE(G)
PARTICULATE	.00000	.00650	.00000	.02980

PARAMETER	INSOL.MATL. IN IMP. (G)	SOLUBLE MATL. IN IMP. (G)
PARTICULATE	.00120	.01000

PARTICULATE .04750

ALL MATLS. .04750

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.00696	2.17115

Emission rates are based on the PA method.
The soluble impinger weight is excluded from the calculations

KEYSTONE ENVIRONMENTAL RESOURCES
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA
#13 BATTERY STACK

DATE:3-12-92
CHARGE #: ...150-605033
TEST #:CLR-13BS-1

1. EMISSION RESULTS

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.00681	1.96874

2. STACK CONDITIONS

FLOW (ACFM)	68978.
(SCFM)	38694.
MOISTURE CONTENT (%)	12.88
STACK TEMPERATURE (F)	451.1

3. SAMPLING CONDITIONS

SAMPLE TIME (MIN.)	120.0
SCFD GAS SAMPLED	78.204
PERCENT ISOKINETIC	92.03

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA #13 BATTERY STACK
CLR-13BS-1 3-12-92

FIELD DATA AND VELOCITY CALCULATIONS

POINT	TIME	METER READING (DRY) CF	DELTA P IN.H2O	ORIFICE DELTA H REQ ACT	METER TEMP DEG F IN OUT	VACUUM IN.HG.	STACK TEMP DEG	CORRECTED VELOCITY FFT/SEC
42.7A	920.0	557.218	.050	1.93 1.93	55. 47.	9.0	483.	17.5
30.0			.045	1.74 1.74	55. 47.	8.5	486.	16.6
21.3			.040	1.54 1.54	56. 47.	8.5	492.	15.7
14.2			.030	1.15 1.15	56. 47.	6.5	493.	13.6
8.0			.030	1.15 1.15	56. 47.	6.0	490.	13.6
2.6A	950.0	576.904	.015	.57 .57	56. 48.	3.5	495.	9.6
42.7B	954.0	576.904	.030	1.15 1.15	57. 50.	5.0	483.	13.5
30.0			.030	1.15 1.15	60. 51.	5.0	476.	13.5
21.3			.030	1.15 1.15	59. 51.	5.0	448.	13.3
14.2			.030	1.15 1.15	59. 51.	5.0	456.	13.3
8.0			.025	.98 .98	59. 51.	4.5	463.	12.2
2.6B	1024.0	594.315	.030	1.15 1.15	60. 51.	470.0 5.0	250.470	11.7
42.7C	1027.0	594.315	.045	1.74 1.74	60. 52.	6.5 <i>DEB</i>	473.	16.5
30.0			.050	1.95 1.95	65. 54.	8.0	492.	17.5
21.3			.035	1.37 1.37	64. 54.	5.5	425.	14.1
14.2			.025	.98 .98	62. 54.	3.5	423.	11.9
8.0			.030	1.17 1.17	61. 54.	3.5	402.	12.9
2.6C	1057.0	612.842	.015	.59 .59	60. 53.	3.5	423.	9.2
42.7D	1100.0	612.842	.050	1.95 1.95	61. 53.	8.0	416.	16.8
30.0			.055	2.15 2.15	65. 54.	9.0	428.	17.8
21.3			.060	2.34 2.34	65. 55.	10.0	454.	18.8
14.2			.055	2.15 2.15	65. 55.	9.0	469.	18.2
8.0			.050	1.95 1.95	64. 54.	8.5	443.	17.1
2.6D	1130.0	637.049	.045	1.76 1.76	64. 55.	8.5	463.	16.4

O R S A T

CO2 2.0
O2 12.0
CO .0
N 86.0

IMPINGER NO. 1 152.9
2 61.5
3 12.4
4 .0
ABSORBED H2O 18.4

CONTROL BOX CALIBRATIONS

	FACTOR	DATE
ORIFICE	1.757	2-11-92
METER	0.9814	2-11-92
PITOT	0.84	2-12-92

LEAK CHECK

	RATE	IN.HG
INITIAL	0.009 CFM	5.0
FINAL	0.008 CFM	10.0

CONTROL BOX NO. 1

PROBE NO. 10-2

NOZZLE NO. 52

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA #13 BATTERY STACK
CLR-13BS-1 3-12-92

