USS CLAIRTON WORKS

COMPLIANCE DEMONSTRATION
B 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: 605024-02

AUGUST 1992

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ABSTRACT

On May 7, 1992, a compliance test program was conducted for USS Clairton Works, Clairton, PA, on the B 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 for B Battery Combustion Stack, 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 0.0072 gr/dscf and 6.67 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. Visible emissions readings were zero for all three test runs, thus, the visible emissions are in compliance.

1.0 INTRODUCTION

On May 7, 1992, a compliance test program was conducted for USS Clairton Works, Clairton, PA, on the B 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, Thomas Morgan, and David Beranek. Visible emissions determinations were performed by Charles Davis of Environmental Technical Services (ETS). Keystone and ETS are divisions 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

The compliance test program followed the USS-approved emissions measurement test protocol which can be found in Appendix A.

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, maximum operation and production of the battery.

The process exhausts through a 195 inch inside 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 traverse point was sampled for 5 minutes, thus bringing the total sampling time to 120 minutes for each test run. A schematic diagram of the combustion 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 CO_2, O_2, and N_2 (by difference) were determined with the use of a Bacharach "Fyrite" apparatus as specified by EPA Method 3. Gas concentrations were used to obtain molecular weight of the process gas.

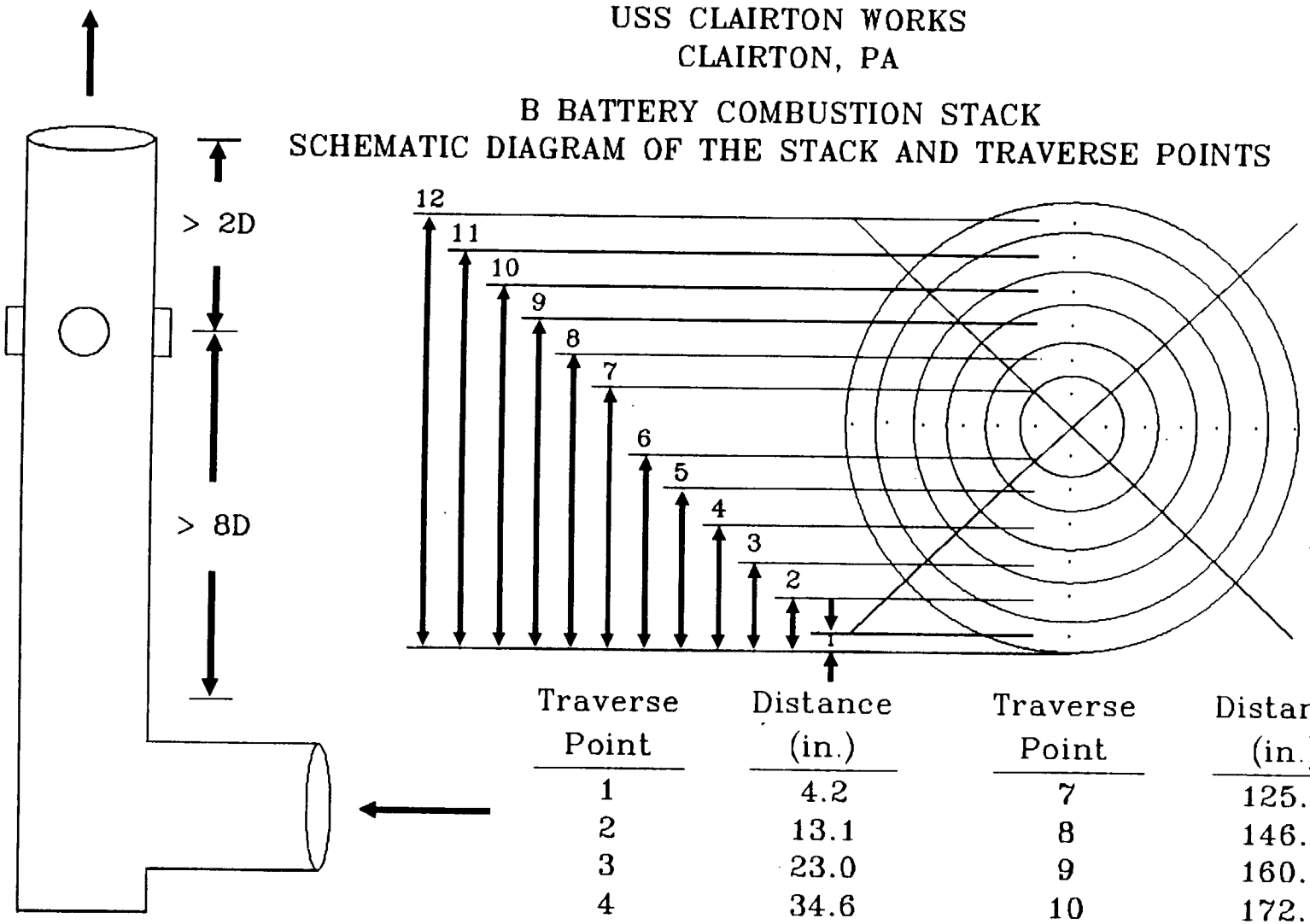
Percent moisture content, by volume, of the exhaust gas was determined by measuring the weight gain of the four sample train impingers in accordance with EPA Method 4.

As specified by EPA Method 5, each sampling 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

FIGURE 2-1

USS CLAIRTON WORKS
CLAIRTON, PA

B BATTERY COMBUSTION STACK
SCHEMATIC DIAGRAM OF THE STACK AND TRAVERSE POINTS



Traverse Point	Distance (in.)	Traverse Point	Distance (in.)
1	4.2	7	125.7
2	13.1	8	146.3
3	23.0	9	160.4
4	34.6	10	172.0
5	48.8	11	181.9
6	69.4	12	190.9

Stack Diameter (D) = 195 in.

KEYSTONE
ENVIRONMENTAL RESOURCES INC

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 were determined as a total; that is, the water rinse was not filtered to determine soluble and 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, on the other hand, were determined separately in accordance with Section 139.12 of the PA DER Source Testing Manual. The first three impinger solutions and back-half water rinses were combined and then filtered under suction through a preweighed 0.22 micrometer membrane filter. This filter was dried, desiccated, and weighed to a constant weight to determine the amount of insoluble particulate matter captured by the filter. 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 rinse residue weights. Front-half water and acetone rinse residue weights (after blank correction), 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.

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 B.

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 C.

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

The test results for particulate matter have been summarized in Table 3-1. As promulgated by the Amended Mon Valley Consent Decree, Paragraph V.A.(6), the allowable particulate matter concentration for B Battery Combustion Stack is 0.015 gr/dscf. The results of the testing yielded an average particulate matter concentration and emission rate of 0.0072 grains per dry standard cubic feet (gr/dscf) and 6.67 pounds per hour (lb/hr), respectively. The actual particulate matter concentration is less than the allowable concentration, 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 expressed 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 (^{o}F), gas volume sampled for each test in units of dry standard cubic feet (dscf), and the isokinetics value for each test. Greater than 80 dry standard cubic feet (dscf) of gas was collected during each of the three test runs. EPA Method 5 requires that at least 50 dscf of process gas be sampled during each test run. Therefore, a sufficient amount of gas was sampled 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 percent and 110 percent is considered acceptable. Isokinetic values for the three test runs were 101.1 percent, 97.6 percent, and

TABLE 3-1

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B BATTERY COMBUSTION STACK
PARTICULATE MATTER EMISSIONS DATA

		Run 1	Run 2	Run 3	Average
Test Number		CLR-BBS-1	CLR-BBS-2	CLR-BBS-3	
Test Date		5/7/92	5/7/92	5/7/92	
Mass Emission Rate and Concentration					
Particulate Matter	(lb/hr)	7.14	6.77	6.11	6.67
	(gr/DSCF)	0.0081	0.0071	0.0063	0.0072
Stack Conditions					
Average Flow Rate	(ACFM)	214768	228137	226646	223184
Standard Flow Rate	(SCFM)	118093	126695	125293	123360
Temperature	(°F)	489.0	479.6	479.5	482.7
Moisture Content	(%)	12.6	12.4	10.3	11.8
Sampling Conditions					
Test times		9:15 to 9:45	12:08 to 12:38	14:49 to 15:19	
		9:49 to 10:19	12:46 to 13:16	15:22 to 15:52	
		10:44 to 11:14	13:21 to 13:51	15:55 to 16:25	
		11:18 to 11:48	13:57 to 14:27	16:27 to 16:57	
Sampling Time	(minutes)	120	120	120	
Sample Volume	(DSCF)	83.609	86.789	87.279	
Isokinetics	(%)	101.1	97.6	96.8	

96.8 percent; therefore, all values were within the acceptable range. Actual test sampling times have also been included in Table 3-1.

