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**USS CLAIRTON WORKS
RESULTS OF THE
COMPLIANCE DEMONSTRATION
OF THE #13 BATTERY COMBUSTION STACK**

1990

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 NO. 601050-02

SEPTEMBER 1990

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ABSTRACT

On July 10, 1990, a compliance test program was conducted for USS Clairton Works, Clairton, PA, on the #13 Battery Combustion Stack operated at the Clairton Coke and Coal Chemical Works. The purpose of the testing was to determine the (1) concentration and mass emissions of particulate matter, and (2) presence of visible emissions from the stack as required by the Amended Mon Valley Consent Decree, Paragraph V.A.(6) and Appendix 4.A. The results of the testing showed an average particulate matter concentration and emission rate of 0.011 gr/scfd and 2.73 lb/hr, respectively. The allowable concentration is 0.015 gr/scfd. Thus, the emissions from the stack are in compliance. No visible emissions were observed from the stack during any of the tests.

1.0 INTRODUCTION

On July 10, 1990, a compliance test program was conducted for USS Clairton Works, Clairton, PA, on the #13 Battery Combustion Stack operated at the Clairton Coke and Coal Chemical Works. The purpose of the testing was to determine the (1) concentration and mass emissions of particulate matter, and (2) presence 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 Mark Grunebach, Manager of the Monitoring Services Department, Richard Casselberry, Daniel Keller, and Thomas Morgan. Visible emissions determinations were performed by Jim McKoy of Environmental Technical Services (ETS). Keystone and ETS are sister companies under the Chester Environmental Group. All test procedures were witnessed by Phil Lawrence of the Allegheny County Health Department.

2.0 METHODOLOGIES

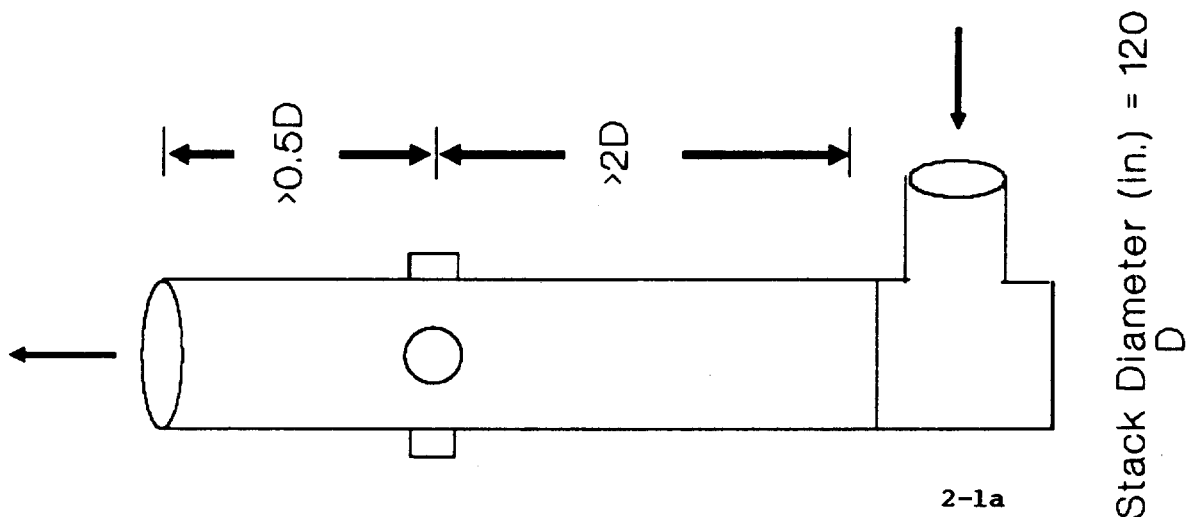
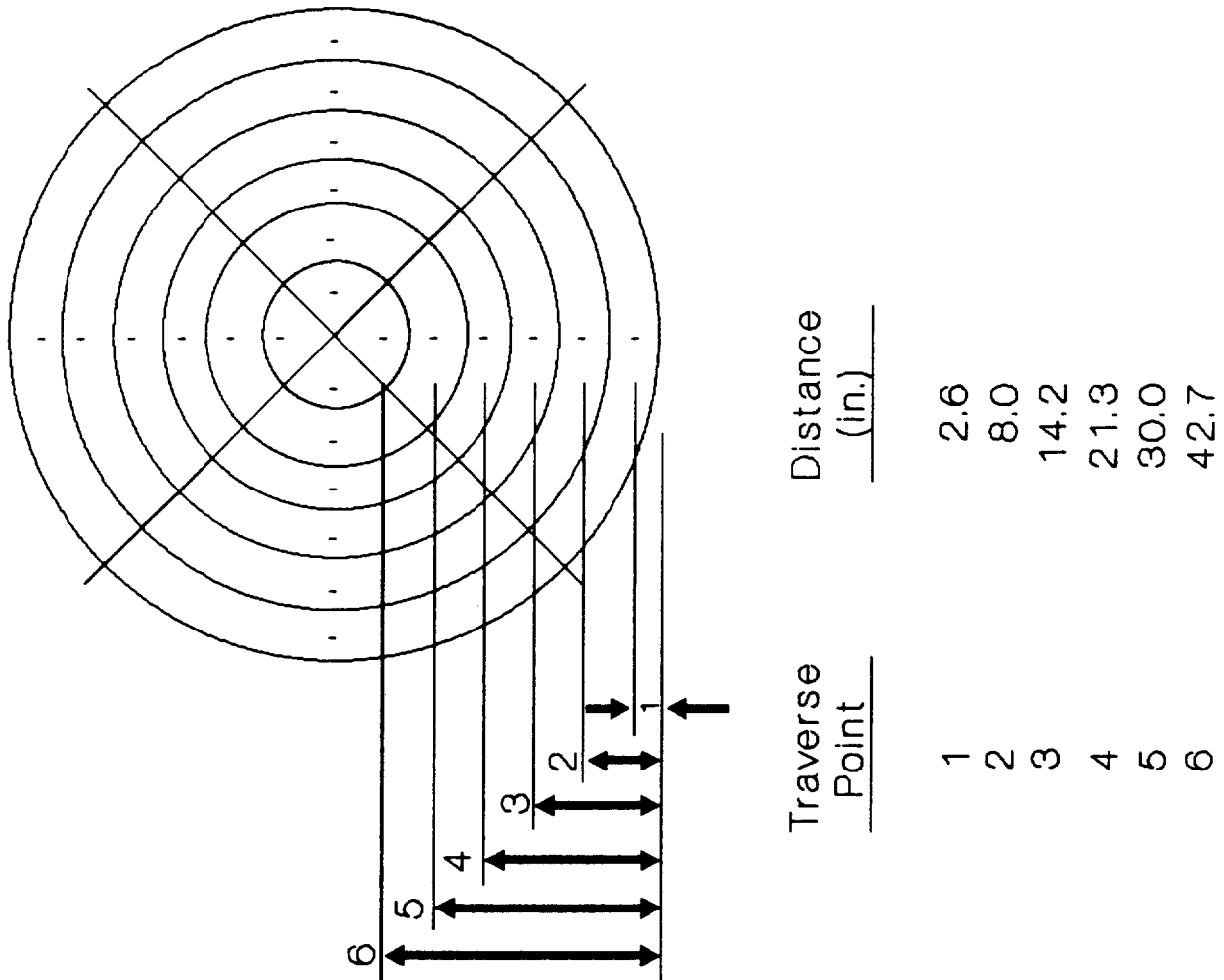
Particulate matter sampling was performed in accordance with EPA Stationary Source Sampling Methods 1 through 5 and Sections 139.11 and 139.12 of the Pennsylvania Department of Environmental Resources (PA DER) Source Testing Manual. The gas volume sampled for each 120 minute test was greater than 50 dry standard cubic feet.

The process exhaust exited through a 120" 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 4 equally spaced ports, with each traverse point sampled for 5 minutes. A schematic diagram of the stack and traverse points is presented in Figure 2-1.

A total of three test runs were performed. During 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.

Clean up of the sampling train included a water and acetone rinse of both the front-half and back-half components. The water soluble and water insoluble portions of the front-half of the sampling train were determined as a total, while 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. After filtration, the soluble back-half water was extracted with chloroform and ethyl ether; the extract was dried, desiccated, and weighed to a constant weight. The filtrate was then submitted for sulfate analysis via ion chromatography.

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



TITLE

SCHEMATIC DIAGRAM OF THE
STACK AND TRAVERSE POINTS

FIGURE 2-1

ACTIVITY
No.

REVISION

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.

The probes and sampling trains were operate 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 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 results have been summarized in Table 3-1. The average particulate matter concentration and emission rate are 0.011 grains per standard cubic foot dry (gr/scfd) and 2.73 pounds per hour (lb/hr), respectively.

As promulgated by the Amended Mon Valley Consent Decree, Paragraph V.A.(6), the particulate matter standard for #13 Battery Combustion Stack is 0.015 gr/scfd. Thus, the emissions from the stack are in compliance.

Table 3-1 also lists other pertinent stack and sampling parameters including the 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, stack gas temperature, gas volume sampled for each test (scfd), and the isokinetics value for each test. 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% and 110% is considered acceptable.

The analytical results of the sulfate determination of the soluble back-half water can be found in Appendix E. These results have been summarized below:

USS CLAIRTON WORKS

TABLE 3-1

PARTICULATE MATTER EMISSIONS DATA

<u>EMISSIONS</u>	<u>TEST #1</u>	<u>TEST #2</u>	<u>TEST #3</u>	<u>AVERAGE</u>
gr/dscf	0.012	0.012	0.010	0.011
lb/hr	2.81	2.68	2.69	2.73

STACK CONDITIONS

Flow (acfm)	59632	58473	67397	61834
Flow (scfm)	31807	31810	36578	33398
Moisture Content (%)	17.37	15.80	16.30	16.49
Stack Temp. (°F)	507	488	489	494

SAMPLING CONDITIONS

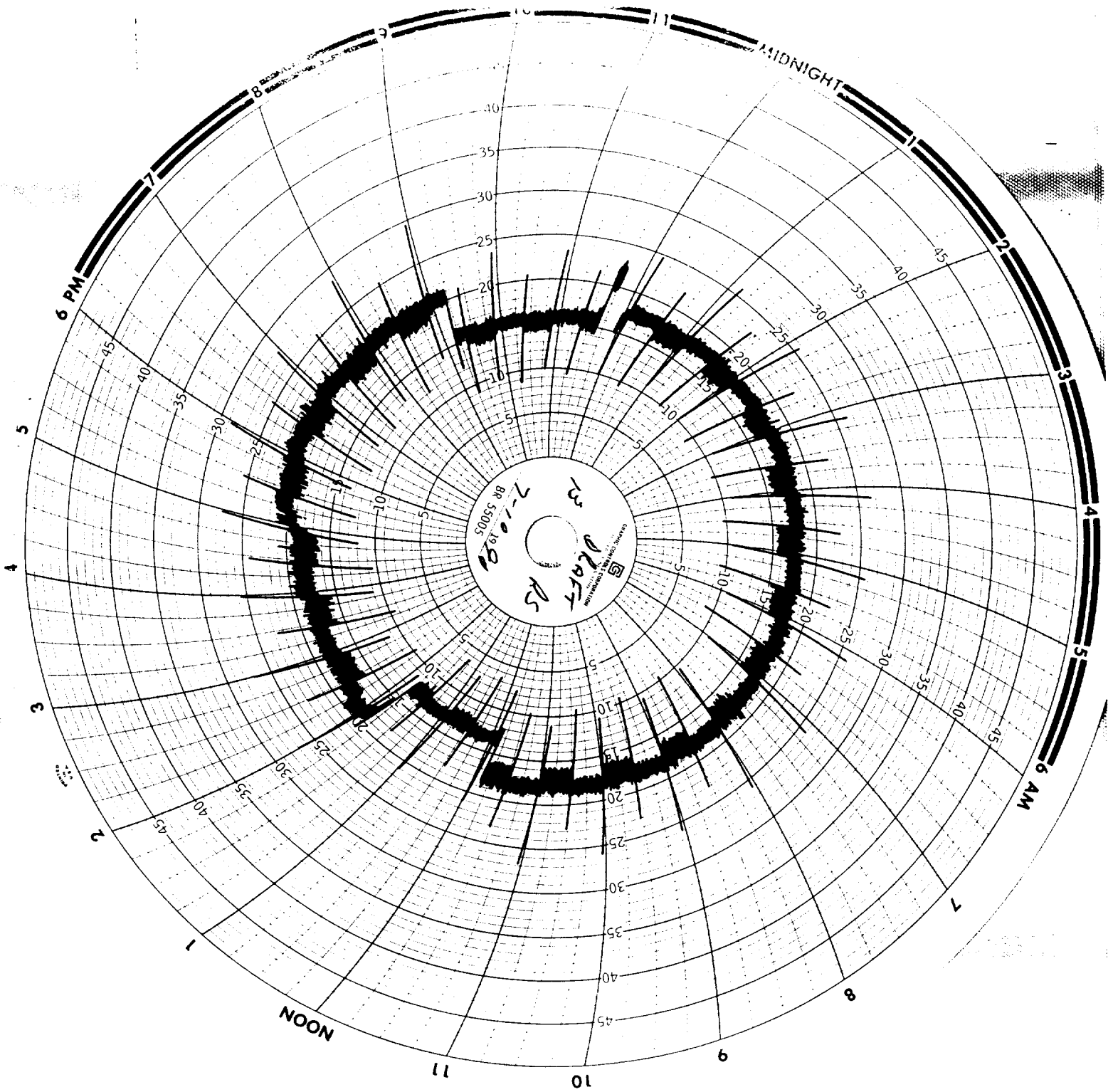
Sampling Time (min)	120	120	120	
Sample Volume (scfd)	70.264	72.226	82.411	
Isokinetics (%)	103.78	104.68	104.49	