STACK SAMPLING CALCULATIONS

A.	BAROMETRIC PRESSURE IN. HG.....	29.05
B.	AVG. DELTA H (IN H2O).....	1.45
C.	METER PRESSURE (IN. HG.).....	29.16
D.	STATIC PRESSURE (IN. H2O).....	-1.20
E.	STATIC PRESSURE (IN. HG.).....	-.088
F.	STACK PRESSURE (IN. HG.) (A+E).....	28.96
G.	STACK DIAMETER (IN.).....	120.00
H.	STACK AREA (SQ. FT.).....	78.54
	NOZZLE DIAMETER.....	.5500
I.	NOZZLE AREA (SQ. FT.).....	.001650
J.	AVG. STACK TEMP (DEG. R.).....	911.1
K.	AVG. METER TEMP (DEG. R.).....	515.8
L.	CONDENSATE VOL. (ML).....	226.8
M.	ABSORBED H2O (ML).....	18.4
N.	TOTAL H2O (ML).....	245.2
O.	METERED GAS (CF).....	79.831
P.	GAS METER CORRECTION.....	.9814
Q.	CORRECTED METERED GAS (CF).....	78.346
R.	H2O GAS VOLUME (CF) (0.00267N(K/C).....	11.582
S.	TOTAL SAMPLED VOLUME (CF) (Q+R).....	89.928
T.	PERCENT H2O (100R/S).....	12.88
	THEORETICAL MAXIMUM.....	100.00
	PERCENT WATER USED.....	12.88
U.	SCFD GAS SAMPLED (528*Q*C/(29.9*K)).....	78.204

V. MOLECULAR WEIGHT OF STACK GAS

COMPONENT	ORSAT-DRY VOL.PCT./100	X	MOISTURE CORRECTION (1-T/100)	X	MOLECULAR WEIGHT	=	WEIGHT PER MOLE
CO2	.020	X	.8712	X	44.0	=	.77
CO	.000	X	.8712	X	28.0	=	.00
O2	.120	X	.8712	X	32.0	=	3.35
N2	.860	X	.8712	X	28.2	=	21.13
H2O		X	T/100= .1288	X	18.0	=	2.32
MOLECULAR WEIGHT OF STACK GAS							= 27.56

W.	PITOT CORRECTION.....	.840
X.	AVERAGE CORRECTED VELOCITY (FPS).....	14.64
	[85.49*W*SQRT((J*DELTA P)/(V*F))]	
Y.	AVG. FLOW RATE (CFM) (X*H*60).....	68978.
Z.	STACK FLOW RATE (SCFM) (528*Y/J*F/29.92).....	38694.
	STACK FLOW RATE (DRY).....	33711.
AA.	SAMPLE TIME (SEC).....	7200.
BB.	PERCENT ISOKINETIC.....	92.03
	(J*100*U*29.92)/(528*X*AA*I*F*(1-T/100))	

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA #13 BATTERY STACK
CLR-13BS-1 3-12-92

PARAMETER	CYCLONE WT. (G)	MATL.ON FILTER(G)	INSOL.MATL. IN PROBE(G)	SOL.MATL. IN PROBE(G)
PARTICULATE	.00000	.00370	.00000	.02880

PARAMETER	INSOL.MATL. IN IMP. (G)	SOLUBLE MATL. IN IMP. (G)
PARTICULATE	.00210	.01260

PARTICULATE .04720

ALL MATLS. .04720

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.00681	1.96874

Emission rates are based on the PA method.
The soluble impinger weight is excluded from the calculations

Plan

Activity No. 605033-01

0.22M
millipore →
ACETONE →
WATER ↓

[illegible]

**COMPLIANCE DEMONSTRATION
#13 BATTERY COMBUSTION STACK**

**USS CLAIRTON WORKS
CLAIRTON, PA**

APPENDIX E

VISIBLE EMISSIONS DATA

VISIBLE EMISSIONS OBSERVATIONS FORM

13 STACK

OBSERVER: Chuck Davis

DATE: 3-12-92

FACILITY: USS CLARKTON

OBSERVATION: START TIME: 9:20

END TIME: _____

OBSERVATION POINT:

Parking lot wallwash

SOURCE:

DISTANCE: 600'