Visible emissions data is summarized in Table 3-2. Visible emissions were not recorded continuously for all three test runs. Charles Davis, ETS visible emission reader, was instructed by BAPC personnel to record visible emissions for one half hour and then not record visible emissions for 15 minutes. Mr. Davis was instructed to repeat this one half hour recording - 15 minute non-recording cycle while BAPC personnel observed testing of the battery combustion stack. This intermittent pattern of recording visible emissions began at approximately 9:15 AM and continued to approximately 3:00 PM. From 3:00 PM to 5:00 PM visible emissions were recorded continuously. 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." Visible emissions readings recorded during the three tests were zero, thus, the visible emissions are in compliance. Copies of the field data sheets for the visible emissions readings can be found in Appendix F.

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

TABLE 3-2

USS CLAIRTON WORKS
CLAIRTON, PA

B BATTERY COMBUSTION STACK
VISIBLE EMISSIONS DATA SUMMARY
TEST DATE: 5/7/92

Observation Time	9:15 to 10:30 (1)	10:45 to 12:00 (1)	12:15 to 1:30 (1)	1:45 to 2:45 (1)	3:00 to 4:00	4:00 to 5:00
Total Number of Readings	60	60	60	60	60	60
Number of Readings with Opacity ≤ 20%	60	60	60	60	60	60
Greatest Opacity (%)	0	0	0	0	0	0

Notes:
(1) Observation times take into account a 15 minute time period in which no visible emissions readings were recorded. There are also 15 minute periods between designated observation times in which no visible emissions were recorded.

TABLE 3–3

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B BATTERY COMBUSTION STACK
SULFATE ANALYSIS OF BACK–HALF WATER

Test Number	Sulfate Concentration (mg/L)	Sample Volume (L)	Total Sulfate (mg)
CLR–BBS–1	31.2	820	25.6
CLR–BBS–2	30.1	860	25.9
CLR–BBS–3	29.9	760	22.7

COMPLIANCE DEMONSTRATION
B BATTERY COMBUSTION STACK

USS CLAIRTON WORKS
CLAIRTON, PA

APPENDIX A

TEST PROTOCOL

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

USS
Clairton Works
400 State Street
Clairton, PA 15025

April 2, 1992

U. S. Environmental Protection Agency
Region III
841 Chestnut Building
Philadelphia, Pennsylvania 19107

Department of Environmental Resources
Bureau of Air Quality Control
Executive House -2nd & Chestnut
P.O. Box 2357
Harrisburg, PA 17105-2357

Bureau of Air Pollution Control
Allegheny County Health Department
301 Thirty-Ninth Street
Pittsburgh, Pennsylvania 15201
ATTN: A. H. Fieser Ph.D., P.E.

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

Gentlemen:

RE: "B" Battery Combustion Stack (Retest)

This letter should serve as a formal notification of our intention to initiate a compliance demonstration program **retest**, on "B" Battery Combustion Stack on May 7, 1992. Three particulate emission concentration tests will be conducted. Each run will be of two hours duration. Each test will be complemented by simultaneous V. E. readings. This tentative schedule is contingent upon normal operations of the "B" Battery Combustion Stack and acceptable weather.

The sampling methods and equipment employed will be those referenced in 40 C.F.R. Part 60, Appendix A, most recent revision. A proposed test protocol is included as an attachment.

Questions regarding this program should be referred to Mr. W. C. Graeser at 233-1467.

Very truly yours,

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

GTW/BAC
Attachment

TEST PROTOCOL
B BATTERY COMBUSTION STACK

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Particulate matter sampling will be 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 will be executed during normal operating conditions. Greater than 50 dry standard cubic feet of sample gas will be collected during each test run.

The process exhausts through a 195 inch diameter stack. A total of 24 traverse points (12 per diameter) will be sampled; the traverse points will be calculated in accordance with EPA Method 1. Sampling will be conducted through four equally spaced ports, with six traverse points sampled per port. Each point will be sampled for 5 minutes, thus bringing the total sampling time to 120 minutes.

In accordance with EPA Method 2, gas velocities and volumetric flow rates of the exhaust gas will be determined using a calibrated S type pitot tube. Gas velocity differential pressures along with stack gas temperatures will be recorded at each sampling point.

At the beginning and end of each test, gas concentrations of CO_2, O_2, and N_2 (by difference) will be determined with the use of a Fyrite apparatus as specified by EPA Method 3. Gas concentrations will be used to obtain molecular weight of the process gas.

Percent moisture content, by volume, of the exhaust gas will 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 will be assembled as required by the method, leak-checked on site at the beginning and end of each test run, and operated so that isokinetic conditions are maintained. Clean up of the sampling train will include a water rinse followed by an acetone rinse of both the front-half and back-half components of the sample train, as per PA DER particulate matter test methods. The water soluble and water insoluble portions of the front-half of the sampling train will be determined as a

total; that is, the water rinse will not be filtered to determine soluble and insoluble portions. However, the water soluble and water insoluble portions of the back-half will be 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 will be filtered under suction through a preweighed 0.22 micrometer filter. The filter used to capture the insoluble material will be dried, desiccated, and weighed to a constant weight. After filtration, the soluble back-half water will be extracted with chloroform and ethyl ether; the extracts will be evaporated to dryness, desiccated, and weighed to a constant weight. The filtrate, or remaining water from the extraction process, will then be submitted for sulfate analysis via ion chromatography. Front-half acetone and water rinses and back-half acetone rinses will be evaporated to dryness, desiccated, and weighed to a constant weight. Sample train filters will be desiccated for 24 hours, and particulate matter weight will be determined gravimetrically. Rinse residue weights and filter weights will be measured to the nearest 0.1 mg. One acetone blank and one deionized distilled water blank will be prepared in the same manner as the test sample rinses. The blank weights will be subtracted from the test sample weights. After blank correction, front-half residue weights, sample filter weights, and back-half water insoluble filter weights and acetone residue weights will added together to determine total particulate matter catch.

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

A report summarizing the compliance test program will be submitted within 60 days following completion of field work. The report will describe test methodologies utilized and present a textual and tabular summary of the emissions results and related sampling information. Copies of operational data will be included in the report to verify that all testing was performed during periods of normal plant operation. Also incorporated into the report will be copies of the pre-test calibration results, post-test calibration results, the results of an audit conducted with a critical orifice provided by the Allegheny County Health Department Bureau of Air Pollution Control, field data sheets for the particulate matter sampling and visible emissions determinations, computer-generated emissions calculations, and analytical results for each test.

COMPLIANCE DEMONSTRATION
B BATTERY COMBUSTION STACK

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CLAIRTON, PA

APPENDIX B

OPERATIONAL DATA

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

03.000.0088
1/85

PUSHING AND CHARGING REPORT

"B" BATTERY

P.M. DATE 5-7-92

PUSH		CHARGE		CLEAN CHUCK DOOR	COMMENTS
A1		A34		A6	
A6		A1		A11	
A11		A6		A16	
A16		A11		A21	
A21		A16		A26	
A26		A21		A31	
A31		A26		A36	
A36		A31		B3	
A3		A36		A8	
A8		A3		A13	
A13		A8		A18	
A18		A13		A23	
A23		A18		A28	
A28		A23		A33	
A33		A28		A38	
A38		A33		B5	
A5		B33		A10	
A10		A5		A15	
A15	12[19]	A10	12[15]	A20	
A20	12[mod]	A15	12[46]	A25	
A25	12[15]	A20	12[19]	A30	
A30	4[38]	A25	3[33]	A35	
A35	5[38]	A30	4[58]	B2	
A2	5[53]	A35	5[60]	A7	
A7	6[20]	A2	6[22]	A12	
A12	6[42]	A7	6[44]	A17	
A17	7[05]	A12	7[05]	A22	
A22	7[25]	A17	7[25]	A27	
A27	7[45]	A22	7[45]	A32	
A32	8[05]	A27	8[05]	A37	
A37	8[27]	A32	8[27]	B4	
A4	8[55]	A37	8[52]	A9	
A9	9[18]	B4	9[18]	A14	
A14	9[44]	A9	9[44]	A19	
A19	10[10]	A14	10[10]	A24	
A24	10[30]	A19	10[30]	A29	
A29	11[05]	A24	11[05]	A34	
A34	11[39]	A29	11[26]	B1	

PUSH		CHARGE		CLEAN CHUCK DOOR	COMMENTS
B1		B34		B6	
B6		B1		B11	
B11		B6		B16	
B16		B11		B21	
B21		B16		B26	
B26		B21		B31	
B31		B26		B36	
B36		B31			
B3		B36		B8	
B8		B3		B13	
B13		B8		B18	
B18		B13		B23	
B23		B18		B28	
B28		B23		B33	
B33		B28			
B5		A38		B10	
B10		B5		B15	
B15	12[28]	B10	12[30]	B20	
B20	12[57]	B15	12[59]	B25	
B25	4[22]	B20	3[12]	B30	
B30	5[30]	B25	4[35]	B35	
B35	5[40]	B30	5[38]		
B2	6[18]	B35	6[08]	B7	
B7	6[32]	B2	6[33]	B12	
B12	6[52]	B7	6[55]	B17	
B17	7[15]	B12	7[15]	B22	
B22	7[35]	B17	7[35]	B27	
B27	7[55]	B22	7[55]	B32	
B32	8[13]	B27	8[13]	B37	
B37	8[41]	B32	8[41]		
B4	9[05]	B37	9[02]	B9	
B9	9[31]	B4	9[31]	B14	
B14	9[58]	B9	9[58]	B19	
B19	10[15]	B14	10[15]	B24	
B24	10[45]	B19	10[16]	B29	
B29	11[19]	B24	11[19]	B34	
B34		B29			