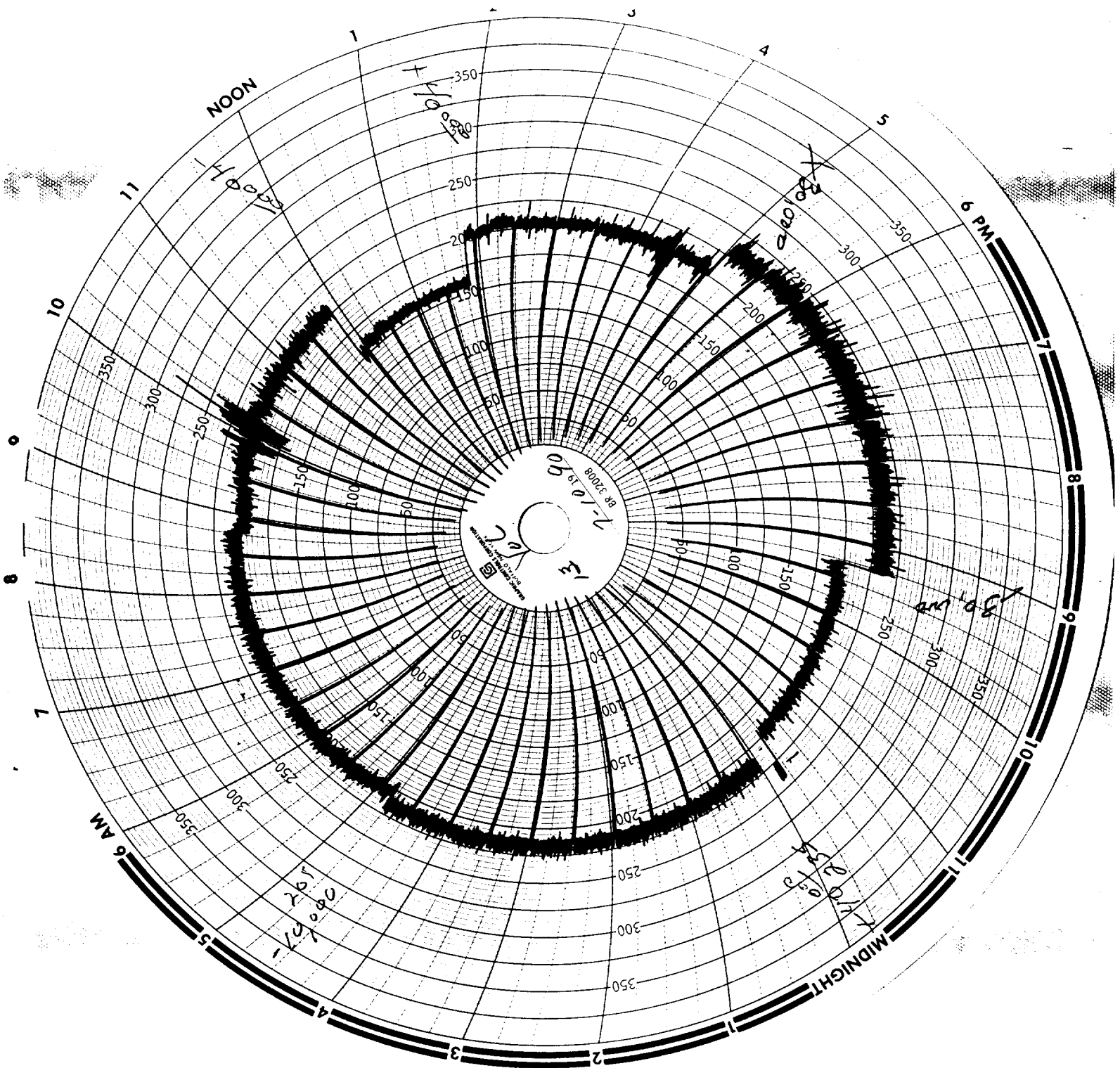
<u>Test #</u>	<u>Sample Volume (mL)</u>	<u>Concentration (mg/L)</u>	<u>Total Sulfate (mg)</u>
1	930	36.8	34.2
2	740	39.6	29.3
3	950	54.2	51.5

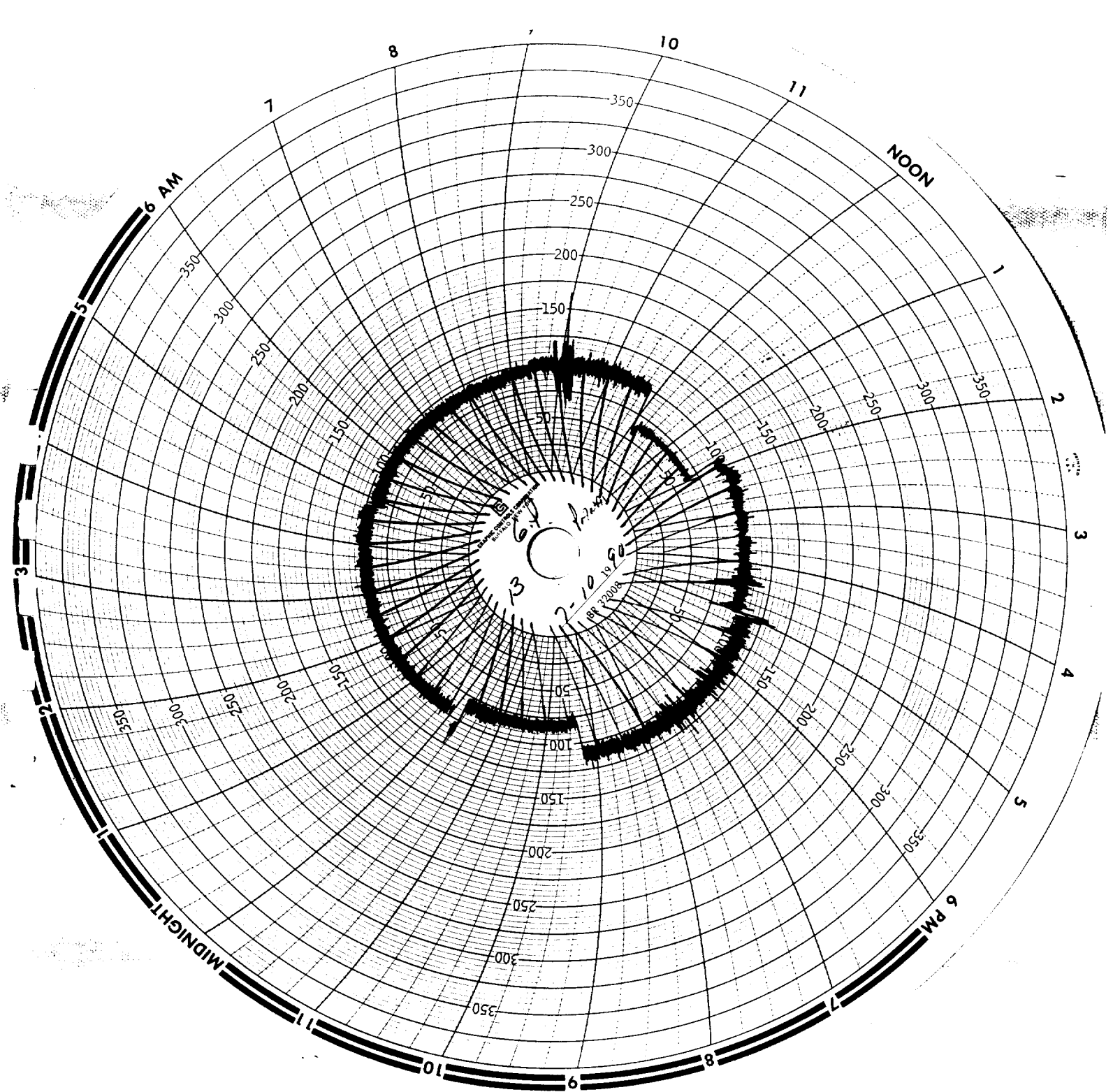
Copies of the field data sheets for the visible emissions determinations can be found in Appendix F. No visible emissions were observed during any of the three tests. As promulgated by the Amended Mon Valley Consent Decree, Paragraph V.A.(6), the visible emissions shall not equal or exceed 20% opacity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

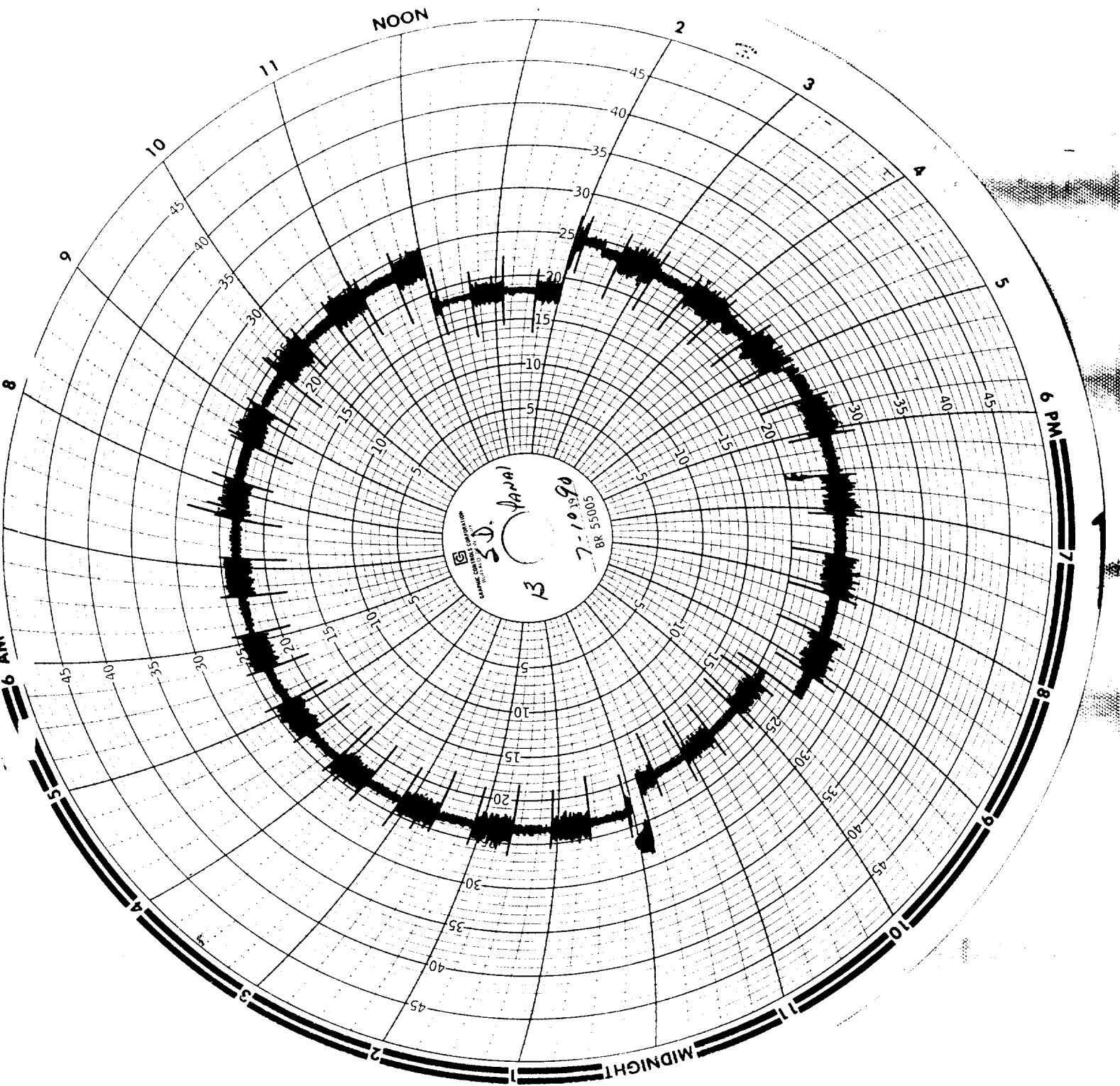
**USS CLAIRTON WORKS
RESULTS OF THE
COMPLIANCE DEMONSTRATION OF THE
#13 BATTERY COMBUSTION STACK**

**APPENDIX A
OPERATIONAL RECORDS**









PUSHING SCHEDULE FOR BATTERIES 13, 14, & 15

	PUSH	CHARGE	STATION	EARLIEST	DESIRED	LATEST
1	A14/15	A12/15	10	50	11	15
2	B14/14	B12/14	10	56	11	21
3	B14/14	B12/14	11	02	11	27
4	B14/13	B12/13	11	08	11	33
5	A14/14	A12/14	11	14	11	39
6	B14/13	B12/13	11	20	11	45
7	A16/15	A14/15	11	26	11	51
8	B16/14	B14/14	11	32	11	57
9	B16/15	B14/15	11	38	12	03
10	A16/13	A14/13	11	44	12	09
11	A16/14	A14/14	11	50	12	15
12	B16/13	B14/13	11	56	12	21
13	A18/15	A16/15	12	02	12	27
14	B18/14	B16/14	12	08	12	33
15	B18/15	B16/15	12	14	12	39
16	A18/13	A16/13	12	20	12	45
17	A18/14	A16/14	12	26	12	51
18	B18/13	B16/13	12	32	12	57
19	A20/15	A18/15	12	38	1	03
20	B20/14	B18/14	12	44	1	09
21	B20/15	B18/15	12	50	1	15
22	A20/13	A18/13	12	56	1	21
23	A20/14	A18/14	1	02	1	27
24	B20/13	B18/13	1	08	1	33
25	A22/15	A20/15	1	14	1	39
26	B22/14	B20/14	1	20	1	45
27	B22/15	B20/15	1	26	1	51
28	A22/13	A20/13	1	32	1	57
29	A22/14	A20/14	1	38	2	03
30	B22/13	B20/13	1	44	2	09
31	A24/15	A22/15	1	50	2	15
32	B24/14	B22/14	1	56	2	21
33	B24/15	B22/15	2	02	2	27
34	A24/13	A22/13	2	08	2	33
35	A24/14	A22/14	2	14	2	39
36	B24/13	B22/13	2	20	2	45
37	A26/15	A24/15	2	26	2	51
38	B26/14	B24/14	2	32	2	57
39	B26/15	B24/15	2	38	3	03
40	A26/13	A24/13	2	44	3	09
41	A26/14	A24/14	2	50	3	15
42	B26/13	B24/13	2	56	3	21
43	A28/15	A26/15	3	02	3	27
44	B28/14	B26/14	3	08	3	33
45	B28/15	B26/15	3	14	3	39
46	A28/13	A26/13	3	20	3	45
47	A28/14	A26/14	3	26	3	51
48	B28/13	B26/13	3	32	3	57
49	A30/15	A28/15	3	38	4	03
50	B30/14	B28/14	3	44	4	09
51	B30/15	B28/15	3	50	4	15
52	A30/13	A28/13	3	56	4	21
53	A30/14	A28/14	4	02	4	27
54	B30/13	B28/13	4	08	4	33
55	A1/15	A30/15	4	14	4	39
56	B1/14	B30/14	4	20	4	45
57	B1/15	B30/15	4	26	4	51
58	A1/13	A30/13	4	32	4	57
59	A1/14	A30/14	4	38	5	03
60	B1/13	B30/13	4	44	5	09
61	A3/15	A1/15	4	50	5	15
62	B3/14	B1/14	4	56	5	21
63	B3/15	B1/15	5	02	5	27
64	A3/13	A1/13	5	08	5	33
65	A3/14	A1/14	5	14	5	39
66	B3/13	B1/13	5	20	5	45
67	A5/15	A3/15	5	26	5	51
68	B5/14	B3/14	5	32	6	57
69	B5/15	B3/15	5	38	6	03
70	A5/13	A3/13	5	44	6	09
71	A5/14	A3/14	6	50	6	15
72	B5/13	B3/13	6	56	6	21
73	A7/15	A5/15	6	02	6	27
74	B7/14	B5/14	6	08	6	33
75	B7/15	B5/15	6	14	6	39
76	A7/13	A5/13	6	20	6	45
77	A7/14	A5/14	6	26	6	51
78	B7/13	B5/13	6	32	7	57
79	A9/15	A7/15	6	38	7	03
80	B9/14	B7/14	6	44	7	09