DIRECTION FROM: _____

HEIGHT: _____

WIND:

SPEED: 16'

DIRECTION: South West

TEMPERATURE: 20°

SKY CONDITION: Cloudy

BACKGROUND: SKY

READING CONDITIONS: Fair

COLOR OF EMISSION: _____

TOTAL No. OF READINGS: _____

No. READINGS $\geq$ 20% _____

No. READINGS $\geq$ 60% _____

GREATEST OPACITY: _____

CREW: _____ FOREMAN: _____

COMMENTS: _____

Port A				
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0

Port B				
30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0

VISIBLE EMISSIONS OBSERVATIONS FORM

13 STACK

OBSERVER: Chuck Davis

DATE: 3-12-92

FACILITY: USS Charleston

OBSERVATION: START TIME: 10128

END TIME: _____

OBSERVATION POINT: _____

SOURCE: _____

DISTANCE: 600

DIRECTION FROM: _____

HEIGHT: _____

WIND: _____

SPEED: 18

DIRECTION: WEST

TEMPERATURE: 24°

SKY CONDITION: Cloudy

BACKGROUND: SKY

READING CONDITIONS: Fair

COLOR OF EMISSION: _____

TOTAL No. OF READINGS: _____

No. READINGS $\geq$ 20% _____

No. READINGS $\geq$ 60% _____

GREATEST OPACITY: _____

CREW: _____ FOREMAN: _____

COMMENTS: _____

PORT "C"				
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0

PORT "D"				
30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0

VISIBLE EMISSIONS OBSERVATIONS FORM

13 STACK

OBSERVER: CHUCK DAVIS

DATE: 3-12-98

FACILITY: USS CHAETON

OBSERVATION: START TIME: 11:55

END TIME: _____

OBSERVATION POINT: _____

Backlog at walkway

SOURCE: _____

DISTANCE: 600

DIRECTION FROM: _____

HEIGHT: _____

WIND: _____

SPEED: 15

DIRECTION: WEST

TEMPERATURE: 25°

SKY CONDITION: Cloudy

BACKGROUND: sky + clouds

READING CONDITIONS: Fair

COLOR OF EMISSION: _____

TOTAL No. OF READINGS: _____

No. READINGS $\geq$ 20% _____

No. READINGS $\geq$ 60% _____

GREATEST OPACITY: _____

CREW: _____ FOREMAN: _____

COMMENTS: _____

PORT "D"				
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0

PORT "C"				
30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0

VISIBLE EMISSIONS OBSERVATIONS FORM

13 STACK

OBSERVER: CHUCK DAVIS

DATE: 3-12-92

FACILITY: USS CLARKTON

OBSERVATION: START TIME: 1908

END TIME: _____

OBSERVATION POINT:

Parking Lot Wall Bash

SOURCE:

DISTANCE: 600'

DIRECTION FROM: _____

HEIGHT: _____

WIND:

SPEED: 16

DIRECTION: WEST

TEMPERATURE: 26°

SKY CONDITION: Cloudy

BACKGROUND: SKY + Clouds

READING CONDITIONS: FAIR

COLOR OF EMISSION: _____

TOTAL No. OF READINGS: _____

No. READINGS $\geq$ 20% _____

No. READINGS $\geq$ 60% _____

GREATEST OPACITY: _____

CREW: _____ FOREMAN: _____

COMMENTS: _____

PORT "B"				
0	☐	☐	☐	☐
1	☐	☐	☐	☐
2	☐	☐	☐	☐
3	☐	☐	☐	☐
4	☐	☐	☐	☐
5	☐	☐	☐	☐
6	☐	☐	☐	☐
7	☐	☐	☐	☐
8	☐	☐	☐	☐
9	☐	☐	☐	☐
10	☐	☐	☐	☐
11	☐	☐	☐	☐
12	☐	☐	☐	☐
13	☐	☐	☐	☐
14	☐	☐	☐	☐
15	☐	☐	☐	☐
16	☐	☐	☐	☐
17	☐	☐	☐	☐
18	☐	☐	☐	☐
19	☐	☐	☐	☐
20	☐	☐	☐	☐
21	☐	☐	☐	☐
22	☐	☐	☐	☐
23	☐	☐	☐	☐
24	☐	☐	☐	☐
25	☐	☐	☐	☐
26	☐	☐	☐	☐
27	☐	☐	☐	☐
28	☐	☐	☐	☐
29	☐	☐	☐	☐