TIME A.M.	P	C
12-1		
1-2		
2-3		
3-4		
4-5		
5-6		
6-7		
7-8		
8-9		
9-10		
10-11		
11-12		

TIME P.M.	P	C
12-1	4	4
1-2	0	0
2-3	1	1
3-4	0	1
4-5	2	2
5-6	4	2
6-7	5	5
7-8	6	6
8-9	5	5
9-10	5	5
10-11	4	4
11-12	3	3

TOTALS	P	C
12x8		
8x4	5	7
4x12	34	32
Total	39	39

FOREMAN

12x8 -

8x4 Kappa

4x12- Sundance

2920

CLEAN A-1, A-2, A-3, A-4, A-5 CHUCK DOORS BEFORE REMOVING FOR PUSH

19/19

L.R. McClintock

13.000.0086
1/85

PUSHING AND CHARGING REPORT

"B" BATTERY

DATE 5-7-92

AM

PUSH		CHARGE		CLEAN CHUCK DOOR	COMMENTS	PUSH		CHARGE		CLEAN CHUCK DOOR	COMMENTS	TIME A.M.	P	C
A1	3:42	A34	3:39	A6		B1	4:02	B34	3:48	B6		12-1	4	4
A6	4:15	A1	3:59	A11		B6	4:28	B1	4:12	B11		1-2	4	4
A11	4:28	A6	4:28	A16		B11	4:39	B6	4:26	B16		2-3	5	4
A16	5:00	A11	4:47	A21		B16	5:14	B11	4:48	B21		3-4	4	5
A21	5:28	A16	5:10	A26		B21	5:42	B16	5:24	B26		4-5	5	5
A26	5:52	A21	5:28	A31		B26	6:11	B21	5:52	B31		5-6	5	4
A31	6:25	A26	6:07	A36		B31	6:32	B26	6:21	B36		6-7	4	4
A36	6:53	A31	6:33	B3		B36	7:02	B31	6:48			7-8	3	4
A3	7:21	A36	7:03	B8		B3	7:35	B36	7:12	B8		8-9	5	3
A8	8:03	A3	7:31	A13		B8	8:19	B3	7:53	B13		9-10	3	3
A13	8:25	A8	8:27	A18		B13	8:37	B8	8:39	B18		10-11	4	4
A18	8:47	A13	8:53	A23		B18	—	B13	9:07	B23		11-12	4	4
A23	9:22	A18	9:24	A28		B23	9:36	B18	—	B28				
A28	9:53	A23	9:55	A33		B28	10:09	B23	10:11	B33		TIME P.M.	P	C
A33	10:21	A28	10:26	A38		B33	10:40	B28	10:42			12-1		
A38	10:55	A33	10:57	B5								1-2		
A5	11:11	B33	11:13	A10		B5	11:26	A38	11:28	B10		2-3		
A10	11:42	A5	11:44	A15		B10	11:57	B5	11:59	B15		3-4		
A15		A10		A20		B15		B10		B20		4-5		
A20		A15		A25		B20		B15		B25		5-6		
A25		A20		A30		B25		B20		B30		6-7		
A30		A25		A35		B30		B25		B35		7-8		
A35		A30		B2		B35		B30				8-9		
A2		A35		A7		B2		B35		B7		9-10		
A7		A2		A12		B7		B2		B12		10-11		
A12		A7		A17		B12		B7		B17		11-12		
A17		A12		A22		B17		B12		B22		TOTALS		
A22		A17		A27		B22		B17		B27			P	C
A27		A22		A32		B27		B22		B32		12x8	34	34
A32		A27		A37		B32		B27		B37		8x4	16	14
A37	DR	A32		B4		B37		B32				4x12		
A4		A37	DR	A9		B4		B37		B9		Total	50	48
A9		A4		A14		B9		B4		B14				
A14		A9		A19		B14		B9		B19				
A19		A14		A24		B19		B14		B24		FOREMAN		
A24		A19		A29		B24		B19		B29		12x8	McCall	
A29		A24		A34		B29		B24		B34		8x4	Kaspar	
A34		A29		B1		B34		B29				4x12-		

26/25

24/23

CLEAN 1-2, 2-3, 3-4, 4-5 CHUCK DOORS BEFORE REMOVING FOR PUSH

JP McCall

SEQ.	PUSH	CHARGE	EARLY TIME	DESIRED	LATE
1	B25	B20	3:50	4:00	4:25
2	A30	A25	4:05	4:15	4:40
3	B30	B25	4:19	4:29	4:54
4	A35	A30	4:34	4:44	5:09
5	B35	B30	4:48	4:58	5:23
6	A 2	A35	5:03	5:13	5:38
7	B 2	B35	5:17	5:27	5:52
8	A 7	A 2	5:32	5:42	6:07
9	B 7	B 2	5:46	5:56	6:21
10	A12	A 7	6:01	6:11	6:36
11	B12	B 7	6:15	6:25	6:50
12	A17	A12	6:29	6:39	7:05
13	B17	B12	6:44	6:54	7:19
14	A22	A17	6:58	7:08	7:33
15	B22	B17	7:13	7:23	7:48
16	A27	A22	7:27	7:37	8:02
17	B27	B22	7:42	7:52	8:17
18	A32	A27	7:56	8:06	8:31
19	B32	B27	8:11	8:21	8:46
20	A37	A32	8:25	8:35	9:00
21	B37	B32	8:39	8:49	9:15
22	A 4	A37	8:54	9:04	9:29
23	B 4	B37	9:08	9:18	9:44
24	A 9	A 4	9:23	9:33	9:58
25	B 9	B 4	9:38	9:48	10:13
26	A14	A 9	9:52	10:02	10:28
27	B14	B 9	10:07	10:17	10:43
28	A19	A14	10:21	10:31	10:57
29	B19	B14	10:36	10:46	11:11
30	A24	A19	10:50	11:00	11:25
31	B24	B19	11:05	11:15	11:40
32	A29	A24	11:19	11:29	11:54
33	B29	B24	11:34	11:44	11:09