PUSHING SCHEDULE FOR BATTERIES 13, 14, & 15

SEQ #	PUSH	CHARGE	STATION	EARLIEST	DESIRED	LATEST
1	A 9/13	A 7/13	6	50	7	0
2	A 9/14	A 7/14	6	56	7	6
3	B 9/13	B 7/13	7	2	7	12
4	A 11/15	A 9/15	7	8	7	18
5	B 11/14	B 9/14	7	14	7	24
6	B 11/15	B 9/15	7	21	7	31
7	A 11/13	A 9/13	7	27	7	37
8	A 11/14	A 9/14	7	33	7	43
9	B 11/13	B 9/13	7	39	7	49
10	A 13/15	A 11/15	7	46	7	56
11	B 13/14	B 11/14	7	52	8	2
12	B 13/15	B 11/15	7	58	8	8
13	A 13/13	A 11/13	8	4	8	14
14	A 13/14	A 11/14	8	11	8	21
15	B 13/13	B 11/13	8	17	8	27
16	A 15/15	A 13/15	8	23	8	33
17	B 15/14	B 13/14	8	29	8	39
18	B 15/15	B 13/15	8	35	8	45
19	A 15/13	A 13/13	8	42	8	52
20	A 15/14	A 13/14	8	48	8	58
21	B 15/13	B 13/13	8	54	9	4
22	A 17/15	A 15/15	9	0	9	10
23	B 17/14	B 15/14	9	7	9	17
24	B 17/15	B 15/15	9	13	9	23
25	A 17/13	A 15/13	9	19	9	29
26	A 17/14	A 15/14	9	25	9	35
27	B 17/13	B 15/13	9	32	9	42
28	A 19/15	A 17/15	9	38	9	48
29	B 19/14	B 17/14	9	44	9	54
30	B 19/15	B 17/15	9	50	10	0
31	A 19/13	A 17/13	9	57	10	7
32	A 19/14	A 17/14	10	3	10	13
33	B 19/13	B 17/13	10	9	10	19
34	A 21/15	A 19/15	10	15	10	25
35	B 21/14	B 19/14	10	21	10	31
36	B 21/15	B 19/15	10	28	10	38
37	A 21/13	A 19/13	10	34	10	44
38	A 21/14	A 19/14	10	40	10	50
39	B 21/13	B 19/13	10	46	10	56
40	A 23/15	A 21/15	10	53	11	3
41	B 23/14	B 21/14	10	59	11	9
42	B 23/15	B 21/15	11	5	11	15
43	A 23/13	A 21/13	11	11	11	21
44	A 23/14	A 21/14	11	18	11	28
45	B 23/13	B 21/13	11	24	11	34
46	A 25/15	A 23/15	11	30	11	40
47	B 25/14	B 23/14	11	36	11	46
48	B 25/15	B 23/15	11	42	11	52
49	A 25/13	A 23/13	11	49	11	59
50	A 25/14	A 23/14	11	55	12	5
51	B 25/13	B 23/13	12	1	12	7
52	A 27/15	A 25/15	12	7	12	14
53	B 27/14	B 25/14	12	14	12	20
54	B 27/15	B 25/15	12	20	12	26
55	A 27/13	A 25/13	12	26	12	32
56	A 27/14	A 25/14	12	32	12	39
57	B 27/13	B 25/13	12	39	12	45
58	A 29/15	A 27/15	12	45	12	51
59	A 31/15	A 29/15	12	51	1	57
60	B 29/14	B 27/14	12	57	1	4
61	B 29/15	B 27/15	1	4	1	10
62	A 29/13	A 27/13	1	10	1	16
63	A 29/14	A 27/14	1	16	1	22
64	A 31/13	A 29/13	1	23	1	29
65	A 31/14	A 29/14	1	29	1	35
66	B 29/13	B 27/13	1	35	1	41
67	A 2/15	A 31/15	1	41	1	47
68	B 2/14	B 29/14	1	47	1	53
69	B 2/15	B 29/15	1	53	2	0
70	A 2/13	A 31/13	2	0	2	6
71	A 2/14	A 31/14	2	6	2	12
72	B 2/13	B 29/13	2	12	2	18
73	A 4/15	A 2/15	2	18	2	25
74	B 4/14	B 2/14	2	25	2	31
75	B 4/15	B 2/15	2	31	2	37
76	A 4/13	A 2/13	2	37	2	43
77	A 4/14	A 2/14	2	43	3	50

TUE JULY 10 1990

7X 3 TURN

PASS UP B9/15

FLIGHT SCHEDULE FOR BATTERIES 13, 14, & 15

SEQ #	PUSH	CHARGE	STATION	EARLIEST	DESIRED	LATEST
1	A 2/13	A31/13		2:50	3:0	3:15
2	A 2/14	A31/14		2:56	3:6	3:21
3	B 2/13	B29/13		3:2	3:12	3:27
4	A 4/15	A 2/15		3:8	3:18	3:33
5	B 4/14	B 2/14		3:14	3:24	3:39
6	B 4/15	B 2/15		3:20	3:30	3:45
7	A 4/13	A 2/13		3:26	3:36	3:51
8	A 4/14	A 2/14		3:32	3:42	3:57
9	B 4/13	B 2/13		3:38	3:48	4:3
10	A 6/15	A 4/15		3:44	3:54	4:9
11	B 6/14	B 4/14		3:50	4:0	4:15
12	B 6/15	B 4/15		3:56	4:6	4:21
13	A 6/13	A 4/13		4:2	4:12	4:27
14	A 6/14	A 4/14		4:8	4:18	4:33
15	B 6/13	B 4/13		4:14	4:24	4:39
16	A 8/15	A 6/15		4:20	4:30	4:45
17	B 8/14	B 6/14		4:26	4:36	4:51
18	B 8/15	B 6/15		4:32	4:42	4:57
19	A 8/13	A 6/13		4:38	4:48	5:3
20	A 8/14	A 6/14		4:44	4:54	5:9
21	B 8/13	B 6/13		4:50	5:0	5:15
22	A 10/15	A 8/15		4:56	5:6	5:21
23	B 10/14	B 8/14		5:2	5:12	5:27
24	B 10/15	B 8/15		5:8	5:18	5:33
25	A 10/13	A 8/13		5:14	5:24	5:39
26	A 10/14	A 8/14		5:20	5:30	5:45
27	B 10/13	B 8/13		5:26	5:36	5:51
28	A 12/15	A 10/15		5:32	5:42	5:57
29	B 12/14	B 10/14		5:38	5:48	6:3
30	B 12/15	B 10/15		5:44	5:54	6:9
31	A 12/13	A 10/13		5:50	6:0	6:15
32	A 12/14	A 10/14		5:56	6:6	6:21
33	B 12/13	B 10/13		6:2	6:12	6:27
34	A 14/15	A 12/15		6:8	6:18	6:33
35	B 14/14	B 12/14		6:14	6:24	6:39
36	B 14/15	B 12/15		6:20	6:30	6:45
37	A 14/13	A 12/13		6:26	6:36	6:51
38	A 14/14	A 12/14		6:32	6:42	6:57
39	B 14/13	B 12/13		6:38	6:48	7:3
40	A 16/15	A 14/15		6:44	6:54	7:9
41	B 16/14	B 14/14		6:50	7:0	7:15
42	B 16/15	B 14/15		6:56	7:6	7:21
43	A 16/13	A 14/13		7:2	7:12	7:27
44	A 16/14	A 14/14		7:8	7:18	7:33
45	B 16/13	B 14/13		7:14	7:24	7:39
46	A 18/15	A 16/15		7:20	7:30	7:45
47	B 18/14	B 16/14		7:26	7:36	7:51
48	B 18/15	B 16/15		7:32	7:42	7:57
49	A 18/13	A 16/13		7:38	7:48	8:3
50	A 18/14	A 16/14		7:44	7:54	8:9
51	B 18/13	B 16/13		7:50	8:0	8:15
52	A 20/15	A 18/15		7:56	8:6	8:21
53	B 20/14	B 18/14		8:2	8:12	8:27
54	B 20/15	B 18/15		8:8	8:18	8:33
55	A 20/13	A 18/13		8:14	8:24	8:39
56	A 20/14	A 18/14		8:20	8:30	8:45
57	B 20/13	B 18/13		8:26	8:36	8:51
58	A 22/15	A 20/15		8:32	8:42	8:57
59	B 22/14	B 20/14		8:38	8:48	9:3
60	B 22/15	B 20/15		8:44	8:54	9:9
61	A 22/13	A 20/13		8:50	9:0	9:15
62	A 22/14	A 20/14		8:56	9:6	9:21
63	B 22/13	B 20/13		9:2	9:12	9:27
64	A 24/15	A 22/15		9:8	9:18	9:33
65	B 24/14	B 22/14		9:14	9:24	9:39
66	B 24/15	B 22/15		9:20	9:30	9:45
67	A 24/13	A 22/13		9:26	9:36	9:51
68	A 24/14	A 22/14		9:32	9:42	9:57
69	B 24/13	B 22/13		9:38	9:48	10:3
70	A 26/15	A 24/15		9:44	9:54	10:9
71	B 26/14	B 24/14		9:50	10:0	10:15
72	B 26/15	B 24/15		9:56	10:6	10:21
73	A 26/13	A 24/13		10:2	10:12	10:27
74	A 26/14	A 24/14		10:8	10:18	10:33
75	B 26/13	B 24/13		10:14	10:24	10:39
76	A 28/15	A 26/15		10:20	10:30	10:45
77	B 28/14	B 26/14		10:26	10:36	10:51
78	B 28/15	B 26/15		10:32	10:42	10:57
79	A 28/13	A 26/13		10:38	10:48	11:3
80	A 28/14	A 26/14		10:44	10:54	11:9

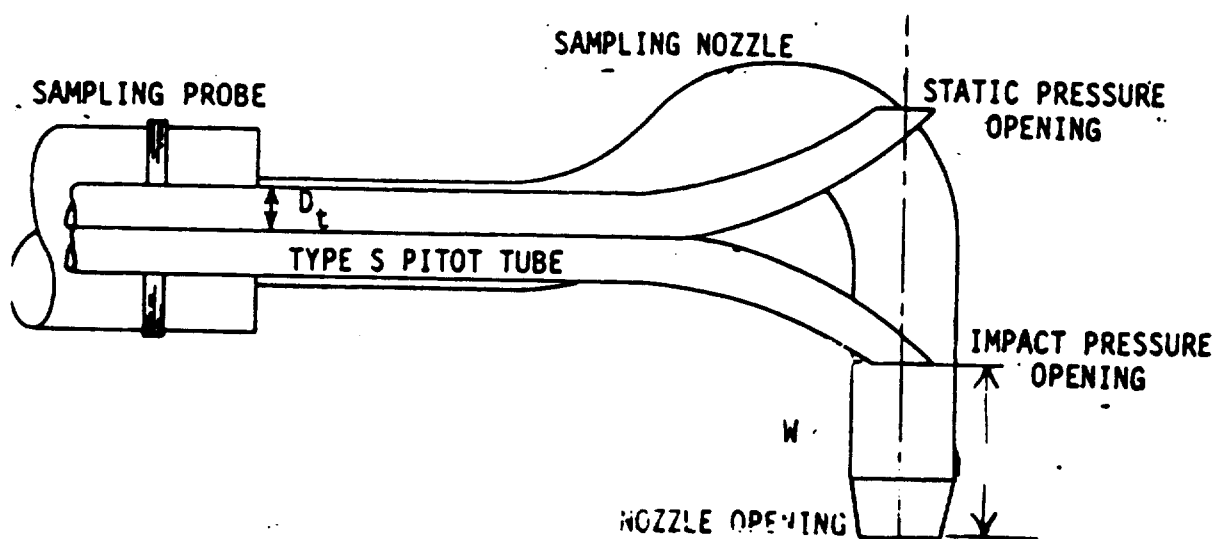
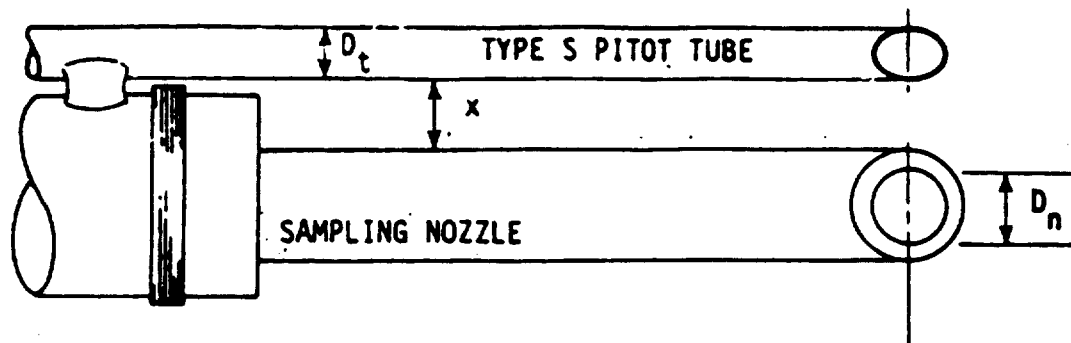
TUE JULY 10 1990

3X11 TURN

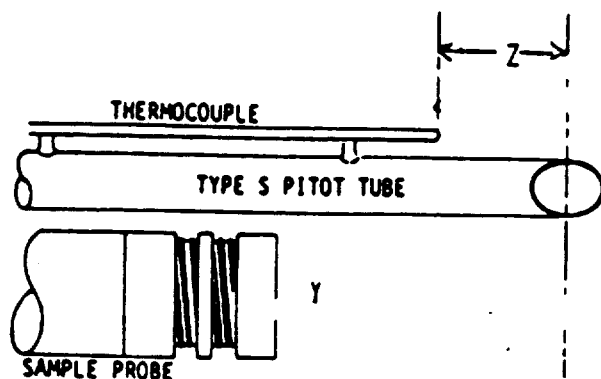
**USS CLAIRTON WORKS
RESULTS OF THE
COMPLIANCE DEMONSTRATION OF THE
#13 BATTERY COMBUSTION STACK**

APPENDIX B

**PRE-TEST AND POST-TEST
CALIBRATION AND AUDIT RESULTS**



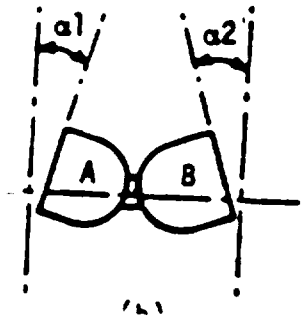
D_n = Nozzle diameter
 D_t = 3/16 to 3/8"



$W \geq 0$
 $x \geq 3/4"$ for 1/2" Nozz
 $y \geq 3"$
 $z \geq 2"$

GEOMETRIC PITOT CALIBRATION

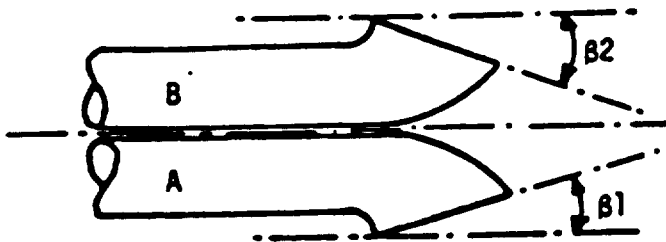
Probe No. 1-1
 Date 6/9/90
 Initials HTS



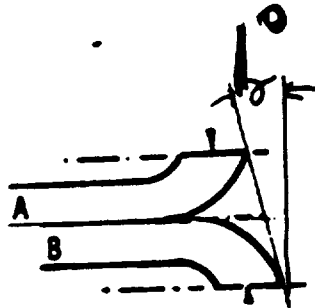
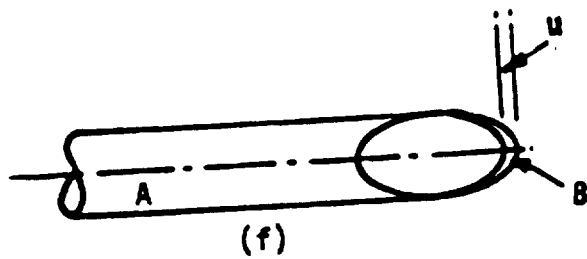
$\alpha 1, \alpha 2 < 10^\circ$

$\alpha 1 = 2^\circ$
 $\alpha 2 = 1^\circ$
 $\beta 1 = 2^\circ$
 $\beta 2 = 4^\circ$
 $A = 1.059$
 $u = .018$
 $v = 0$
 $w = 0$
 $x = 2\frac{3}{4}"$
 $y = 2\frac{3}{4}"$
 $z = 2"$
 $D_t = 380$

pre-test

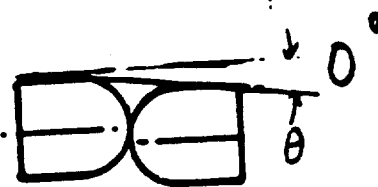
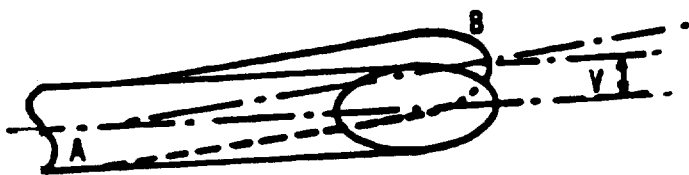