PORT "A"				
30	☐	☐	☐	☐
31	☐	☐	☐	☐
32	☐	☐	☐	☐
33	☐	☐	☐	☐
34	☐	☐	☐	☐
35	☐	☐	☐	☐
36	☐	☐	☐	☐
37	☐	☐	☐	☐
38	☐	☐	☐	☐
39	☐	☐	☐	☐
40	☐	☐	☐	☐
41	☐	☐	☐	☐
42	☐	☐	☐	☐
43	☐	☐	☐	☐
44	☐	☐	☐	☐
45	☐	☐	☐	☐
46	☐	☐	☐	☐
47	☐	☐	☐	☐
48	☐	☐	☐	☐
49	☐	☐	☐	☐
50	☐	☐	☐	☐
51	☐	☐	☐	☐
52	☐	☐	☐	☐
53	☐	☐	☐	☐
54	☐	☐	☐	☐
55	☐	☐	☐	☐
56	☐	☐	☐	☐
57	☐	☐	☐	☐
58	☐	☐	☐	☐
59	☐	☐	☐	☐

VISIBLE EMISSIONS OBSERVATIONS FORM

13 STACKOBSERVER: Chuck DavisDATE: 3-12-92FACILITY: USS CHARITONOBSERVATION: START TIME: 2:34

END TIME: _____

OBSERVATION POINT:

Parking Lot wall on R.

SOURCE:

DISTANCE: 600'

DIRECTION FROM: _____

HEIGHT: _____

WIND:

SPEED: 17DIRECTION: WESTTEMPERATURE: 27°SKY CONDITION: CloudyBACKGROUND: Sky + CloudsREADING CONDITIONS: Fair

COLOR OF EMISSION: _____

TOTAL No. OF READINGS: _____

No. READINGS $\geq$ 20% _____No. READINGS $\geq$ 60% _____

GREATEST OPACITY: _____

CREW: _____ FOREMAN: _____

COMMENTS: _____

PORT "A"				
0	☐	☐	☐	☐
1	☐	☐	☐	☐
2	☐	☐	☐	☐
3	☐	☐	☐	☐
4	☐	☐	☐	☐
5	☐	☐	☐	☐
6	☐	☐	☐	☐
7	☐	☐	☐	☐
8	☐	☐	☐	☐
9	☐	☐	☐	☐
10	☐	☐	☐	☐
11	☐	☐	☐	☐
12	☐	☐	☐	☐
13	☐	☐	☐	☐
14	☐	☐	☐	☐
15	☐	☐	☐	☐
16	☐	☐	☐	☐
17	☐	☐	☐	☐
18	☐	☐	☐	☐
19	☐	☐	☐	☐
20	☐	☐	☐	☐
21	☐	☐	☐	☐
22	☐	☐	☐	☐
23	☐	☐	☐	☐
24	☐	☐	☐	☐
25	☐	☐	☐	☐
26	☐	☐	☐	☐
27	☐	☐	☐	☐
28	☐	☐	☐	☐
29	☐	☐	☐	☐

PORT "B"				
30	☐	☐	☐	☐
31	☐	☐	☐	☐
32	☐	☐	☐	☐
33	☐	☐	☐	☐
34	☐	☐	☐	☐
35	☐	☐	☐	☐
36	☐	☐	☐	☐
37	☐	☐	☐	☐
38	☐	☐	☐	☐
39	☐	☐	☐	☐
40	☐	☐	☐	☐
41	☐	☐	☐	☐
42	☐	☐	☐	☐
43	☐	☐	☐	☐
44	☐	☐	☐	☐
45	☐	☐	☐	☐
46	☐	☐	☐	☐
47	☐	☐	☐	☐
48	☐	☐	☐	☐
49	☐	☐	☐	☐
50	☐	☐	☐	☐
51	☐	☐	☐	☐
52	☐	☐	☐	☐
53	☐	☐	☐	☐
54	☐	☐	☐	☐
55	☐	☐	☐	☐
56	☐	☐	☐	☐
57	☐	☐	☐	☐
58	☐	☐	☐	☐
59	☐	☐	☐	☐