34 A-34 A-29

THURSDAY MAY 7, 1992

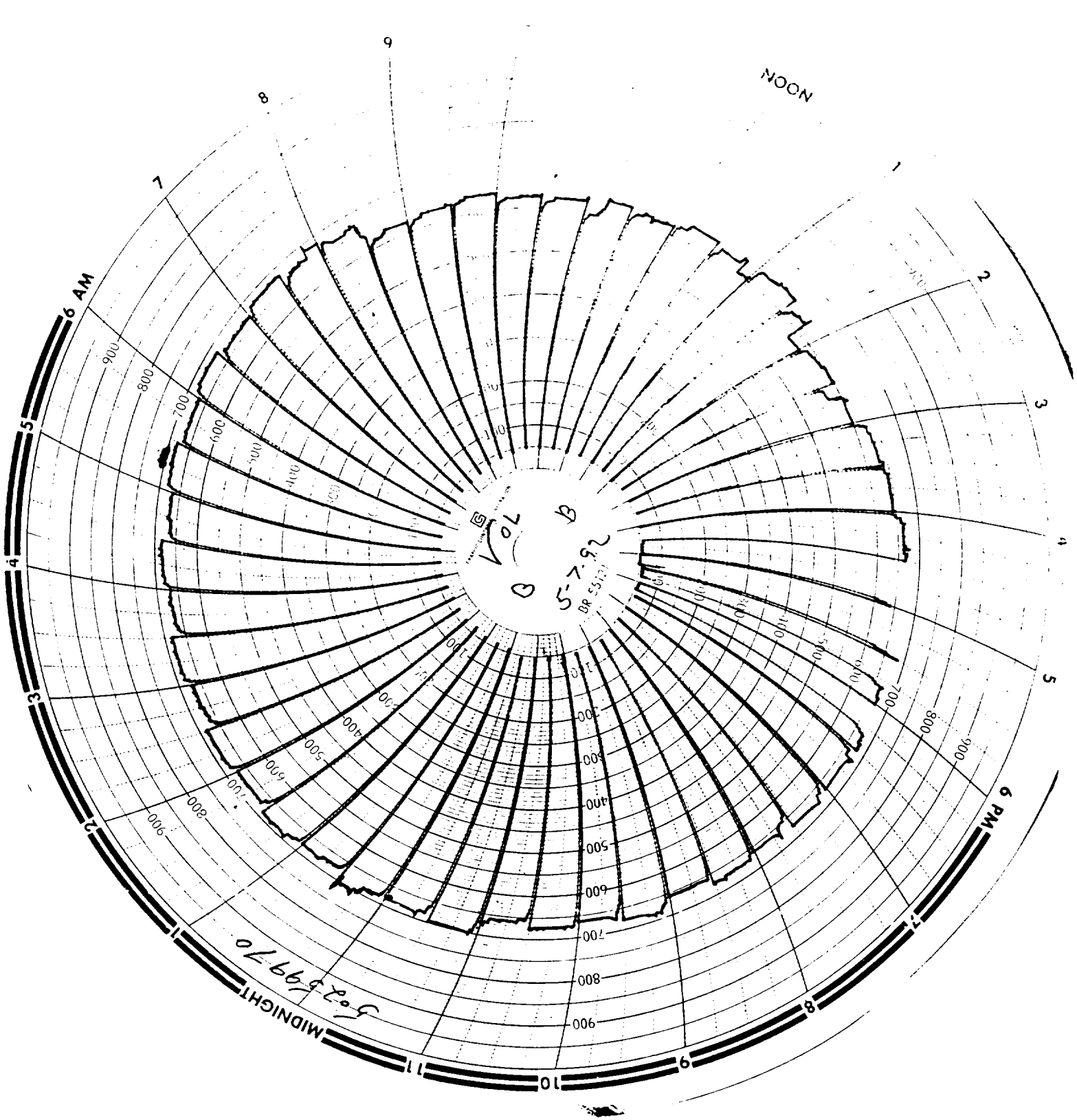
4 X 12

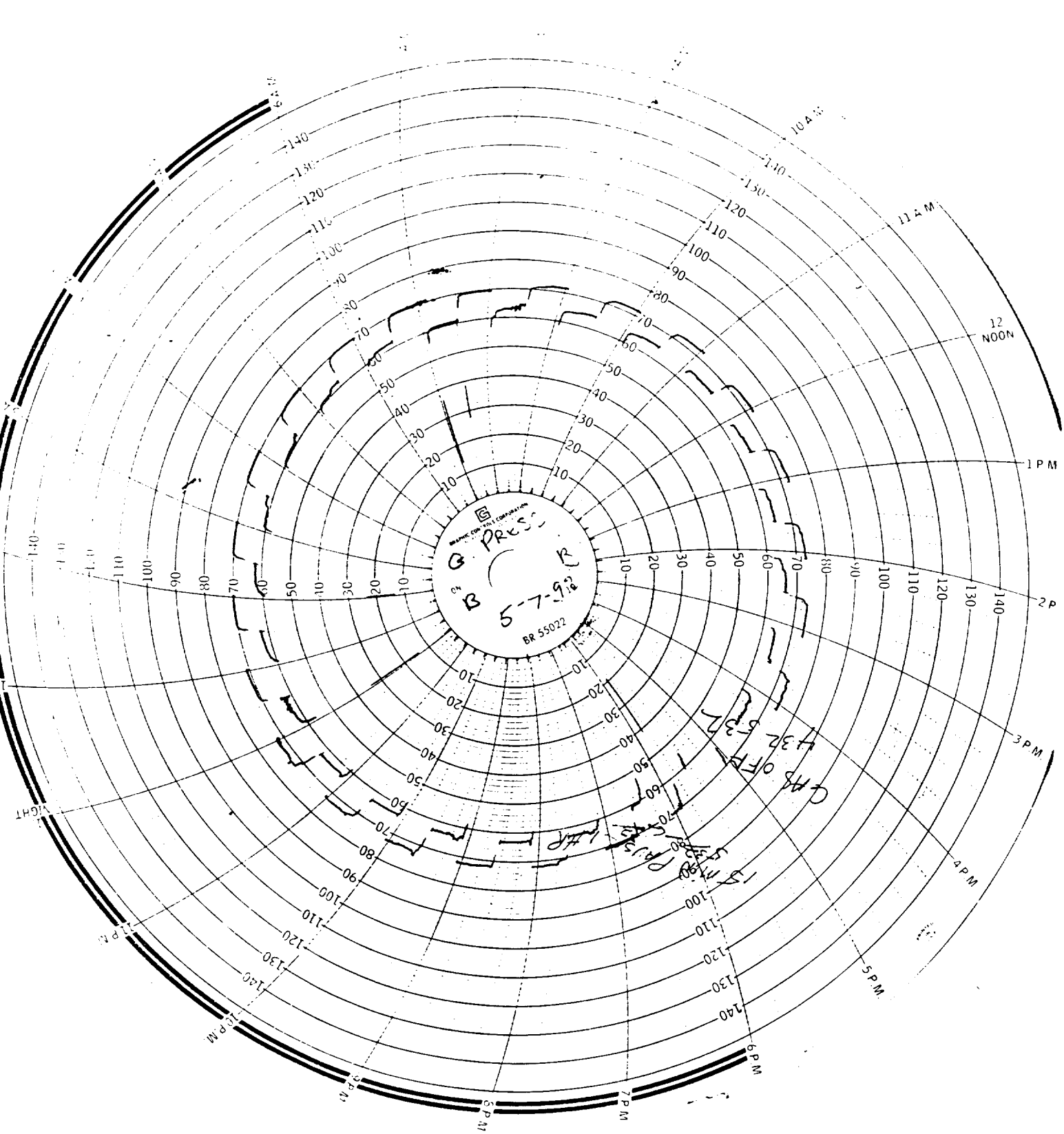
PAGE.06:

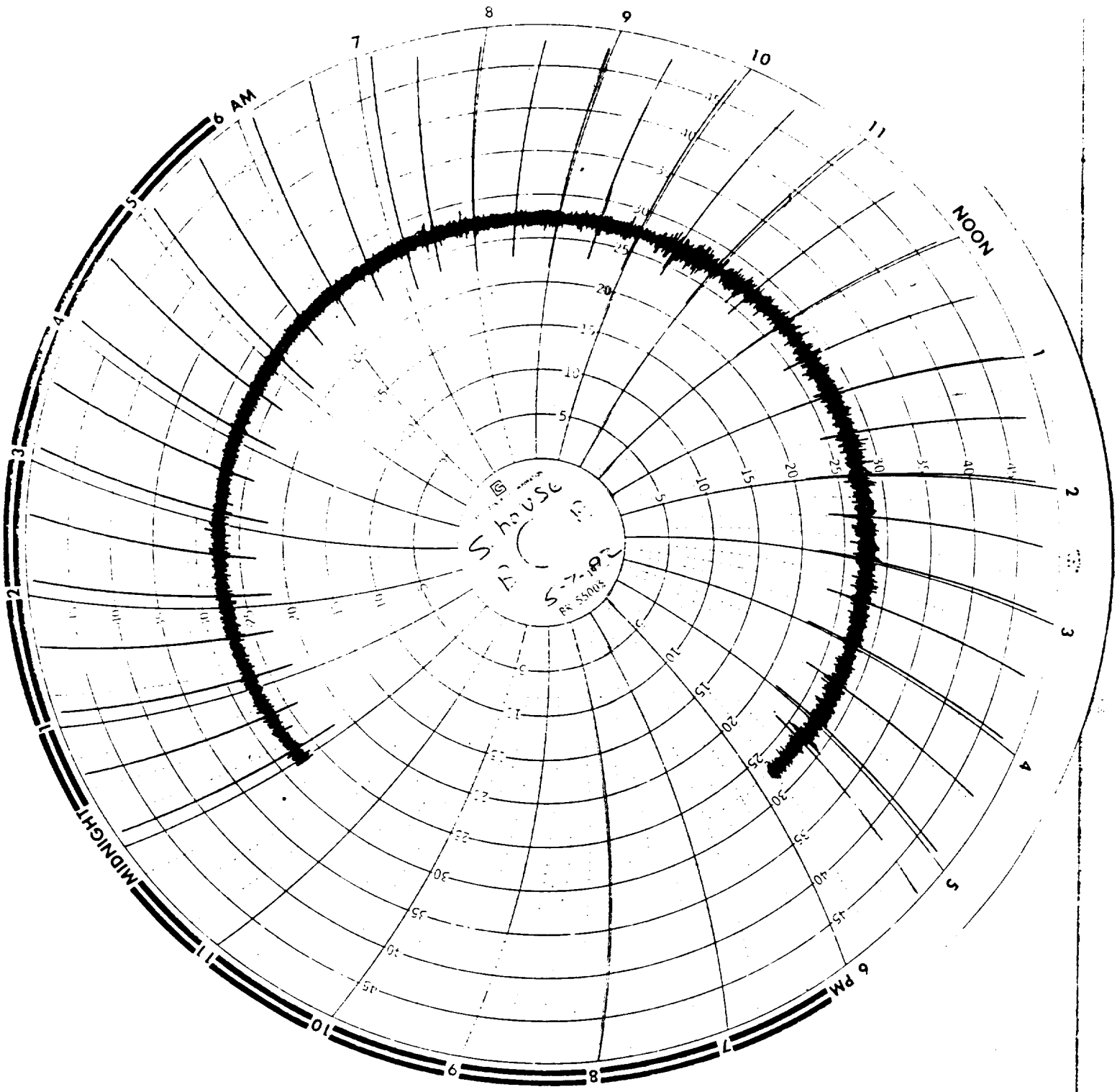
SEQ	PUSH	CHARGE	EARLY	DESIRED	LATE
1	A37	A32	11:50	12:00	12:25
2	B37	B32	12:04	12:14	12:39
3	A 4	A37	12:18	12:28	12:53
4	B 4	B37	12:32	12:42	1:07
5	A 9	A 4	12:46	12:56	1:21
6	B 9	B 4	1:00	1:10	1:35
7	A14	A 9	1:14	1:24	1:49
8	B14	B 9	1:28	1:38	2:03
9	A19	A14	1:42	1:52	2:17
10	B19	B14	1:57	2:07	2:32
11	A24	A19	2:11	2:21	2:56
12	B24	B19	2:25	2:35	3:00
13	A29	A24	2:39	2:49	3:14
14	B29	B24	2:53	3:03	3:28
15	A34	A29	3:07	3:17	3:42
16	B34	B29	3:21	3:31	3:56
17	A 1	A34	3:35	3:45	4:10
18	B 1	B34	3:50	4:00	4:25
19	A 6	A 1	4:04	4:14	4:39
20	B 6	B 1	4:18	4:28	4:53
21	A11	A 6	4:32	4:42	5:07
22	B11	B 6	4:46	4:56	5:21
23	A16	A11	5:00	5:10	5:35
24	B16	B11	5:14	5:24	5:49
25	A21	A16	5:28	5:38	6:03
26	B21	B16	5:42	5:52	6:17
27	A26	A21	5:57	6:07	6:32
28	B26	B21	6:11	6:21	6:46
29	A31	A26	6:25	6:35	7:00
30	B31	B26	6:39	6:49	7:14
31	A36	A31	6:53	7:03	7:28
32	B36	B31	7:07	7:17	7:42
33	A 3	A36	7:21	7:31	7:56
34	B 3	B36	7:35	7:45	8:10