$\beta 1, \beta 2 < 5$

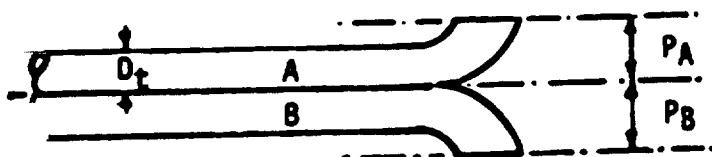


$$u = A \sin \theta$$

$$v = A \sin \phi$$



A-SIDE PLANE



B-SIDE PLANE

.399 .570
 $1.05 D_t < P < 1.50 D_t$
 $P_A = P_B$
 $2.10 D_t < A < 3.00 D_t$
 .798 1.14

GEOMETRIC PITOT CALIBRATION

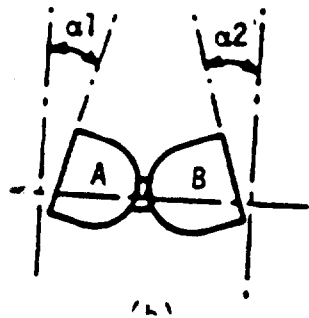
Probe No. 7-1

Date 8-20-90

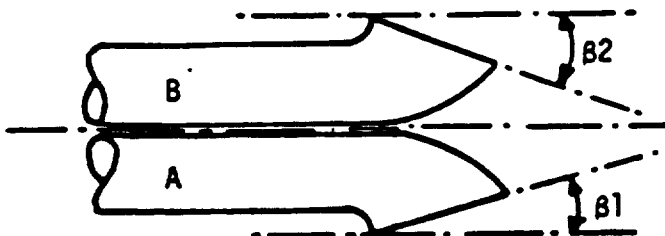
Initials gnt

$\alpha_1 = 4^\circ$
 $\alpha_2 = 1^\circ$
 $\beta_1 = 3^\circ$
 $\beta_2 = 0$
 $A = 1.055$
 $\mu = .036$
 $V = .036$
 $W = \geq 0$
 $X = .825$
 $Y = \geq 3$
 $Z = \geq 2$
 $D_t = 38$

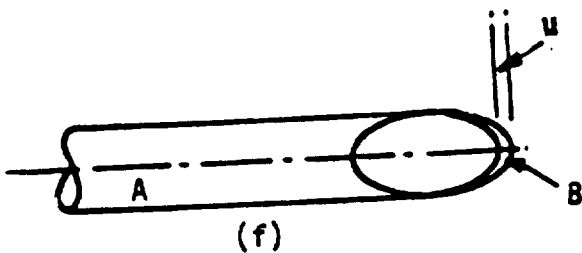
post-test



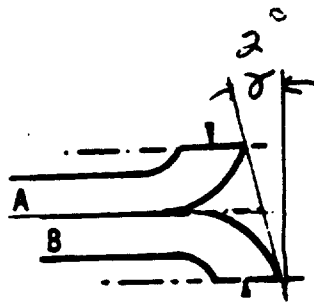
$\alpha_1, \alpha_2 < 10^\circ$



$\beta_1, \beta_2 < 5$

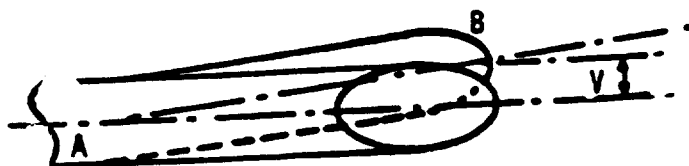


(f)

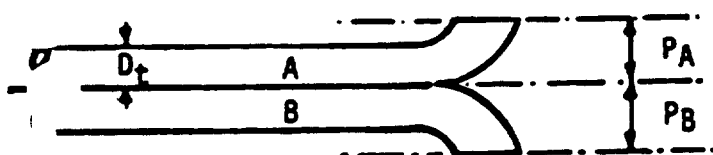


$$\mu = A \sin \theta$$

$$V = A \sin \theta$$



A-SIDE PLANE



B-SIDE PLANE

405 .579

$$1.05 D_t < P < 1.50 D_t$$

$$P_A = P_B$$

$$2.10 D_t < A < 3.00 D_t$$

811

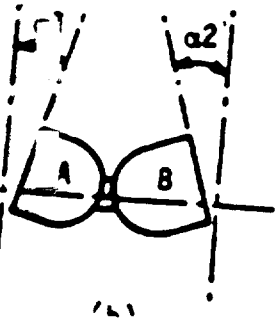
1.16

GEOMETRIC PITOT CALIBRATION

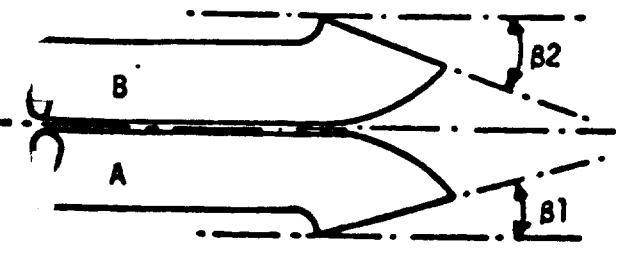
Probe No. 1-L
 Date 6-29-90
 Initials ATS

$\alpha_1 = 4^\circ$
 $\alpha_2 = 3^\circ$
 $\beta_1 = 1^\circ$
 $\beta_2 = 3^\circ$
 $A = .988$
 $\mu = .034$
 $V = .069$
 $W = > 0$
 $X = > 3/4"$
 $Y = > 3/4"$
 $Z = > 2"$
 $D_t = .385$

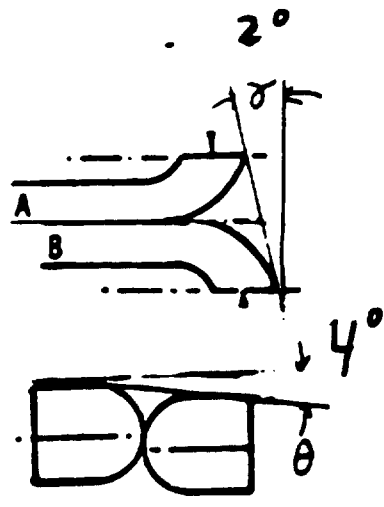
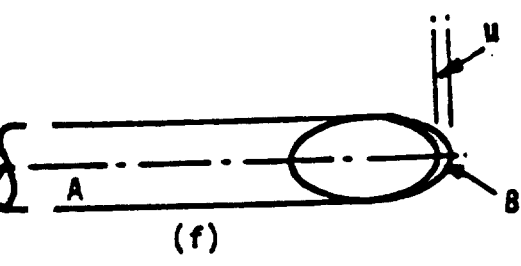
pre-test



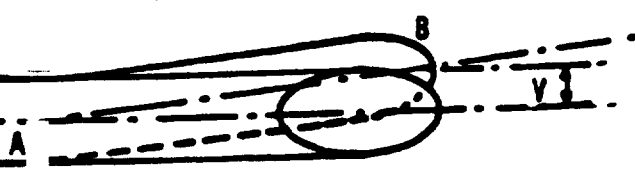
$\alpha_1, \alpha_2 < 10^\circ$



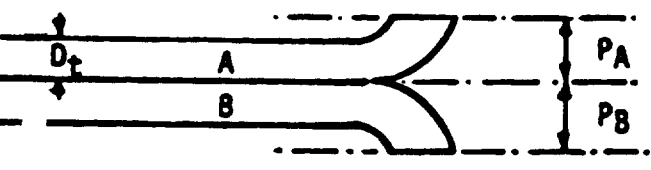
$\beta_1, \beta_2 < 5^\circ$



$\mu = A \sin \theta$
 $V = A \sin \theta$



A-SIDE PLANE



B-SIDE PLANE

.404 .5775
 $1.05 D_t < P < 1.50 D_t$
 $P_A = P_B$
 $2.10 D_t < A < 3.00 D_t$
 .808 1.155

GEOMETRIC PITOT CALIBRATION

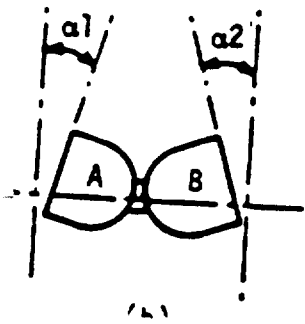
Probe No. 7-2

Date 8-30-90

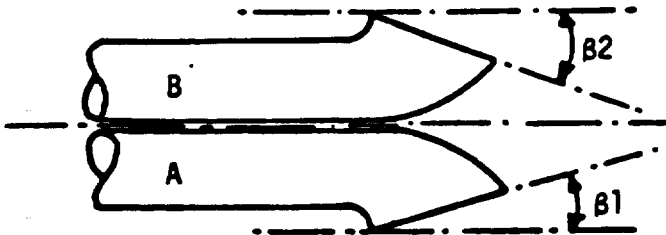
Initials BNJ

$\alpha 1 = 1^\circ$
 $\alpha 2 = 3^\circ$
 $\beta 1 = 4^\circ$
 $\beta 2 = 1^\circ$
 $A = 962$
 $\mu = .067$
 $V = .033$
 $W = 20$
 $X = .789$
 $Y = 23'$
 $Z = 2.2''$
 $D_t = .376$

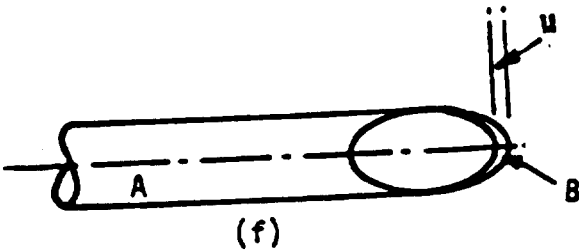
post-test



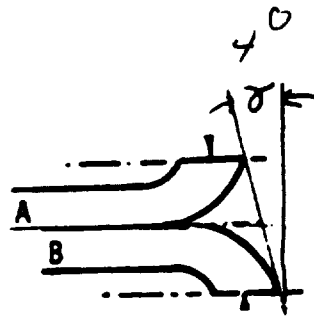
$\alpha 1, \alpha 2 < 10^\circ$



$\beta 1, \beta 2 < 5$

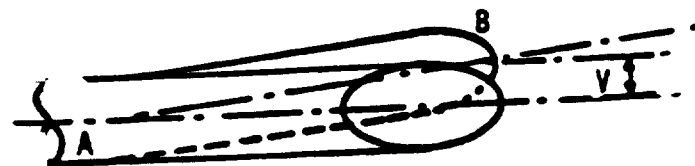


(f)

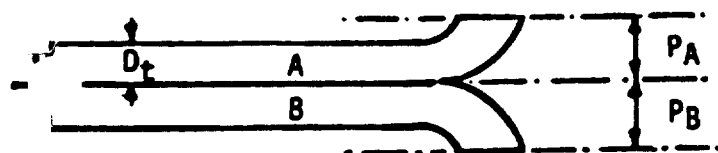


$$\mu = A \sin \theta$$

$$V = A \sin \theta$$



A-SIDE PLANE



B-SIDE PLANE

374

564

$$1.05 D_t < P < 1.50 D_t$$

$$P_A = P_B$$

$$2.10 D_t < A < 3.00 D_t$$

.789

1.128

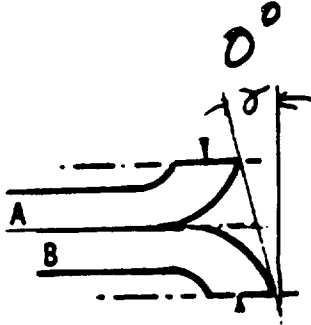
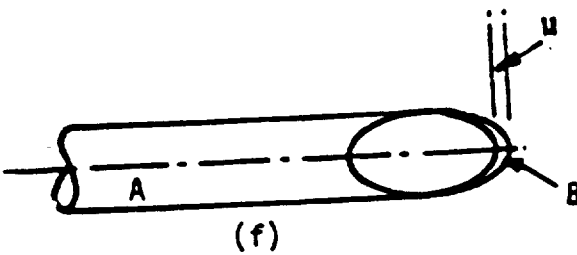
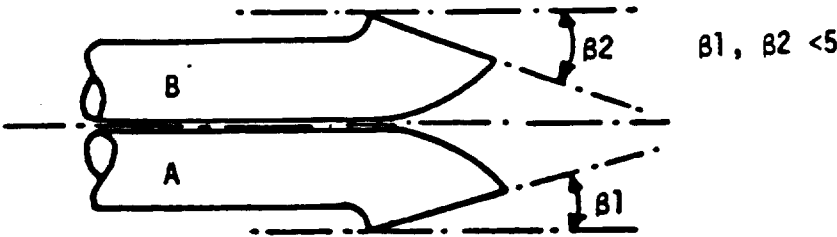
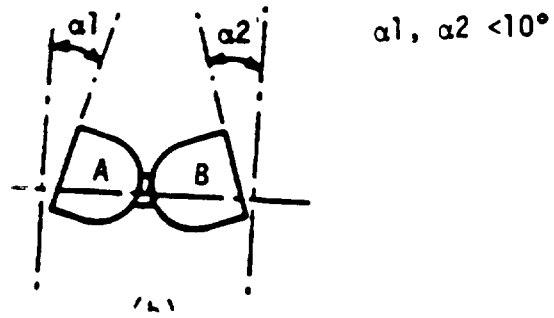
B-5

GEOMETRIC PITOT CALIBRATION

Probe No. 7-3
 Date 6/29/90
 Initials ATS

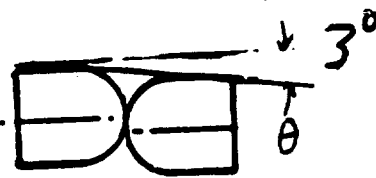
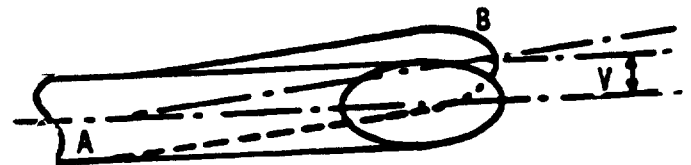
$\alpha_1 = 4^\circ$
 $\alpha_2 = 2^\circ$
 $\beta_1 = 0^\circ$
 $\beta_2 = 1^\circ$
 $A = .954$
 $\mu = 0^\circ$
 $V = .050$
 $W = 70$
 $X = 73\frac{3}{4}^\circ$
 $Y = 73''$
 $Z = 72''$
 $D_t = .376$

pre-test

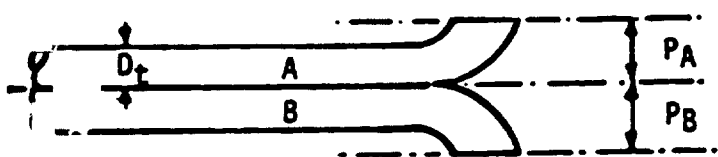


$$\mu = A \sin \gamma$$

$$V = A \sin \theta$$



A-SIDE PLANE



B-SIDE PLANE

$.395$ $.564$
 $1.05 D_t < P < 1.50 D_t$
 $P_A = P_B$
 $2.10 D_t < A < 3.00 D_t$
 $.799$ 1.128