VISIBLE EMISSIONS OBSERVATIONS FORM

13 STACKOBSERVER: BUCK DAVISDATE: 3-12-92FACILITY: USS CHARLOTTEOBSERVATION: START TIME: 15:44

END TIME: _____

OBSERVATION POINT:

Packshot wallwash

SOURCE:

DISTANCE: 600'

DIRECTION FROM: _____

HEIGHT: _____

WIND:

SPEED: 18DIRECTION: westTEMPERATURE: 28°SKY CONDITION: CloudyBACKGROUND: Sky + CloudsREADING CONDITIONS: Fair

COLOR OF EMISSION: _____

TOTAL No. OF READINGS: _____

No. READINGS $\geq$ 20% _____No. READINGS $\geq$ 60% _____

GREATEST OPACITY: _____

CREW: _____ FOREMAN: _____

COMMENTS: _____

Port "C"				
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0

Port "D"				
30	0	0	0	0
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0

**COMPLIANCE DEMONSTRATION
#13 BATTERY COMBUSTION STACK**

**USS CLAIRTON WORKS
CLAIRTON, PA**

APPENDIX F

SULFATE ANALYSIS

RJ LeeGroup, Inc.

350 Hochberg Road • Monroeville, PA 15146
412/325-1776 • FAX 412/733-1799

March 20, 1992

Mr. Patrick Stockton
Keystone Environmental Resources, Inc.
3000 Tech Center Drive
Monroeville, PA 15146

RE: RJ Lee Group Project Number CHH203038
Keystone Purchase Order Number B-7185
Keystone Project/Account Number 605033-01

Dear Pat:

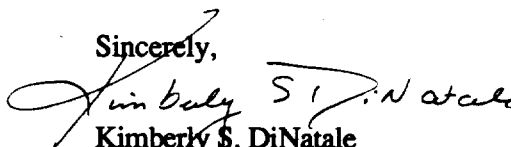
At your request, we analyzed four samples, provided by you, for total sulfate (SO_4^{2-}) content. The solutions contained a mixture of chloroform and ethyl ether and were prepared for analysis by evaporating a 100 ml aliquot to 10 ml and rediluting back to the original volume of 100 ml with deionized water. This removed the chloroform and ethyl ether. The samples were then analyzed along with standard sulfate solutions on a Dionex 2120i ion chromatograph.

Results are calculated as milligrams per liter and then converted to total milligrams using the volumes of the solutions that you provided. These results are reported in the enclosed Table I. The precision of this analysis is $\pm 5\%$ of the value reported.

These results are submitted pursuant to RJ Lee Group's current terms and conditions of sale, including the company's standard warranty and limitation of liability provisions. No responsibility or liability is assumed for the manner in which the results are used or interpreted. Unless notified in writing to return the samples covered by this report, RJ Lee Group will store the samples for a period of thirty (30) days before discarding. A shipping and handling fee will be assessed for the return of any samples.

If you have any questions about this report, or if I can be of further assistance, please let me know.

Sincerely,


Kimberly S. DiNatale
Project Manager, Analytical Chemistry

KSD/dcd
Enclosure

Table I

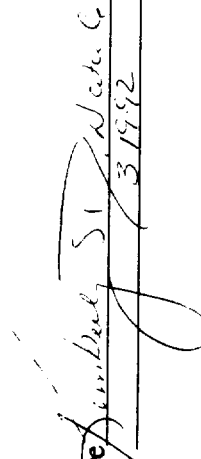
RJ Lee Group Project Number CHH203038
For: Keystone Environmental Resources, Inc.

SULFATE ANALYSIS

Keystone Identification	RJ Lee Group Sample Number	ppm	Volume (ml)	Total mg	Analytical Method
CLR-13-BS-Blank	100088	0.277	800	0.222	IC
CLR-13-BS-1	100085	23.64	900	21.28	IC
CLR-13-BS-2	100086	19.93	750	14.95	IC
CLR-13-BS-3	100087	17.03	900	15.33	IC

Authorized Signature

Date


3/19/92

RJ Lee Group, Inc.
Headquarters

350 Hochberg Road
Monroeville, PA 15146

(412) 325-1776
FAX (412) 733-1799

[illegible]

- DISTRIBUTION: Original accompanied shipment; Copy to Coordinator Field Files.