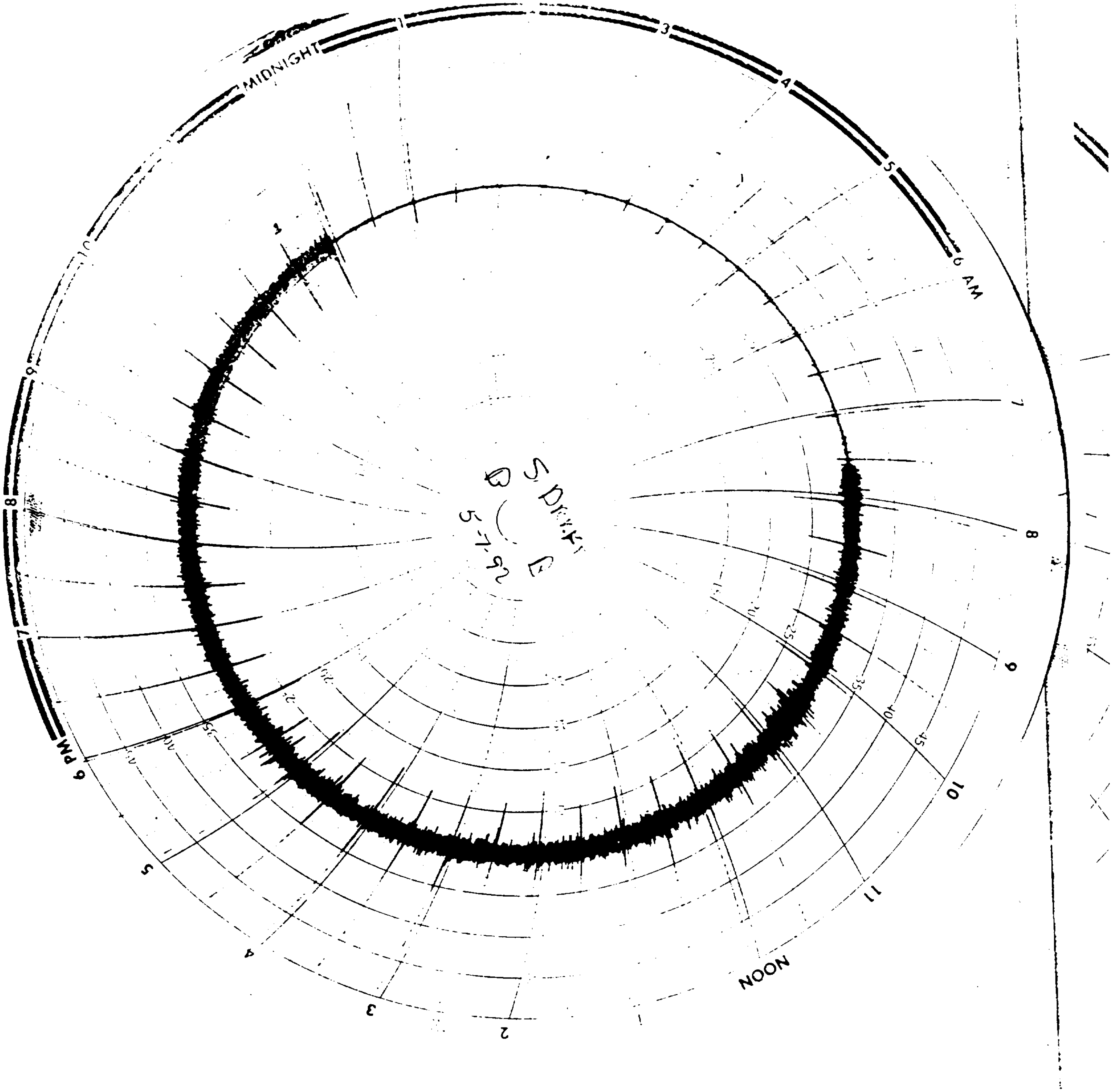
THURSDAY MAY 7, 1992 12X8

** TOTAL PAGE.001 **


NOON
6 AM
6 PM
MIDNIGHT
100
200
300
400
500
600
700
800
900


12
NOON
1 PM
2 P
3 PM
4 PM
5 PM
6 PM
7 PM
10 A M
11 A M
BR 55022


6 AM
NOON
6 PM
MIDNIGHT


MIDNIGHT
1
3
4
5
6 AM
7
8
9
10
11
NOON
1
2
3
4
5
6 PM
7
8
9
10
5-7-92

COMPLIANCE DEMONSTRATION
B BATTERY COMBUSTION STACK

USS CLAIRTON WORKS
CLAIRTON, PA

APPENDIX C

CALIBRATION RESULTS

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

CONTROL BOX CALIBRATION

THREE POINT CALIBRATION

BOX # 1 BP 28.75
DATE 04-24-92 OPERATOR RPC

	WET TEST METER				DRY TEST METER						
	TIME (min)	TEMP TW	VOLUME VM	PRESSURE PW	TEMP IN TI	TEMP OUT TO	TEMP AVG TA	ORIFICE PD	VOLUME VD	METER CORRECTY	ORIFICE COEFFICIENT ΔH@
START			0.000	28.75				0.50	72.450		
HALF		72.0			108.0	100.0	104.0				
STOP	13.43		5.000						77.853		
CALCULATION	13.43	532.0	5.013	28.75			564.0	28.79	5.403	0.9823	1.986
START			0.000	29.00				1.00	78.400		
HALF		72.0			118.0	107.0	112.5				
STOP	9.05		5.000						83.823		
CALCULATION	9.05	532.0	5.013	29.00			572.5	28.82	5.423	1.0008	1.777
START			0.000	29.00				2.00	84.305		
HALF		72.0			128.0	111.0	119.5				
STOP	6.40		5.000						89.790		
CALCULATION	6.40	532.0	5.013	29.00			579.5	28.90	5.485	0.9990	1.756
AVERAGE										0.9940	1.840

POST TEST

BOX # 1 BP 28.95
DATE 06-02-92 OPERATOR RPC

	WET TEST METER				DRY TEST METER						
	TIME (min)	TEMP TW	VOLUME VM	PRESSURE PW	TEMP IN TI	TEMP OUT TO	TEMP AVG TA	ORIFICE PD	VOLUME VD	METER CORRECTY	ORIFICE COEFFICIENT ΔH@
START			0.000	28.95				1.70	566.800		
HALF		74.0			95.0	86.0	90.5				
STOP	6.83		5.000						572.066		
CALCULATION	6.83	534.0	5.013	28.95			550.5	29.08	5.266	0.9771	1.790
START			0.000	28.95				1.70	572.300		
HALF		74.0			97.0	87.0	92.0				
STOP	6.82		5.000						577.575		
CALCULATION	6.82	534.0	5.013	28.95			552.0	29.08	5.275	0.9780	1.780
START			0.000	28.95				1.70	577.800		
HALF		74.0			98.0	88.0	93.0				
STOP	6.82		5.000						583.088		
CALCULATION	6.82	534.0	5.013	28.95			553.0	29.08	5.288	0.9774	1.777
AVERAGE										0.9775	1.782
DIFFERENCE										1.69%	3.20%