GEOMETRIC PITOT CALIBRATION

Probe No. 2-3

Date 8-20-90

Initials g17

$\alpha 1 = 2^\circ$

$\alpha 2 = 2^\circ$

$\beta 1 = 1^\circ$

$\beta 2 = 0^\circ$

$A = .961$

$\mu = .016$

$V = .067$

$W = .30$

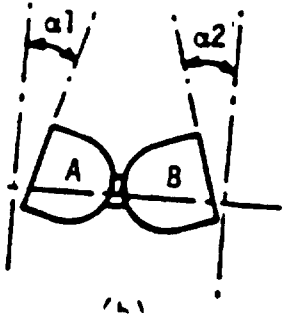
$X = .945$

$Y = .33''$

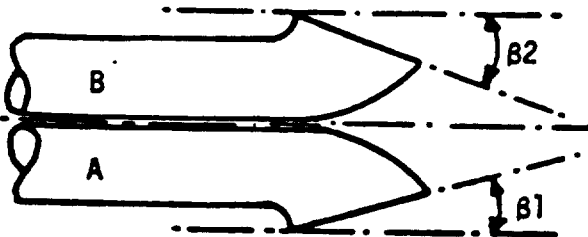
$Z = .32''$

$U_t = .327$

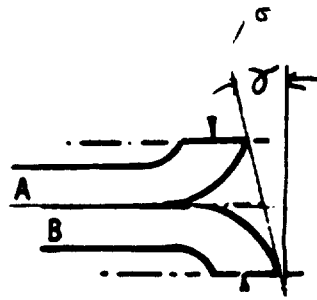
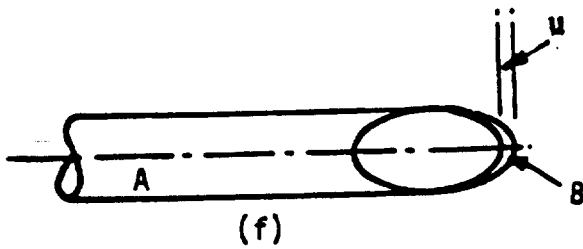
post-test



$\alpha 1, \alpha 2 < 10^\circ$

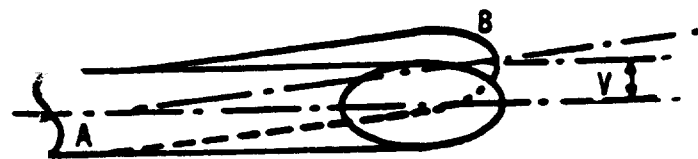


$\beta 1, \beta 2 < 5^\circ$

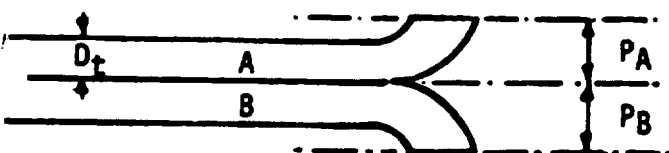


$$\mu = A \sin \theta$$

$$V = A \sin \theta$$



A-SIDE PLANE



B-SIDE PLANE

.385

.565

$$1.05 D_t < P < 1.50 D_t$$

$$P_A = P_B$$

$$2.10 D_t < A < 3.00 D_t$$

.771

.113

B-7

CONTROL BOX CALIBRATION

THREE POINT CALIBRATION

BOX NO. 1
DATE 6-12-90
BP 29.1
OPERATOR TJM

	TIME	WET TEST METER			PRESSURE T _I	DRY TEST METER				TEMP AVG Y	ORIFICE H ₂	VOLUME	METER CORRECT	ORIFICE COEFFICE
		TEMP T _W	VOLUME V _M	P _W		TEMP IN T _A	TEMP OUT P _D	TEMP OUT V _D						
START				0.000	29.10							464.200		
HALF			78.0			94.0	92.0	93.0						
STOP	11.50			5.000								469.118		
CALCULATION	11.50		538.0	5.057	29.10				553.0	29.14	4.918	1.0555	1.475	
START				0.000	29.10						1.00	470.000		
HALF			78.0			98.0	91.0	94.5						
STOP	8.43			5.000								474.977		
CALCULATION	8.43		538.0	5.057	29.10				554.5	29.17	4.977	1.0445	1.580	
START				0.000	29.10						2.00	476.000		
HALF			78.0			99.0	92.0	95.5						
STOP	6.12			5.000								480.920		
CALCULATION	6.12		538.0	5.057	29.10				555.5	29.25	4.920	1.0558	1.663	
AVERAGE													1.0519	1.573

POST TEST

BOX NO. 1
DATE 8-15-90
BP 29.03
OPERATOR MGG

	TIME	WET TEST METER			PRESSURE	DRY TEST METER				AVG	ORIFICE	VOLUME	METER CORRECT	ORIFICE COEFFICE
		TEMP	VOLUME			TEMP IN	TEMP OUT	TEMP						
		T _W	V _M	P _W	T _I	T _O	T _A	P _D	V _D	Y	H ₂			
START				0.000	29.03		94.0		85.0	89.5	1.50	139.400		
HALF			77.0									144.422		
STOP	7.22			5.000										
CALCULATION	7.22		537.0	5.057	29.03					549.5	29.14	5.022	1.0264	1.753
START				0.000	29.03		94.0		84.0	89.0	1.50	145.600		
HALF			77.0									150.643		
STOP	7.18			5.002										
CALCULATION	7.18		537.0	5.059	29.03					549.0	29.14	5.043	1.0216	1.733
START				0.000	29.03		94.0		83.0	88.5	1.50	152.700		
HALF			77.0									157.744		
STOP	7.12			5.001										
CALCULATION	7.12		537.0	5.058	29.03					548.5	29.14	5.044	1.0203	1.707
AVERAGE													1.0228	1.731
DIFFERENCE													2.85%	-9.14%

MAGNAHELIC CALIBRATION

DATE 8-15-90
OPERATOR MGG

P 0-10		P 0-.5		H	
MAGNEHILIC	MANOMETER	MAGNEHILIC	MANOMETER	MAGNEHILIC	MANOMETER
0.50	0.50	0.50	0.50	4.00	4.00
1.00	1.00	0.40	0.40	3.00	3.00
2.00	2.00	0.30	0.30	2.00	2.00
4.00	4.00	0.20	0.20	1.00	1.00
6.00	6.00	0.10	0.10	0.50	0.50
8.00	8.00				

LEAK CHECK

DATE 8-15-90
OPERATOR MGG

	START CF	STOP CF	VOL	TIME	LEAK RATE
DRY	138.270	138.413	0.143	10.000	0.023
WET	0.000	0.371	0.371		

PYROMETER CALIBRATION

DATE 04-28-88
OPERATOR AGL

mV input	temp °F	temp rdg °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

PYROMETER CHECK

DATE 8-6-90
OPERATOR TM

mV input °F	temp °F	temp rdg
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	300.0
8.31	400	400.0
10.57	500	500.0

Name: Keystone Env. Res

Phone: 825-9761

Date 6-25-90 Train ID Box 1 DGM Cal. Factor, Y 1.0519 Orifice No. BAPC#3

Type of Meter Box Napp 100 Type of Pump Diaphragm

		Run Number			
		Example	1	2	3
DGM					
Final reading	ft ³	966.461	114.340	121.375	128.375
Initial reading	ft ³	946.602	107.300	114.400	121.400
Difference, V _m	ft ³	9.859	7.040	6.975	6.975
Percent Accuracy, ZA					
Inlet/Outlet temperatures					
Initial	°F.	108/88	92.192	89.189	89.189
After 5 minutes		110/88	91.190	90.189	91.190
After 10 minutes		111/88	91.190	90.189	92.190
Final		112/89	90.189	90.190	92.191
Avg. temperature, t _d	°F/°R	99.3/559.3	90.6/650.6	89.5/549.5	90.9/55
Time, θ	min	15.0	15.0	15.0	15.0
Orifice man. rdg., delta H		1.35	.70	.70	.70
Bar. pressure, P _{bar}		29.75	28.94	28.94	28.94
Ambient temperature, t _a	°F/°C	74/23.3	74.1233	74.1233	74.123
Pump vacuum	in. Hg	18.8	19.0	19.0	19.0
V _m (std)'	ft ³	9.2815			
DGM cal. factor, Y _c		1.0593			
*V _m (std) (M)	m ³	0.2629			

*If you calculate dry gas volume in English Units, use the conversion factor of 0.02832 m³/ft³ to obtain the volume in metric units.

VOLUMETRIC FLOW DEVICE CALCULATION SHEET

$$\text{Eq. 8-1} \quad Vm(\text{std}) = VmY \left(\frac{T_{\text{std}}}{T_m} \right) \left(\frac{P_{\text{bar}} + \frac{\Delta H}{13.6}}{P_{\text{std}}} \right)$$

$$\text{Run \#1} \quad Vm(\text{std})' = Vm \times Y \times \frac{528}{T_m} \times \left(\frac{P_{\text{bar}} + \frac{\Delta H}{13.6}}{29.92} \right)$$

$$Vm(\text{std})' = \frac{(7.040)(1.0519)(.9590)(.9690)}{}$$

$$Vm(\text{std})' = \underline{6.882} \text{ ft}^3 \text{ (round to 3 decimals)}$$

$$\text{Run \#2} \quad Vm(\text{std})' = \frac{(6.975)(1.0519)(.9608)(.9690)}{}$$

$$Vm(\text{std})' = \underline{6.831} \text{ ft}^3$$

$$\text{Run \#3} \quad Vm(\text{std})' = \frac{(6.975)(1.0519)(.9591)(.9690)}{}$$

$$Vm(\text{std})' = \underline{6.819} \text{ ft}^3$$

$$V_{\text{std}}(\text{M}) = \frac{Vm(\text{std})' \text{ Run \#1} + Vm(\text{std})' \text{ Run \#2} + Vm(\text{std})' \text{ Run \#3}}{3}$$

$$V_{\text{std}}(\text{M}) = \underline{6.844} \text{ ft}^3$$

.....
(To Be Completed By Auditor)

$$\% A = \frac{V_{\text{std}}(\text{M}) - V_{\text{std}}(\text{A})}{V_{\text{std}}(\text{A})} \times 100 \leq \pm 3\%$$

$$\% A = \underline{\hspace{2cm}} \times 100$$

$$\% A = \underline{\hspace{2cm}} \%$$

Project: KEYSTONE ENV. RES.

Phone: 825-9761

Date: 8/21/90 Train ID: BOX 1 DGM Cal. Factor, Y: 1.0519

Orifice No. BAPC-2

Type of Meter Box: NAPP 100 Type of Pump: DIAPHRAM

		Run Number			
		Example	1	2	3
DGM					
Final reading	ft ³	966.461	338.857	345.980	353.060
Initial reading	ft ³	946.602	331.900	339.000	346.100
Difference, V _m	ft ³	9.859	6.957	6.980	6.966
Percent Accuracy, %A					
Inlet/Outlet temperatures					
Initial	°F.	108/88	77.174	78.176	77.175
After 5 minutes		110/88	77.174	78.175	78.175
After 10 minutes		111/88	77.174	78.175	78.175
Final		112/89	76.174	77.175	77.175
Avg. temperature, t _d	°F/°R	99.3/559.3	75.4/535.4	76.8/536.5	76.3/536.6
Time, θ	min	15.0	15.0	15.0	15.0
Orifice man. rdg., delta H		1.35	0.65	0.65	0.65
Bar. pressure, P _{bar}		29.75	28.981	28.98	28.98
Ambient temperature, t _a	°F/°C	74/23.3	82.122.8	82.127.8	82.127
Pump vacuum	in. Hg	18.8	19.5	19.5	19.5
V _m (std)	ft ³	9.2815			
DGM cal. factor, Y _c		1.0593			
*V _m (std) (M)	m ³	0.2629			

*If you calculate dry gas volume in English Units, use the conversion factor of 0.02832 m³/ft³ to obtain the volume in metric units.

VOLUMETRIC FLOW DEVICE CALCULATION SHEET

Eq. 8-1 $V_m(\text{std}) = V_m Y \left(\frac{T_{\text{std}}}{T_m} \right) \left(\frac{P_{\text{bar}} + \frac{\Delta H}{13.6}}{P_{\text{std}}} \right)$

Run #1 $V_m(\text{std})' = V_m \times Y \times \frac{528}{T_m} \times \left(\frac{P_{\text{bar}} + \frac{\Delta H}{13.6}}{29.92} \right)$

$V_m(\text{std})' = \frac{(6.957)(1.0519)(0.9862)(0.9701)}{7.002} \text{ ft}^3$

$V_m(\text{std})' = \frac{6.731}{7.002} \text{ ft}^3 \text{ (round to 3 decimals)}$

Run #2 $V_m(\text{std})' = \frac{(6.980)(1.0519)(0.9842)(0.9702)}{7.011} \text{ ft}^3$

$V_m(\text{std})' = \frac{6.740}{7.011} \text{ ft}^3$

Run #3 $V_m(\text{std})' = \frac{(6.966)(1.0519)(0.9845)(0.9702)}{6.999} \text{ ft}^3$

$V_m(\text{std})' = \frac{6.728}{6.999} \text{ ft}^3$

$V_{\text{std}}(\text{M}) = \frac{V_m(\text{std})' \text{ Run \#1} + V_m(\text{std})' \text{ Run \#2} + V_m(\text{std})' \text{ Run \#3}}{3}$

$V_{\text{std}}(\text{M}) = \frac{7.004}{6.733} \text{ ft}^3$

(To Be Completed By Auditor)

$\% A = \frac{V_{\text{std}}(\text{M}) - V_{\text{std}}(\text{A})}{V_{\text{std}}(\text{A})} \times 100 \leq \pm 3\%$

$\% A = \frac{\quad}{\quad} \times 100$

$\% A = \frac{\quad}{\quad} \%$

**USS CLAIRTON WORKS
RESULTS OF THE
COMPLIANCE DEMONSTRATION OF THE
#13 BATTERY COMBUSTION STACK**

**APPENDIX C
FIELD DATA SHEETS
FOR PARTICULATE MATTER EMISSIONS**

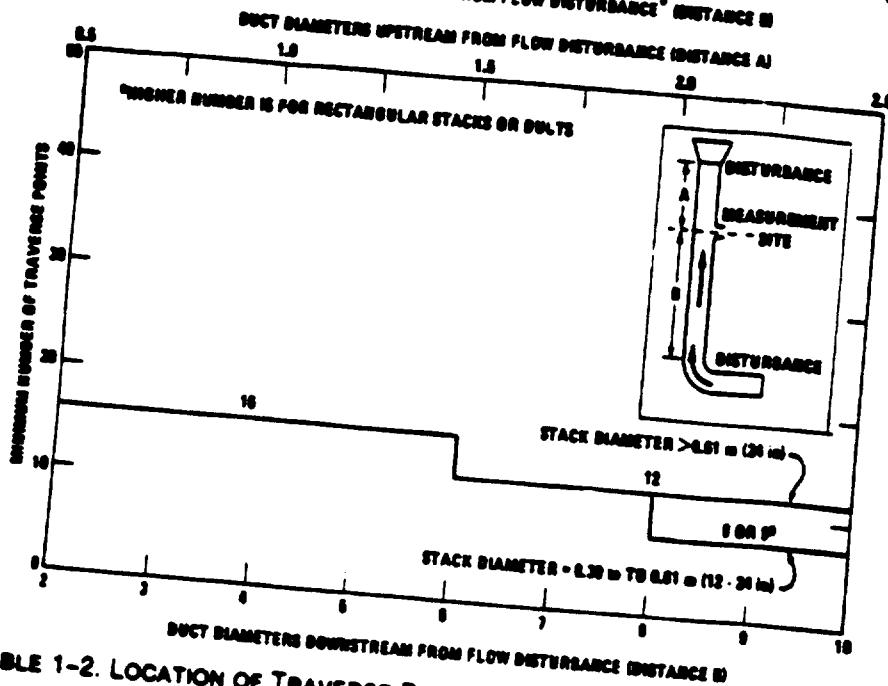
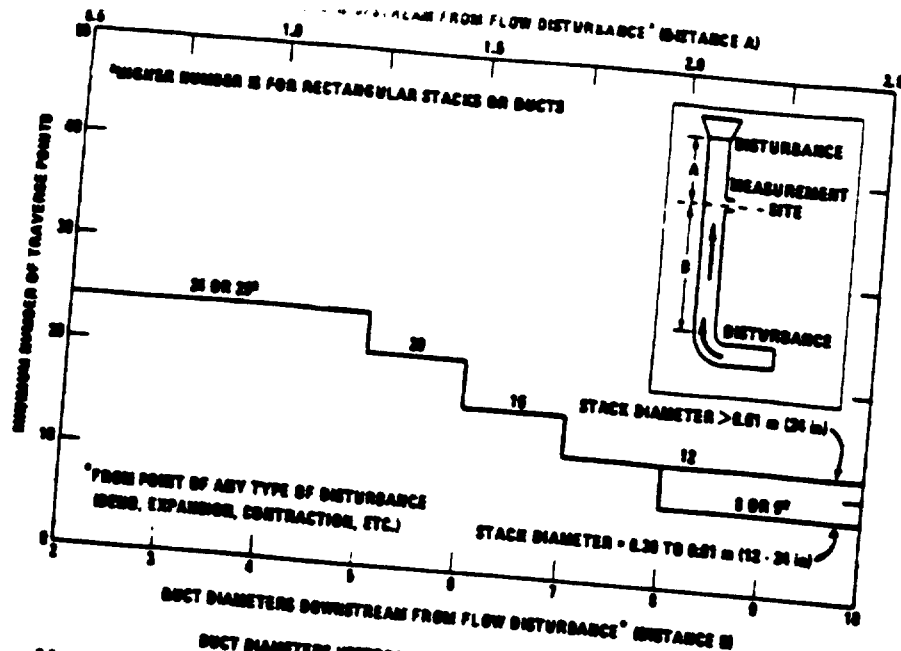