PRE-TEST MAGNEHELIC CALIBRATION

BOX# 1
DATE 04-24-92
OPERATOR RPC

0 to 10" H2O RANGE

MAGNEHELIC Δ P	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 Δ P	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 04-24-92
OPERATOR RPC

	START CF	STOP CF	VOLUME CF	TIME (min)	LEAK RATE
DRY	52.710	52.935	0.225	10.000	-0.003
WET	0.000	0.200	0.200		

PYROMETER CALIBRATION

DATE 04-28-88
OPERATOR AGL

mV Input	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 04-24-92
OPERATOR RPC

mV Input	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	201.0
6.09	300	301.0
8.31	400	401.0
10.57	500	500.0

POST-TEST MAGNEHELIC CALIBRATION

BOX# 1
DATE 06-02-92
OPERATOR RPC

0 to 10" H2O RANGE

MAGNEHELIC DELTA P	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 DELTA P	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

POST-TEST LEAK CHECK

DATE 06-02-92
OPERATOR RPC

	START CF	STOP CF	VOLUME CF	TIME (min)	LEAK RATE
DRY	566.060	566.230	0.170	10.000	0.003
WET	0.000	0.160	0.200		

PYROMETER CALIBRATION
DATE 04-28-88
OPERATOR AGL

mV Input	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 06-02-92
OPERATOR RPC

mV Input	TEMP F	TEMP READING F
0.18	40	40.0
0.40	50	49.0
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

QA ORIFICE AUDIT

AGENCY BAPC DATE 06-02-92 B.P. 28.95
OPERATOR RPC BOX # 1

RUN	1		2		3	
INITIAL CF	539.900		547.600		555.300	
FINAL CF	547.421		555.150		562.851	
DIFFERENCE	7.521		7.550		7.551	
	IN	OUT	IN	OUT	IN	OUT
TEMP INITIAL	80	75	80	77	82	80
TEMP 5 MIN	80	76	81	78	83	82
TEMP 10 MIN	80	76	81	79	83	82
TEMP 15 MIN	80	77	82	80	84	82
		TEMP R		TEMP R		TEMP R
TEMP AVG	78	538	79.75	539.75	82.25	542.25
TIME MINUTES	15.00		15.00		15.00	
	IN WATE	IN HG	IN WATER	IN HG	IN WATER	IN HG
ORIFICE	0.75	0.06	0.75	0.06	0.75	0.06
METER PRESSURE		29.01		29.01		29.01
	F	C	F	C	F	C
AMBIENT TEMP.	75.0	23.9	75.0	23.9	75.0	23.9
VACUUM IN HG	19.0		19.0		19.0	
DGM CAL Y	0.9940		0.9940		0.9940	
STD CF	7.140		7.144		7.112	
STD CUBIC METERS	0.2022		0.2023		0.2014	

PROBE #: 10-2

DATE: 4-10-92

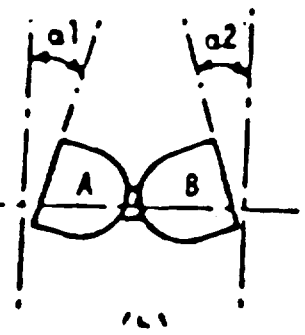
INITIALS: [illegible]

GEOMETRIC [illegible] CALIBRATION

PRECHECK

a1 = 3.0 ↖
a1, a2 = <10°
a2 = 0 ↙

B1 = 2.0 ↖
B1, B2 = <5°
B2 = 1.5 ↙



a1, a2 <10°

A = 0.897

μ = 0.031 μ = ≤0.1250"

V = 0.008 V = ≤0.03125"

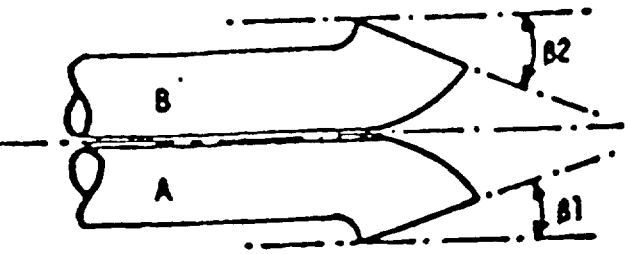
W = 0.212 W ≥ 0
(3/4" using 1/2" nozzle)

X = 0.826 X ≥ 0.745

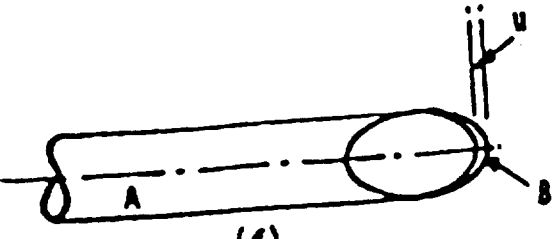
Y = .625 Y ≥ 3.0"

Z = 2.10 Z > 2.0"

D_t = 0.370 D_t > .200 to 370
(3/16" to 3/8")



B1, B2 <5°



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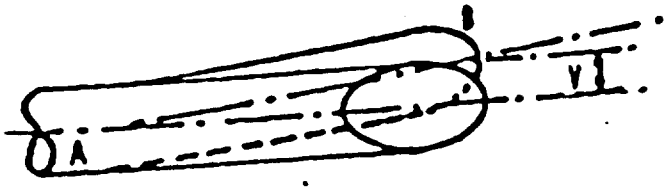
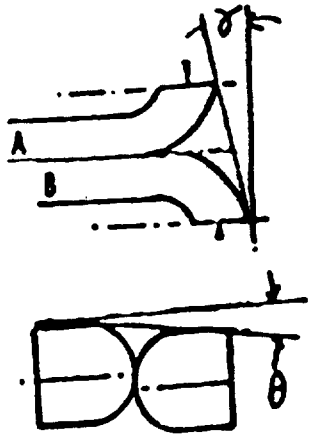
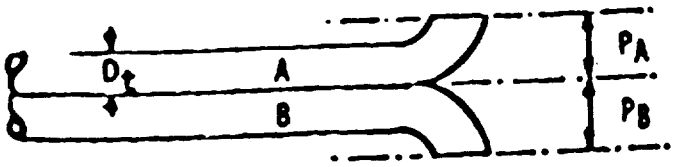




μ = A SIN γ

Y = A SIN θ

A-SIDE PLANE



1.05 D_t < P <1.50 D_t

P_A = P_B

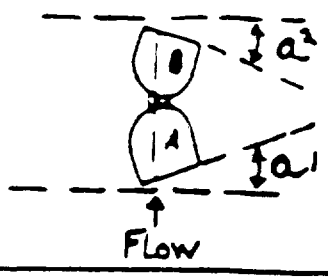
2.10 D_t <A <3.00 D_t

B-SIDE PLANE

GEOMETRIC PITOT CALIBRATION

Caliper # XCF-59
Precheck
Post Check ✓

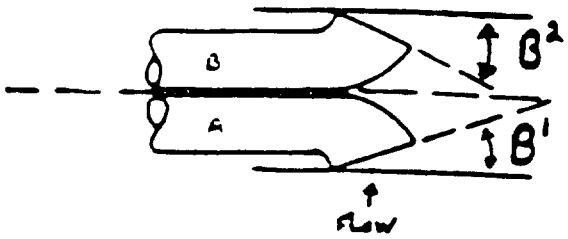
Probe #: KC-2
Date: 5-18-92
Initials: [illegible]

① 

a¹ = 4.5°
a² = 1.0°
a¹, a² = <10°

B¹ = 0.5°
B² = 0.5°
B¹, B² = <5°

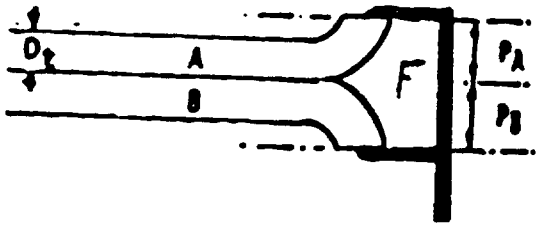
F = 0.908"

② 

μ = 0.0158
μ = ≤ 0.1250" (μ = F TAN γ)

V = 0
V = ≤0.03125" (V = F TAN θ)

W = 0.190
W ≥ 0"