TABLE 1-2. LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS
(Percent of stack diameter from inside wall to traverse point)

Traverse point number on a diameter	Number of traverse points on a diameter—											
	2	4	6	8	10	12	14	16	18	20	22	24
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	86.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4		83.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			86.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6			85.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				88.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				88.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3
12						97.9	90.1	83.1	76.4	66.4	40.7	36.8
13							94.3	87.5	81.2	75.0	66.5	40.2
14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.6
16								98.4	92.5	87.1	82.0	77.0
17									95.6	90.3	85.4	80.6
18									98.6	93.3	88.4	83.9
19										96.1	91.3	86.8
20										98.7	94.0	89.5
21											96.6	92.1
22											98.9	94.5
23												96.9
24												98.9

TABLE 1-1. CROSS-SECTION LAYOUT FOR RECTANGULAR STACKS

Number of traverse points	Method used
8	
12	
16	
20	
24	
28	
32	
36	
40	
44	
48	

STACK SAMPLING DATA SHEET

PLANT USX Clanton DATE: 7-10-90 ΔH : 1573 (6-12-90) HOT BOX NO.: 2
 LOCATION: #13 Combustion Stack TEST NO.: 62-13CS-1 METER CORRECTION: 1.0519 COLD BOX NO.: 2
 ACTIVITY NO.: NOZZLE: #52 0.530 PITOT CORRECTION: 0.87 PROBE NO.: 7-3
 CONTROL BOX OPERATOR: STATIC PRESSURE Ps: ~1.2 CONTROL BOX NO.: 1 FILTER NO.: 410
 PROBE HANDLER: PORT DIRECTION: A, B NOMOGRAPH SET POINT: STACK DIA: 120"
 CLEAN UP: BAROMETRIC PRESSURE: 29.30 LENGTHS OF UMBILICAL x 25' x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H ₂ O	Orifice ΔH 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	910	110.776	.020	.99	.99	77	6.0	483	260	268°F	250	Sampling
36.0			.020	.87	.87	78	5.5	514		Heat Down		
21.3			.020	.86	.86	80	5.5	517				
14.2			.025	1.08	.91	83	7.0	519		58°		
8.0			.020	.86	.93	84	5.5	510		58°		
2.6	940	175.429	.010	.43	.93	86	3.0	500				
B 42.7	745	175.429	.020	.86	.91	87	5.5	500		58°		
30.0			.025	1.08	.96	88	6.0	498				
21.3			.020	.88	.97	86	5.5	501		59°		
14.2			.025	1.10	.98	90	6.5	497				
8.0			.020	.88	.99	91	5.5	490		56°		
2.6	1015	190.880	.010	.44	.98	92	3.0	490				

ORSAT

	1	2
CO ₂	4.5	4.5
O ₂	(3)	(2)
CO	0.2	0.2
N		

LEAK CHECK

	in. Hg.	Rate
fore	5.0	0.02
er	10.0	0.000

Impinger No.

	Final	Initial	Difference
1	268.7	522.1	241.6
2	563.5	512.2	51.3
3	477.7	470.0	4.4
4	689.0	673.0	16.0

PITOT LEAK CHECK	
POS.	NEG.
0.5 sec	OK
15 sec	15 sec

100ml H₂O
 100ml H₂O
 empty
 5.18g



KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

STACK SAMPLING DATA SHEET

PLANT: USX Clarison DATE: 7-10-90 ΔH@: 1.573 (6-12-90) HOT BOX NO.: 2
LOCATION: #13 Combustion Stack TEST NO.: CAR-13CS-1 METER CORRECTION: 1.0514 COLD BOX NO.: 2
ACTIVITY NO.: NOZZLE: #52 0.536 PITOT CORRECTION: 0.84 PROBE NO.: 7-3
CONTROL BOX OPERATOR: STATIC PRESSURE PS: -1.2 CONTROL BOX NO.: 1 FILTER NO.: 410
PROBE HANDLER: PORT DIRECTION: C, D NOMOGRAPH SET POINT: STACK DIA: 120"
CLEAN UP: BAROMETRIC PRESSURE: 29.30 LENGTHS OF UMBILICAL x 25' x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H ₂ O	Orifice ΔH in. H ₂ O		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	1020	190.880	.040	1.76	1.76	96	92	9.0	507	260	48°F 54°F	250	5 min / pt
30.0			.035	1.54	1.54	101	93	8.5	522				
21.3			.030	1.32	1.32	101	93	7.5	527				
14.2			.030	1.32	1.32	102	93	7.5	529				
8.0			.035	1.54	1.54	103	94	8.0	520		570		
2.6	1050	211.384	.025	1.10	1.10	103	95	6.0	510				
D 42.7	1055	211.318	.040	1.76	1.76	94	93	9.0	500		590		
30.0			.040	1.76	1.76	100	92	9.0	514				
21.3			.040	1.76	1.76	101	92	9.0	507		560		
14.2			.035	1.54	1.54	102	93	8.5	507				
8.0			.030	1.32	1.32	102	94	7.5	498		550		
2.6	1025	231.945	.020	1.88	1.88	102	94	5.5	495				

LEAK CHECK

in. Hg.	Rate
before	
after	

ORSAT

CO ₂	O ₂	CO	N
47.5	44.9		

PITOT LEAK CHECK

POS.	NEG.

Impinger No.

1	2	3	4

Final Initial Difference

--	--	--	--

STACK SAMPLING DATA SHEET

PLANT: USX Clackson DATE: 7-10-90 AH@: 1.573 (6-12-90) HOT BOX NO.: 6
 LOCATION: #13 Combustion Stack TEST NO.: C12-13CS-2 METER CORRECTION: 1.0519 COLD BOX NO.: 6
 ACTIVITY NO.: NOZZLE: #52 0.556 PITOT CORRECTION: 0.84 PROBE NO.: 7-2
 CONTROL BOX OPERATOR: STATIC PRESSURE PS: -1.2 CONTROL BOX NO.: 1 FILTER NO.: 397
 PROBE HANDLER: PORT DIRECTION: D, C NOMOGRAPH SET POINT: STACK DIA: 120"
 CLEAN UP: BAROMETRIC PRESSURE: 29.30 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 Out °F	Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp °C/°F	Hot Box °F	Comments
42.7	1200	232.350	.040	1.74	97	95	499	260	56.8°F Heat Down	250	5 min pt
30.0			.028	1.09	104	97	500				
21.3			.030	1.31	106	97	489		58°		
14.2			.020	1.87	107	98	492				
8.0			.010	1.44	106	100	485		56°		
2.6	1230	248.836	.010	1.44	106	100	480				
42.7	1235	248.836	.030	1.31	106	101	502		59°		
30.0			.035	1.53	111	102	505				
21.3			.030	1.43	112	103	495		56°		
14.2			.030	1.43	113	104	490				
8.0			.030	1.43	114	104	490		57°		
2.6	1305	268.138	.020	1.95	115	106	480				

LEAK CHECK

in. Hg.	Rate
5.0	2.02 CFM
7.0	.005 CFM

ORSAT

	1	2
CO ₂	4.0	4.0
O ₂	11.0	11.0
CO		
N		

Impinger No.

PITOT LEAK CHECK	1	2	3	4
POS.				
15 sec	OK	OK	OK	OK

Final Initial Difference

283.8	558.3	225.5	100ml H ₂ O
623.5	586.2	37.3	100ml H ₂ O
382.5	375.4	7.1	empty
698.3	680.7	17.6	5.1.2 Gal

STACK SAMPLING DATA SHEET

PLANT USX Claxton DATE: 7-10-90 ΔH@: 1.573 (6-12-90) HOT BOX NO.: 6
 LOCATION: #13 Combustion Stack TEST NO.: CLE-13CS-2 METER CORRECTION: 1.0519 COLD BOX NO.: 6
 ACTIVITY NO.: NOZZLE: #52 0.556 PITOT CORRECTION: 0.84 PROBE NO.: 7-2
 CONTROL BOX OPERATOR: STATIC PRESSURE PS: -1.2 CONTROL BOX NO.: 1 FILTER NO.: 397
 PROBE HANDLER: PORT DIRECTION: B, A NOMOGRAPH SET POINT: STACK DIA: 120"
 CLEAN UP: BAROMETRIC PRESSURE: 29.30 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 in °F	Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp °C/F	Hot Box °F	Comments
42.7	1310	268.938	.030	1.43	112	107	495	260	<68°F stack down	250	5 min/pt
30.0			.030	1.43	114	108	490				
21.3			.030	1.43	115	108	490		57°		
14.2			.030	1.43	116	109	490				
8.0			.030	1.43	116	109	482		59°		
2.6	1340	289.221	.020	.95	117	110	475				
42.7	1345	289.221	.030	1.43	113	109	490		57°		
30.0			.025	1.19	116	109	478				
21.3			.025	1.19	117	110	480		56°		
14.2			.020	.95	117	110	480				
8.0			.020	.92	117	110	475		55°		
2.6	1415	307.546	.020	.92	117	110	470				

LEAK CHECK

in. Hg.	Rate
before	
after	

ORSAT

CO ₂	1	2
O ₂		
CO		
N		

PITOT LEAK CHECK

POS.	NEG.

Impinger No.

1	2	3	4

Final Initial Difference

STACK SAMPLING DATA SHEET

PLANT USX Canton DATE: 7-10-90 ΔH@: 1,573 (6-12-90) HOT BOX NO.: 7
 LOCATION: #13 Construction Stack TEST NO.: CLE-13CS-3 METER CORRECTION: 1.0519 COLD BOX NO.: 7
 ACTIVITY NO.: NOZZLE: #52 0.550 PITOT CORRECTION: 0.84 PROBE NO.: 7-1
 CONTROL BOX OPERATOR: STATIC PRESSURE PS: -1.2 CONTROL BOX NO.: 1 FILTER NO.: 409
 PROBE HANDLER: PORT DIRECTION: AB NOMOGRAPH SET POINT: STACK DIA: 120"
 CLEAN UP: BAROMETRIC PRESSURE: 29.30 LENGTHS OF UMBILICAL x 25' x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H ₂ O	Orifice ΔH 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	14.35	307.725	.040	1.84	110	109	8.0	485	260	568°F 260	250	5 min / pt
30.0			.035	1.61	117	110	7.5	485				
21.3			.035	1.61	117	110	7.5	489		580		
14.2			.035	1.61	117	110	7.5	493				
8.0			.025	1.15	118	109	5.0	472		56°		
2.6	1505	328.976	.020	.92	118	109	4.0	470				
B 42.7	1510	328.976	.035	1.61	112	108	7.0	490		570		
30.0			.035	1.61	116	109	7.0	498				
21.3			.030	1.38	116	109	6.0	507		560		
14.2			.030	1.38	116	109	6.0	507				
8.0			.025	1.15	116	109	5.0	495		570		
2.6	1540	349.164	.020	.92	114	109	4.0	480				

LEAK CHECK				ORSAT				Impinger No.				Final				Initial				Difference			
in. Hg.	Rate	CO ₂	O ₂	CO	N	1	2	1	2	3	4	796.3	531.6	264.7	100 ml H ₂ O	586.9	537.1	49.8	100 ml H ₂ O	477.4	471.8	5.6	empty
5.0	5.02 CFM					POS.	NEG.	15 sec	OK	15 sec	OK	477.4	471.8	5.6	empty	586.9	537.1	49.8	100 ml H ₂ O	477.4	471.8	5.6	empty
4.0	1001											680.1	659.8	20.3	5.6 ml H ₂ O								

STACK SAMPLING DATA SHEET

PLANT USX Claiton DATE: 7-10-90 ΔH@: 1.573 (6-12-90) HOT BOX NO.: 7
 LOCATION #13 Combustion Stack TEST NO.: CUR-13CS-3 METER CORRECTION: 1.0519 COLD BOX NO.: 7
 ACTIVITY NO.: NOZZLE #52 0.556 PITOT CORRECTION: 0.84 PROBE NO.: 7-1
 CONTROL BOX OPERATOR: STATIC PRESSURE PS: -1.2 CONTROL BOX NO.: 1 FILTER NO.: 409
 PROBE HANDLER: PORT DIRECTION: C, D NOMOGRAPH SET POINT: STACK DIA: 120"
 CLEAN UP: BAROMETRIC PRESSURE: 29.30 LENGTHS OF UMBILICAL x 25' x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H ₂ O	Orifice ΔH 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
42.7	1545	349.164	0.40	1.84	1.84	108	8.0	487	260	56.9	250	5 min ft
30.0			0.40	1.84	1.84	108	8.0	489				
21.3			0.35	1.61	1.61	108	7.0	478		57°		
14.2			0.30	1.38	1.38	107	6.0	476		57°		
8.0			0.30	1.38	1.38	107	6.0	470		57°		
2.6	1615	371.358	0.30	1.38	1.38	107	6.0	470				
42.7	1620	371.358	0.40	1.84	1.84	108	7.0	490		55°		
30.0			0.40	1.84	1.84	109	7.0	510				
21.3			0.40	1.84	1.84	111	7.0	517		57°		
14.2			0.40	1.84	1.84	111	7.0	510				
8.0			0.40	1.84	1.84	111	7.0	498		56°		
2.6	1650	391.043	0.40	1.92	1.92	112	4.0	490				

LEAK CHECK

in. Hg.	Rate

ORSAT

1	2
CO ₂	
O ₂	
CO	
N	

PITOT LEAK CHECK

1	2	3	4
POS.	NEG.		

Impinger No. Final Initial Difference

**USS CLAIRTON WORKS
RESULTS OF THE
COMPLIANCE DEMONSTRATION OF THE
#13 BATTERY COMBUSTION STACK**

**APPENDIX D
PARTICULATE MATTER
EMISSIONS CALCULATIONS**

Plant: Clairton Steel (7/10/90)

Activity No. 601050-02

PARTICULATE REPORTING FORM

[illegible]

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
#13 COMBUSTION
STACK

DATE:7-10-90
CHARGE #: ...150-601050
TEST #:CLR-13CS-1

1. EMISSION RESULTS

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.01247	2.80936

2. STACK CONDITIONS

FLOW (ACFM)	59632.
(SCFM)	31807.
MOISTURE CONTENT (%)	17.37
STACK TEMPERATURE (F)	506.5

3. SAMPLING CONDITIONS

SAMPLE TIME (MIN.)	120.0
SCFD GAS SAMPLED	70.264
PERCENT ISOKINETIC	103.78

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
#13 COMBUSTION STACK
CLR-13CS-1 7-10-90

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	910.0	160.776	.020	.99 .99	82. 77.	6.0	483.	11.0
30.0A			.020	.87 .87	85. 78.	5.5	514.	11.2
21.3A			.020	.86 .86	88. 80.	5.5	517.	11.2
14.2A			.025	1.08 1.08	91. 83.	7.0	519.	12.6
8.0A			.020	.86 .86	93. 84.	5.5	510.	11.2
2.6A	940.0	175.429	.010	.43 .43	93. 86.	3.0	500.	7.9
42.7B	945.0	175.429	.020	.86 .86	91. 87.	5.5	500.	11.1
30.0B			.025	1.08 1.08	96. 88.	6.0	498.	12.4
21.3B			.020	.88 .88	97. 86.	5.5	501.	11.1
14.2B			.025	1.10 1.10	98. 90.	6.5	497.	12.4
8.0B			.020	.88 .88	99. 91.	5.5	490.	11.1
2.6B	1015.0	190.880	.010	.44 .44	98. 92.	3.0	490.	7.8
42.7C	1020.0	190.880	.040	1.76 1.76	96. 92.	9.0	507.	15.8
30.0C			.035	1.54 1.54	101. 93.	8.5	522.	14.9
21.3C			.030	1.32 1.32	101. 93.	7.5	527.	13.8
14.2C			.030	1.32 1.32	102. 93.	7.5	529.	13.8
8.0C			.035	1.54 1.54	103. 94.	8.0	520.	14.9
2.6C	1050.0	211.318	.025	1.10 1.10	103. 95.	6.0	510.	12.5
42.7D	1055.0	211.318	.040	1.76 1.76	94. 93.	9.0	500.	15.7
30.0D			.040	1.76 1.76	100. 92.	9.0	514.	15.9
21.3D			.040	1.76 1.76	101. 92.	9.0	507.	15.8
14.2D			.035	1.54 1.54	102. 93.	8.5	507.	14.8
8.0D			.030	1.32 1.32	102. 94.	7.5	498.	13.6
2.6D	1125.0	231.945	.020	.88 .88	102. 94.	5.5	495.	11.1

O R S A T

CO2	4.5	IMPINGER NO. 1	241.6
O2	11.0	2	51.3
CO	.0	3	4.4
N	84.5	4	.0
		ABSORBED H2O	16.0

CONTROL BOX CALIBRATIONS

	FACTOR	DATE
ORIFICE	1.573	6-12-90
METER	1.0519	6-12-90
PITOT	0.84	6-29-90

LEAK CHECK

	RATE	IN. HG
INITIAL LT	0.02CFM	5.0
FINAL LT	0.02CFM	10.0

CONTROL BOX NO. 1

PROBE NO. 7-3

NOZZLE NO. 52

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
#13 COMBUSTION STACK
CLR-13CS-1 7-10-90

STACK SAMPLING CALCULATIONS

A.	BAROMETRIC PRESSURE IN. HG.....	29.30
B.	AVG. DELTA H (IN H2O).....	1.16
C.	METER PRESSURE (IN. HG.).....	29.39
D.	STATIC PRESSURE (IN. H2O).....	-1.20
E.	STATIC PRESSURE (IN. HG.).....	-.088
F.	STACK PRESSURE (IN. HG.) (A+E).....	29.21
G.	STACK DIAMETER (IN.).....	120.00
H.	STACK AREA (SQ. FT.).....	78.54
	NOZZLE DIAMETER.....	.5560
I.	NOZZLE AREA (SQ. FT.).....	.001686
J.	AVG. STACK TEMP (DEG. R.).....	966.5
K.	AVG. METER TEMP (DEG. R.).....	552.9
L.	CONDENSATE VOL. (ML).....	297.3
M.	ABSORBED H2O (ML).....	16.0
N.	TOTAL H2O (ML).....	313.3
O.	METERED GAS (CF).....	71.169
P.	GAS METER CORRECTION.....	1.0519
Q.	CORRECTED METERED GAS (CF).....	74.863
R.	H2O GAS VOLUME (CF) (0.00267N(K/C).....	15.739
S.	TOTAL SAMPLED VOLUME (CF) (Q+R).....	90.601
T.	PERCENT H2O (100R/S).....	17.37
	THEORETICAL MAXIMUM.....	100.00
	PERCENT WATER USED.....	17.37
U.	SCFD GAS SAMPLED (528*Q*C/(29.9*K)).....	70.264

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	.045	X	.8263	X	44.0	=	1.64
CO	.000	X	.8263	X	28.0	=	.00
O2	.110	X	.8263	X	32.0	=	2.91
N2	.845	X	.8263	X	28.2	=	19.69
H2O		X	T/100= .1737	X	18.0	=	3.13
MOLECULAR WEIGHT OF STACK GAS							= 27.36

W.	PITOT CORRECTION.....	.840
X.	AVERAGE CORRECTED VELOCITY (FPS).....	12.65
	[85.49*W*SQRT((J*DELTA P)/(V*F))]	
Y.	AVG. FLOW RATE (CFM) (X*H*60).....	59632.
Z.	STACK FLOW RATE (SCFM) (528*Y/J*F/29.92).....	31807.
	STACK FLOW RATE (DRY).....	26282.
AA.	SAMPLE TIME (SEC).....	7200.
BB.	PERCENT ISOKINETIC.....	103.78
	(J*100*U*29.92)/(528*X*AA*I*F*(1-T/100))	

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
 #13 COMBUSTION STACK
 CLR-13CS-1 7-10-90

PARAMETER	CYCLONE WT. (G)	MATL.ON FILTER(G)	INSOL.MATL. IN PROBE(G)	SOL.MATL. IN PROBE(G)
PARTICULATE	.00000	.03900	.00000	.01650

PARAMETER	INSOL.MATL. IN IMP.(G)	SOLUBLE MATL. IN IMP.(G)
PARTICULATE	.00140	.00970

PARTICULATE	.06660
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ALL MATLS.	.06660
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PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.01247	2.80936

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

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
#13 COMBUSTION
STACK

DATE:7-10-90
CHARGE #: ...150-601050
TEST #:CLR-13CS-2

1. EMISSION RESULTS

PARAMETER	GR/SCFD	LB/HR
-----	-----	-----
PARTICULATE	.01166	2.67752

2. STACK CONDITIONS

FLOW (ACFM)	58473.
(SCFM)	31810.
MOISTURE CONTENT (%)	15.80
STACK TEMPERATURE (F)	487.6

3. SAMPLING CONDITIONS

SAMPLE TIME (MIN.)	120.0
SCFD GAS SAMPLED	72.226
PERCENT ISOKINETIC	104.68

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
#13 COMBUSTION STACK
CLR-13CS-2 7-10-90

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 F	CORRECTED VELOCITY FFT/SEC
42.7D	1200.0	232.350	.040	1.74 1.74	97. 95.	6.0	499.	15.7
30.0D			.025	1.09 1.09	104. 97.	4.0	500.	12.4
21.3D			.030	1.31 1.31	106. 97.	4.0	489.	13.5
14.2D			.020	.87 .87	107. 98.	3.0	492.	11.1
8.0D			.010	.44 .44	106. 100.	2.0	485.	7.8
2.6D	1230.0	248.836	.010	.44 .44	106. 100.	2.0	480.	7.8
42.7C	1235.0	248.836	.030	1.31 1.31	106. 101.	4.0	502.	13.6
30.0C			.035	1.53 1.53	111. 102.	5.0	505.	14.7
21.3C			.030	1.43 1.43	112. 103.	5.0	495.	13.6
14.2C			.030	1.43 1.43	113. 104.	5.0	490.	13.5
8.0C			.030	1.43 1.43	114. 104.	5.0	490.	13.5
2.6C	1305.0	268.938	.020	.95 .95	115. 106.	3.0	480.	11.0
42.7B	1310.0	268.938	.030	1.43 1.43	112. 107.	5.0	495.	13.6
30.0B			.030	1.43 1.43	114. 108.	5.0	490.	13.5
21.3B			.030	1.43 1.43	115. 108.	5.0	490.	13.5
14.2B			.030	1.43 1.43	116. 109.	5.0	490.	13.5
8.0B			.030	1.43 1.43	116. 109.	5.0	482.	13.5
2.6B	1340.0	289.221	.020	.95 .95	117. 110.	5.5	475.	11.0
42.7A	1345.0	289.221	.030	1.43 1.43	113. 109.	5.0	490.	13.5
30.0A			.025	1.19 1.19	116. 109.	4.5	478.	12.3
21.3A			.025	1.19 1.19	117. 110.	4.5	480.	12.3
14.2A			.020	.95 .95	117. 110.	4.0	480.	11.0
8.0A			.020	.92 .92	117. 110.	4.0	475.	11.0
2.6A	1415.0	307.546	.020	.92 .92	117. 110.	4.0	470.	10.9

O R S A T

CO2	4.0	IMPINGER NO. 1	225.5
O2	11.0	2	37.3
CO	.0	3	7.1
N	85.0	4	.0
		ABSORBED H2O	17.6

CONTROL BOX CALIBRATIONS

	FACTOR	DATE
ORIFICE	1.573	6-12-90
METER	1.0519	6-12-90
PITOT	0.84	6-29-90

LEAK CHECK

	RATE	IN. HG
INITIAL	LT 0.02 CFM	5.0
FINAL	0.005 CFM	7.0

CONTROL BOX NO. 1

PROBE NO. 7-2

NOZZLE NO. 52

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
#13 COMBUSTION STACK
CLR-13CS-2 7-10-90

STACK SAMPLING CALCULATIONS

A.	BAROMETRIC PRESSURE IN. HG.....	29.30
B.	AVG. DELTA H (IN H2O).....	1.19
C.	METER PRESSURE (IN. HG.).....	29.39
D.	STATIC PRESSURE (IN. H2O).....	-1.20
E.	STATIC PRESSURE (IN. HG.).....	-.088
F.	STACK PRESSURE (IN. HG.) (A+E).....	29.21
G.	STACK DIAMETER (IN.).....	120.00
H.	STACK AREA (SQ. FT.).....	78.54
	NOZZLE DIAMETER.....	.5560
I.	NOZZLE AREA (SQ. FT.).....	.001686
J.	AVG. STACK TEMP (DEG. R.).....	947.6
K.	AVG. METER TEMP (DEG. R.).....	568.3
L.	CONDENSATE VOL. (ML).....	269.9
M.	ABSORBED H2O (ML).....	17.6
N.	TOTAL H2O (ML).....	287.5
O.	METERED GAS (CF).....	75.196
P.	GAS METER CORRECTION.....	1.0519
Q.	CORRECTED METERED GAS (CF).....	79.099
R.	H2O GAS VOLUME (CF) (0.00267N(K/C)).....	14.845
S.	TOTAL SAMPLED VOLUME (CF) (Q+R).....	93.944
T.	PERCENT H2O (100R/S).....	15.80
	THEORETICAL MAXIMUM.....	100.00
	PERCENT WATER USED.....	15.80
U.	SCFD GAS SAMPLED (528*Q*C/(29.9*K)).....	72.226

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	.040	X	.8420	X	44.0	=	1.48
CO	.000	X	.8420	X	28.0	=	.00
O2	.110	X	.8420	X	32.0	=	2.96
N2	.850	X	.8420	X	28.2	=	20.18
H2O		X	T/100= .1580	X	18.0	=	2.84
MOLECULAR WEIGHT OF STACK GAS							= 27.47

W.	PITOT CORRECTION.....	.840
X.	AVERAGE CORRECTED VELOCITY (FPS).....	12.41
	[85.49*W*SQRT{(J*DELTA P)/(V*F)}]	
Y.	AVG. FLOW RATE (CFM) (X*H*60).....	58473.
Z.	STACK FLOW RATE (SCFM) (528*Y/J*F/29.92).....	31810.
	STACK FLOW RATE (DRY).....	26784.
AA.	SAMPLE TIME (SEC).....	7200.
BB.	PERCENT ISOKINETIC.....	104.68
	(J*100*U*29.92)/(528*X*AA*I*F*(1-T/100))	

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
 #13 COMBUSTION STACK
 CLR-13CS-2 7-10-90

PARAMETER	CYCLONE WT. (G)	MATL.ON FILTER(G)	INSOL.MATL. IN PROBE(G)	SOL.MATL. IN PROBE(G)
PARTICULATE	.00000	.03740	.00000	.01590

PARAMETER	INSOL.MATL. IN IMP. (G)	SOLUBLE MATL. IN IMP. (G)
PARTICULATE	.00140	.00790

PARTICULATE	.06260
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ALL MATLS.	.06260
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PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.01166	2.67752

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

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
#13 COMBUSTION
STACK

DATE:7-10-90
CHARGE #: ...150-601050
TEST #:CLR-13CS-3

1. EMISSION RESULTS

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.01026	2.69222

2. STACK CONDITIONS

FLOW (ACFM)	67397.
(SCFM)	36578.
MOISTURE CONTENT (%)	16.30
STACK TEMPERATURE (F)	489.8

3. SAMPLING CONDITIONS

SAMPLE TIME (MIN.)	120.0
SCFD GAS SAMPLED	82.411
PERCENT ISOKINETIC	104.49

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
#13 COMBUSTION STACK
CLR-13CS-3 7-10-90

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	1435.0	307.725	.040	1.84 1.84	110. 109.	8.0	485.	15.6
30.0A			.035	1.61 1.61	117. 110.	7.5	485.	14.6
21.3A			.035	1.61 1.61	117. 110.	7.5	489.	14.6
14.2A			.035	1.61 1.61	117. 110.	7.5	493.	14.7
8.0A			.025	1.15 1.15	118. 109.	5.0	472.	12.2
2.6A	1505.0	328.976	.020	.92 .92	118. 109.	4.0	470.	10.9
42.7B	1510.0	328.976	.035	1.61 1.61	112. 108.	7.0	490.	14.6
30.0B			.035	1.61 1.61	116. 109.	7.0	498.	14.7
21.3B			.030	1.38 1.38	116. 109.	6.0	507.	13.7
14.2B			.030	1.38 1.38	116. 109.	6.0	507.	13.7
8.0B			.025	1.15 1.15	116. 109.	5.0	495.	12.4
2.6B	1540.0	349.164	.020	.92 .92	114. 108.	4.0	480.	11.0
42.7C	1545.0	349.164	.040	1.84 1.84	111. 108.	8.0	487.	15.6
30.0C			.040	1.84 1.84	114. 108.	8.0	489.	15.6
21.3C			.035	1.61 1.61	115. 108.	7.0	478.	14.5
14.2C			.030	1.38 1.38	114. 107.	6.0	476.	13.4
8.0C			.030	1.38 1.38	114. 107.	6.0	470.	13.4
2.6C	1615.0	371.358	.030	1.38 1.38	115. 107.	6.0	470.	13.4
42.7D	1620.0	371.358	.040	1.84 1.84	111. 108.	7.0	490.	15.6
30.0D			.040	1.84 1.84	117. 109.	7.0	510.	15.8
21.3D			.040	1.84 1.84	118. 111.	7.0	517.	15.9
14.2D			.040	1.84 1.84	118. 111.	7.0	510.	15.8
8.0D			.040	1.84 1.84	118. 111.	7.0	498.	15.7
2.6D	1650.0	394.043	.040	.92 .92	119. 112.	4.0	490.	15.6