③ 

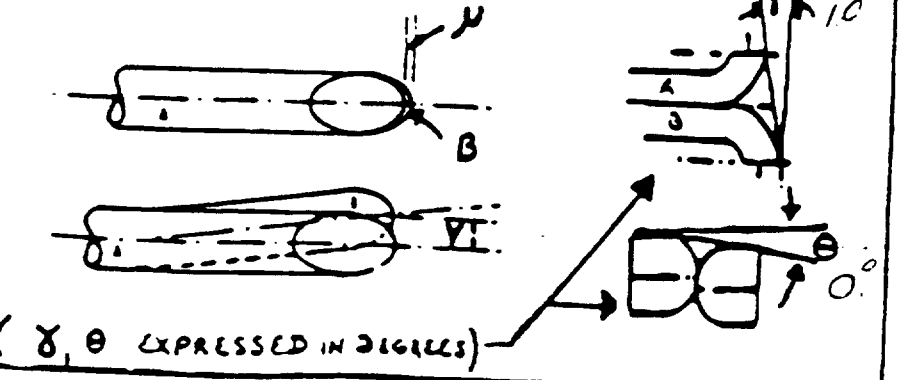
1.05 D_t < A <1.50 D_t
$P_A = P_B$
2.10 D_t <A <3.00 D_t

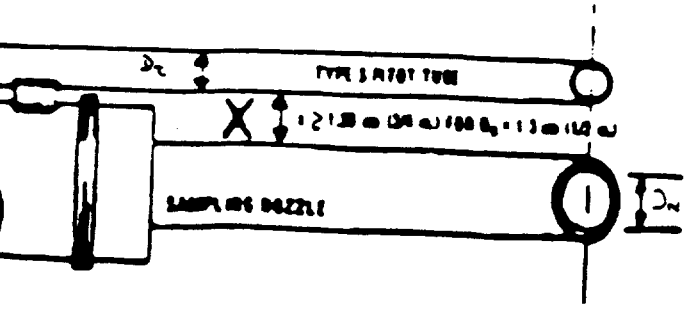
X = 0.776
X ≥ 0.750"
(3/4" using 1/2" nozzle)

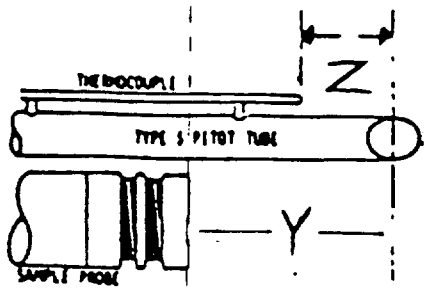
Y = 5.748
Y ≥ 3.0"

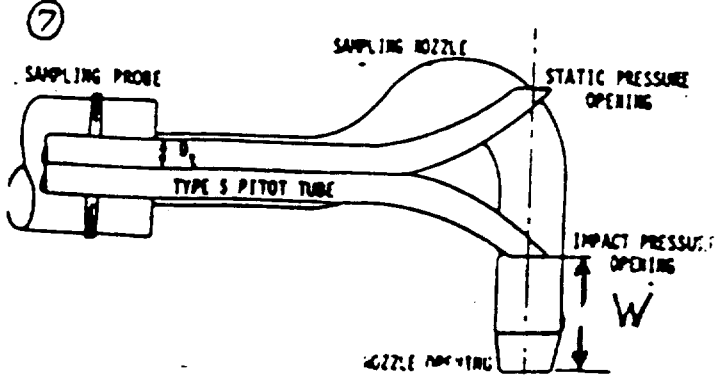
Z = 3.036
Z > 2.0"

D_t = 0.374
D_t > .1875" to .375"
(3/16" to 3/8")

④ 

⑤ 

⑥ 

⑦ 

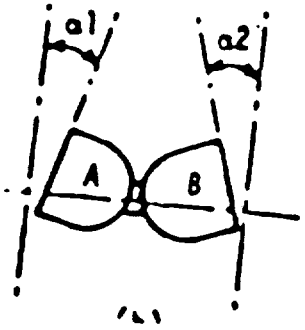
PROBE #: 10-3

DATE: 4-10-92

INITIALS: [illegible]

GEOMETRIC PITOT CALIBRATION

PRECHECK



a1, a2 <10°

a1 = 4.0

a2 = 3.5 ← a1, a2 = <10°

B1 = ∅

B2 = 1.5 ← B1, B2 = <5°

A = 0.975

μ = 0.0510 μ = ≤0.1250"

V = .0255 V = ≤0.03125"

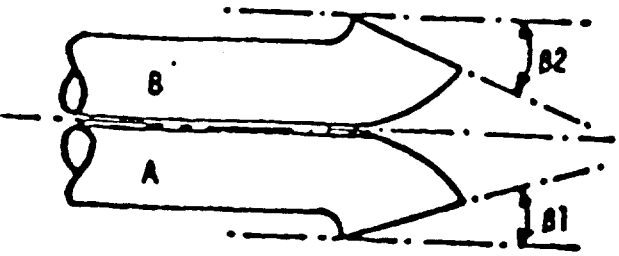
W = 0.131 W ≥ 0

X = 0.832 X ≥ 0.745 (3/4" using 1/2" nozzle)

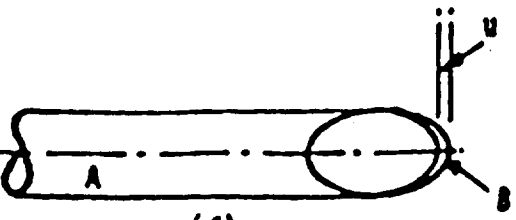
Y = 5.78 Y ≥ 3.0"

Z = 2.67 Z > 2.0"

D_t = 0.370 D_t > .200 to 370 (3/16" to 3/8")



B1, B2 <5°



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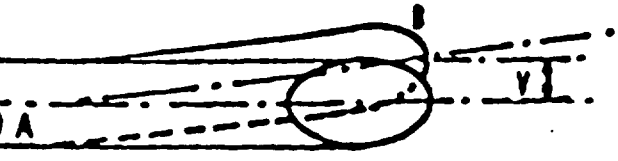
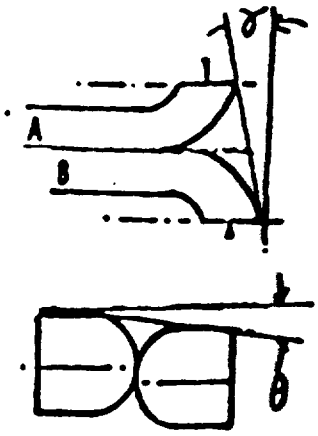
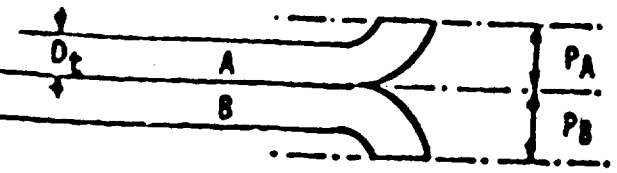




μ = A SIN γ

V = A SIN θ

A-SIDE PLANE



B-SIDE PLANE

1.05 D_t < P < 1.50 D_t

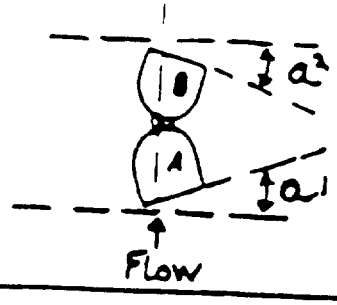
P_A = P_B

2.10 D_t < R < 3.00 D_t

GEOMETRIC PITOT CALIBRATION

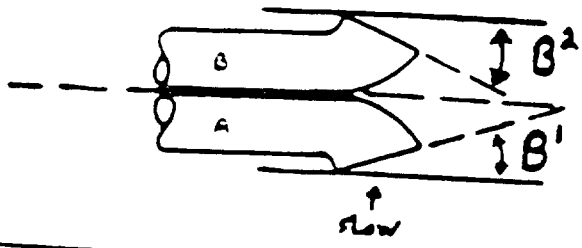
Caliper # XCF-59
Precheck
Post Check ✓

Probe #: 10-3
Date: 5-18-92
Initials: TMT

① 

a¹ = 30°
a² = 35° → a¹, a² = <10°

B¹ = 20°
B² = 10° → B¹, B² = <5°

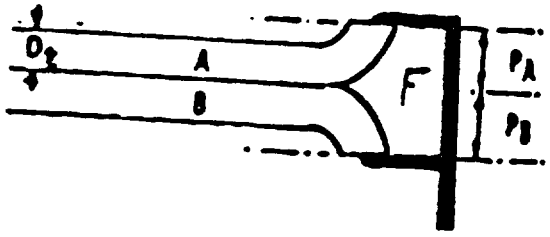
② 

F = 0.998"

μ = 0.0087 μ = ≤ 0.1250" (μ = F TAN β)

V = 0.0174 V = ≤0.03125" (V = F TAN θ)

W = 0.152 W ≥ 0"