O R S A T

CO2 4.0
O2 10.8
CO .0
N 85.3

IMPINGER NO. 1 264.7

2 49.8

3 5.6

4 .0

ABSORBED H2O 20.3

CONTROL BOX CALIBRATIONS

	FACTOR	DATE
ORIFICE	1.573	6-12-90
METER	1.0519	6-12-90
PITOT	0.84	6-29-90

LEAK CHECK

	RATE	IN. HG
INITIAL LT	0.02CFM	5.0
FINAL	0.001 CFM	9.0

CONTROL BOX NO. 1

PROBE NO. 7-1

NOZZLE NO. 52

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
#13 COMBUSTION STACK
CLR-13CS-3 7-10-90

STACK SAMPLING CALCULATIONS

A.	BAROMETRIC PRESSURE IN. HG.....	29.30
B.	AVG. DELTA H (IN H2O).....	1.51
C.	METER PRESSURE (IN. HG.).....	29.41
D.	STATIC PRESSURE (IN. H2O).....	-1.20
E.	STATIC PRESSURE (IN. HG.).....	-.088
F.	STACK PRESSURE (IN. HG.) (A+E).....	29.21
G.	STACK DIAMETER (IN.).....	120.00
H.	STACK AREA (SQ. FT.).....	78.54
	NOZZLE DIAMETER.....	.5560
I.	NOZZLE AREA (SQ. FT.).....	.001686
J.	AVG. STACK TEMP (DEG. R.).....	949.8
K.	AVG. METER TEMP (DEG. R.).....	572.2
L.	CONDENSATE VOL. (ML).....	320.1
M.	ABSORBED H2O (ML).....	20.3
N.	TOTAL H2O (ML).....	340.4
O.	METERED GAS (CF).....	86.318
P.	GAS METER CORRECTION.....	1.0519
Q.	CORRECTED METERED GAS (CF).....	90.798
R.	H2O GAS VOLUME (CF) (0.00267N(K/C).....	17.683
S.	TOTAL SAMPLED VOLUME (CF) (Q+R).....	108.481
T.	PERCENT H2O (100R/S).....	16.30
	THEORETICAL MAXIMUM.....	100.00
	PERCENT WATER USED.....	16.30
U.	SCFD GAS SAMPLED (528*Q*C/(29.9*K)).....	82.411

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	.040	X	.8370	X	44.0	=	1.47
CO	.000	X	.8370	X	28.0	=	.00
O2	.108	X	.8370	X	32.0	=	2.88
N2	.853	X	.8370	X	28.2	=	20.12
H2O		X	T/100= .1630	X	18.0	=	2.93
MOLECULAR WEIGHT OF STACK GAS							= 27.41

W.	PITOT CORRECTION.....	.840
X.	AVERAGE CORRECTED VELOCITY (FPS).....	14.30
	[85.49*W*SQRT{(J*DELTA P)/(V*F)}]	
Y.	AVG. FLOW RATE (CFM) (X*H*60).....	67397.
Z.	STACK FLOW RATE (SCFM) (528*Y/J*F/29.92).....	36578.
	STACK FLOW RATE (DRY).....	30616.
AA.	SAMPLE TIME (SEC).....	7200.
BB.	PERCENT ISOKINETIC.....	104.49
	(J*100*U*29.92)/(528*X*AA*I*F*(1-T/100))	

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
 #13 COMBUSTION STACK
 CLR-13CS-3 7-10-90

PARAMETER	CYCLONE WT. (G)	MATL.ON FILTER(G)	INSOL.MATL. IN PROBE(G)	SOL.MATL. IN PROBE(G)
PARTICULATE	.00000	.03470	.00000	.01840

PARAMETER	INSOL.MATL. IN IMP.(G)	SOLUBLE MATL. IN IMP.(G)
PARTICULATE	.00180	.00530

PARTICULATE	.06020
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ALL MATLS.	.06020
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PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.01026	2.69222

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

**USS CLAIRTON WORKS
RESULTS OF THE
COMPLIANCE DEMONSTRATION OF THE
#13 BATTERY COMBUSTION STACK**

**APPENDIX E
ANALYTICAL RESULTS**

RJ Lee Group

The Materials Characterization Specialists

August 21, 1990

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

Re: RJ Lee Project Number: CHH008019-1
Customer Purchase Order: 601050-02

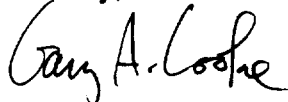
Dear Pat:

At your request, we examined three samples, provided by you for total sulfate (SO_4^{2-}) content. The solutions contained a mixture of organic solvents and water and were prepared for analysis by evaporation of a 100 ml aliquot to 25ml and rediluting back to the original 100ml volume. This removed the solvents. The samples were then analyzed along with standard sulfate solutions on a Dionex 2000i ion chromatography unit. Results are calculated as milligrams per liter (ppm) and then converted to total milligrams using the volumes of the solutions that you provided. These results are reported on the enclosed table. 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 and 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 ninety (90) days before discarding. A shipping and handling fee will be assessed for the return of any samples.

If you have any questions on this report or if we can be of further assistance, please feel free to call me.

Sincerely,



Gary A. Cooke
Manager, Analytical Chemistry

GAC/ljm
Enclosure

E-1

Table I

CHH008019-1

For Keystone Environmental

Client Sample Number	RJ Lee Sample Number	SO ₄ ²⁻ (ppm)	Solution volume (ml)	Total Sulfate (mg)
CLR-13CS-1	90593	36.8	930	34.2
CLR-13CS-2	90594	39.6	740	29.3
CLR-13CS-3	90595	54.2	950	51.5

Authorized Signature

Date


9/21/92

RJ Lee Group, Inc.
Headquarters

350 Hochberg Road
Monroeville, PA 15146

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

**USS CLAIRTON WORKS
RESULTS OF THE
COMPLIANCE DEMONSTRATION OF THE
#13 BATTERY COMBUSTION STACK**

**APPENDIX F
FIELD DATA SHEETS
FOR VISIBLE EMISSIONS**

VISIBLE EMISSIONS OBSERVATIONS FORM

OBSERVER: MCROY

DATE: 10 JUN 1990

FACILITY: USX Clinton

OBSERVATION: START TIME: 9:10 AM

END TIME: 10:10 AM

OBSERVATION POINT:

Wabash Employee Wash Lot
#13

SOURCE: Battery Draft Stack

DISTANCE: 560'

DIRECTION FROM: SW of H¹

HEIGHT: 200'

WIND:

SPEED: 9 mph

DIRECTION: → SW

TEMPERATURE: 79°

SKY CONDITION: sun cast

BACKGROUND: SKY

READING CONDITIONS: Fair

COLOR OF EMISSION: N/A

TOTAL No. OF READINGS: 240

No. READINGS ≥ 20% 0

No. READINGS ≥ 60% 0

GREATEST OPACITY: 0

CREW: B FOREMAN: R. McNalt

COMMENTS: _____

#13 Stack

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

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

13 Stack

DATE: 10 July 1990

FACILITY: USXC/Airton works

OBSERVATION: START TIME: 10:10 AM

END TIME: 11:10 AM

OBSERVATION POINT: wash :15

Wabash Employee House Lot

13

SOURCE: Bottery Drafts Book

DISTANCE: 2575'

DIRECTION FROM: S-W 0 ft

HEIGHT: 0200

MIND:

SPEED: 9. mph

DIRECTION: SW

TEMPERATURE: 79°

SKY CONDITION: overcast

BACKGROUND: Sty

READING CONDITIONS: Good

COLOR OF EMISSION: 0

TOTAL No. OF READINGS: 240

No. READINGS $\geq$ 20% 0

No. READINGS = 60Z 0

GREATEST OPACITY: 0

CREW: B FOREMAN: R. Mcnatt

COMMENTS: _____

0	○	○	○	○	○	30	○	○	○	○	○
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	○	○	○	○	○

VISIBLE EMISSIONS OBSERVATIONS FORM

OBSERVER: Mc Kay

DATE: 10 July, 1990

FACILITY: US & Clinton works

OBSERVATION: START TIME: 11:10

END TIME: 11:28

OBSERVATION POINT:

Wabash Employee Wash Lot

#13

SOURCE: Battery Sulf Stack

DISTANCE: 0.570'

DIRECTION FROM: → SW to F

HEIGHT: 0.200'

WIND:

SPEED: _____

DIRECTION: _____

TEMPERATURE: _____

SKY CONDITION: _____

BACKGROUND: _____

READING CONDITIONS: _____

COLOR OF EMISSION: _____

TOTAL No. OF READINGS: _____

No. READINGS ≥ 20% _____

No. READINGS ≥ 60% _____

GREATEST OPACITY: _____

CREW: _____ FOREMAN: _____

COMMENTS: _____

#13 Stack

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
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VISIBLE EMISSIONS OBSERVATIONS FORM

OBSERVER: Mc Koy

DATE: 10 July, 1990

FACILITY: USC/airton work

OBSERVATION: START TIME: 12:00 n

END TIME: 1:00 pm

OBSERVATION POINT:

Wahash Employee House Lot
13

SOURCE: Battery Dract Stack

DISTANCE: 0.570

DIRECTION FROM: SW "OF"

HEIGHT: 0.200'

WIND:

SPEED: 12-mph

DIRECTION: → SW

TEMPERATURE: 83°

SKY CONDITION: Partly Cloudy

BACKGROUND: Sky

READING CONDITIONS: Good

COLOR OF EMISSION: 0

TOTAL No. OF READINGS: 240

No. READINGS ≥ 20% 0

No. READINGS ≥ 60% 0

GREATEST OPACITY: 0

CREW: B FOREMAN: R. Mena

COMMENTS: _____

#13 Stack

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

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

OBSERVER: McKoy

DATE: 10 July 1990

FACILITY: NIS&Canton Works

OBSERVATION: START TIME: 1:00 PM

END TIME: 2:00 PM

OBSERVATION POINT:

South End #19 Batt.
#13

SOURCE: Battery Craft Stack

DISTANCE: 0.560'

DIRECTION FROM: SW of

HEIGHT: 200'

WIND:

SPEED: 10. MPH

DIRECTION: → SW

TEMPERATURE: 83°

SKY CONDITION: Partly Cloudy

BACKGROUND: SKY

READING CONDITIONS: Good

COLOR OF EMISSION: 0

TOTAL No. OF READINGS: 240

No. READINGS ≥ 20% 0

No. READINGS ≥ 60% 0

GREATEST OPACITY: 0

CREW: B FOREMAN: P. McRutt

COMMENTS: _____

#13 Stack

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

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

2 of 2

VISIBLE EMISSIONS OBSERVATIONS FORM

OBSERVER: McKoy

DATE: 10 July 1990

FACILITY: USC Clinton Works

OBSERVATION: START TIME: 2:00 PM

END TIME: 2:10 PM

OBSERVATION POINT:

South End #19 Batt.

#13

SOURCE: Battery Drift. Clock

DISTANCE: 0.550'

DIRECTION FROM: SW "off"

HEIGHT: 0.200'

WIND:

SPEED: _____

DIRECTION: _____

TEMPERATURE: _____

SKY CONDITION: Partly

BACKGROUND: SKY

READING CONDITIONS: _____

COLOR OF EMISSION: _____

TOTAL No. OF READINGS: _____

No. READINGS $\geq$ 20% _____

No. READINGS $\geq$ 60% _____

GREATEST OPACITY: _____

CREW: _____ FOREMAN: _____

COMMENTS: _____

#13 Stack

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
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VISIBLE EMISSIONS OBSERVATIONS FORM

OBSERVER: McKeyDATE: 10 July, 1990FACILITY: USX (air) on workOBSERVATION START TIME: 2:35 PMEND TIME: 3:35 AM

OBSERVATION POINT:

South end #19 Batt.

#13

SOURCE: Battery Duff StreetDISTANCE: 0.5556DIRECTION FROM: SW ofHEIGHT: 0.200

WIND:

SPEED: 16 m.p.h.DIRECTION: SWTEMPERATURE: 88°SKY CONDITION: 1/2 cloudsBACKGROUND: skyREADING CONDITIONS: GoodCOLOR OF EMISSION: 0TOTAL No. OF READINGS: 240No. READINGS $\geq 20\%$ 8No. READINGS $\geq 60\%$ 0GREATEST OPACITY: 0CREW: 3 FOREMAN: McKeyCOMMENTS: /

#13 Stack

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

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

OBSERVER: McKayDATE: 10 July, 1990FACILITY: USX Clinton worksOBSERVATION: START TIME: 3:35 PM
END TIME: 4:35 PM

OBSERVATION POINT:

Wabash Employee Wash
#13SOURCE: Battery Shaft StackDISTANCE: 0.5DIRECTION FROM: SWOKHEIGHT: 200

WIND:

SPEED: 18-25 mphDIRECTION: → NWTEMPERATURE: 87°SKY CONDITION: overcast RainBACKGROUND: SkyREADING CONDITIONS: GoodCOLOR OF EMISSION: A/NTOTAL No. OF READINGS: 210No. READINGS ≥ 20% 0No. READINGS ≥ 60% 0GREATEST OPACITY: 0CREW: B FOREMAN: R. Hall

COMMENTS:

0	0	0	0	0	105	30	0	0	0	0
1	0	0	0	0		31	0	0	0	0
2	0	0	0	0		32	0	0	0	0
3	0	0	0	0		33	0	0	0	0
4	0	0	0	0		34	0	0	0	0
5	0	0	0	0	110	35	0	0	0	0
6	0	0	0	0		36	0	0	0	0
7	0	0	0	0		37	0	0	0	0
8	0	0	0	0		38	0	0	0	0
9	0	0	0	0		39	0	0	0	0
10	0	0	0	0	115	40	0	0	0	0
11	0	0	0	0		41	0	0	0	0
12	0	0	0	0		42	0	0	0	0
13	0	0	0	0		43	0	0	0	0
14	0	0	0	0		44	0	0	0	0
15	0	0	0	0	120	45	0	0	0	0
16	0	0	0	0		46	0	0	0	0
17	0	0	0	0		47	0	0	0	0
18	0	0	0	0		48	0	0	0	0
19	0	0	0	0		49	0	0	0	0
20	0	0	0	0	125	50	0	0	0	0
21	0	0	0	0		51	0	0	0	0
22	0	0	0	0		52	0	0	0	0
23	0	0	0	0		53	0	0	0	0
24	0	0	0	0		54	0	0	0	0
25	0	0	0	0	130	55	0	0	0	0
26	0	0	0	0		56	0	0	0	0
27	0	0	0	0		57	0	0	0	0
28	0	0	0	0		58	0	0	0	0
29	0	0	0	0		59	0	0	0	0

VISIBLE EMISSIONS OBSERVATIONS FORM

OBSERVER: Mc KayDATE: 10 July, 1990FACILITY: USS Clinton W. KOBSERVATION: START TIME: 4:35END TIME: 4:47OBSERVATION POINT: 40SOURCE: #13 Battery Draft StackDISTANCE: 2550' : 45DIRECTION FROM: SW ofHEIGHT: 200

WIND:

SPEED: 18 mphDIRECTION: → NETEMPERATURE: 86°SKY CONDITION: hazyBACKGROUND: sky

READING CONDITIONS: _____

COLOR OF EMISSION: _____

TOTAL No. OF READINGS: _____

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

GREATEST OPACITY: _____

CREW: _____ FOREMAN: _____

COMMENTS: _____

#13 Stack

0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
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7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
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