③ 

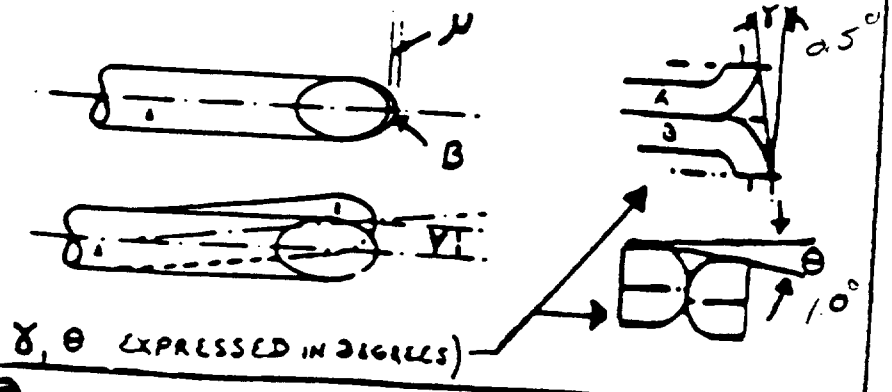
1.05 D_t < A < 1.50 D_t
P_A = P_B
2.10 D_t < A < 3.00 D_t

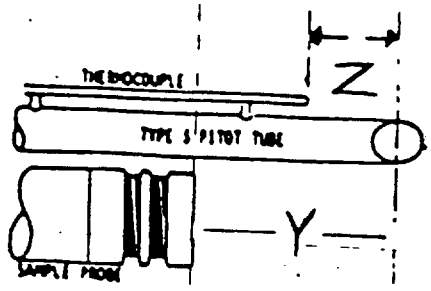
X = 0.895 X ≥ 0.750" (3/4" using 1/2" nozzle)

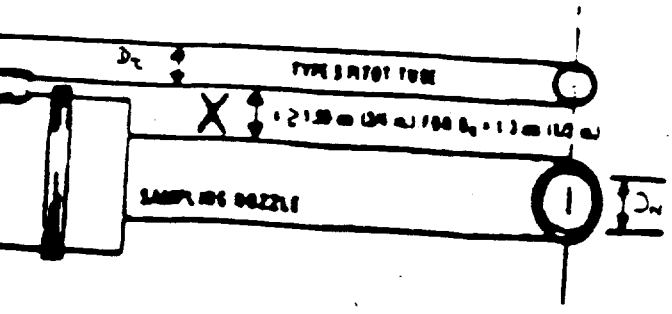
Y = 5.861 Y ≥ 3.0"

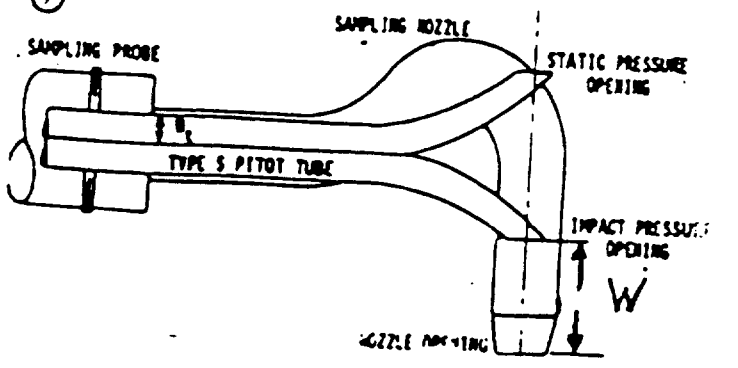
Z = 2.691 Z > 2.0"

D_t = 0.376 D_t > .1875" to .375" (3/16" to 3/8")

④ 

⑥ 

⑤ 

⑦ 

COMPLIANCE DEMONSTRATION
B BATTERY COMBUSTION STACK

USS CLAIRTON WORKS
CLAIRTON, PA

APPENDIX D

FIELD DATA SHEETS

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

D/C

STACK SAMPLING DATA SHEET

CLIENT USS Clairton
TEST UNIT B Battery Stack
PROJECT NO. 60224.02
CONTROL BOX OPERATOR DJ
BAROMETRIC PRESSURE 29.68

TEST DATE 5-7-92
TEST NO. CLR-BBS-1
NOZZLE (SIZE,#) 0.504 #55
STATIC PRESSURE -1.5
PORT DIRECTION A,B,C

ORIFICE CORRECTION 1.840
METER CORRECTION 0.9940
CALIBRATION DATE 4-24-92
PITOT CORRECTION 0.84
CONTROL BOX NO. 1

HOT BOX NO. 5
COLD BOX NO. 5
PROBE NO. 10-2
FILTER NO. 810
STACK DIA. 195"

Port	Traverse Point (inches)	Time	Dry Gas Meter Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Req'd. (in. H2O)	Orifice ΔH Act. (in. H2O)	Meter Temperature In (°F)	Meter Temperature Out (°F)	Vacuum (in. Hg)	Stack Temp. (°F)	Probe Temp. (°F)	Impinger Temp. (°C/°F)	Hot Box Temp. (°F)	Comments
A	69.4	0915	147.021	0.04	1.25	1.25	65	61	5.0	485	250	ICE BATH <68°F		
	48.8			0.05	1.55	1.55	73	62	6.0	514			260	5min/pt.
	34.6			0.045	1.39	1.40	79	66	5.5	521	250			
	23.0			0.045	1.39	1.40	82	68	5.5	470		56	260	
	13.1			0.04	1.24	1.25	88	72	5.0	472	250	57		
A	4.2	0945	167.103	0.04	1.24	1.25	84	76	5.0	471			260	
B	69.4	0949	167.103	0.05	1.55	1.55	90	80	5.5	487				OFFSETS: Ports A,B,&D 54½"
	48.8			0.05	1.55	1.55	94	87	5.5	502	250			
	34.6			0.05	1.55	1.55	99	84	5.5	508		53	250	Ports C 56"
	23.0			0.055	1.70	1.70	102	89	6.0	474	250			
	13.1			0.055	1.70	1.70	103	90	6.0	481		52	260	
B	4.2	1019	189.400	0.04	1.24	1.24	107	93	6.0	476	250			1033 - Replace broken silica gel impinger / performed leak check
C	69.4	~~1032~~ 1044	~~189.400~~ 189.925	0.05	1.55	1.55	89	84	6.0	465		47	230	
	48.8			0.05	1.55	1.55	94	85	5.0	488				Static = -1.5"
	34.6			0.05	1.55	1.55	96	85	5.0	493	250			0.008 cfm / 5.5" Hg
	23.0			0.05	1.55	1.55	96	86	5.0	501		46	240	
	13.1			0.06	1.86	1.85	98	85	5.5	473	250			
C	4.2	1114	211.793	0.04	1.24	1.25	97	87	4.5	480			180	

Estimates:
MW= 27.7
%H2O= 13.5
Tstack 470

SYSTEM LEAK CHECK

	Vacuum (in. Hg)	DGM Rate (cfm)
Before	6.0	0.007
After	6.0	0.006

PITOT LEAK CHECK

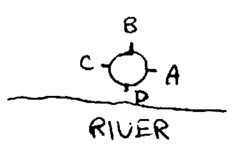
	Positive	Negative
Before	OK 15sec	OK 15sec
After	OK 15sec	OK 15sec

	1	2
CO2	3.0	3.0
O2	13.5	12.0
CO		
N2		

1110 Replaced heater cone

Impinger No.	Impinger Contents	Final	Initial	Difference
1.	100mL DI H2O	697.7	514.4	183.3
(GBS) 2.	100 mL DI H2O	609.3	563.8	46.5
3.	DRY	467.9	461.5	6.4
FINISHED TEST	SILICA GEL	666.2	657.4	8.8
STARTED TEST	SILICA GEL	579.5	568.5	11.0

} 19.8



AQE 2/92

KEYSTONE ENVIRONMENTAL RESOURCES INC

STACK SAMPLING DATA SHEET

CLIENT USS CLAIRTON
TEST UNIT B Battery Stack
PROJECT NO.
CONTROL BOX OPERATOR
BAROMETRIC PRESSURE 29.68

TEST DATE 5-7-92
TEST NO. CLR-BBS-1
NOZZLE (SIZE,#) 0.504 55
STATIC PRESSURE -1.5
PORT DIRECTION D

ORIFICE CORRECTION 1.840
METER CORRECTION 0.9940
CALIBRATION DATE 4-24-92
PITOT CORRECTION 0.84
CONTROL BOX NO. 1

HOT BOX NO. 5
COLD BOX NO. 5
PROBE NO. 10-2
FILTER NO. 810
STACK DIA. 195

	Traverse Point (inches)	Time	Dry Gas Meter Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Req'd. (in. H2O)	Orifice ΔH Act. (in. H2O)	Meter Temperature In (°F)	Meter Temperature Out (°F)	Vacuum (in. Hg)	Stack Temp. (°F)	Probe Temp. (°F)	Impinger Temp. (°C/°F)	Hot Box Temp. (°F)	Comments
D	69.4	1118	211.793	0.055	1.70	1.70	89	83	5.5	501	250			
	48.8			0.065	2.01	2.0	94	84	6.5	518				
	34.6			0.06	1.86	1.85	100	85	6.0	524				
	23.0			0.055	1.70	1.70	101	88	6.0	470				
	13.1			0.05	1.55	1.55	102	89	5.5	473				
D	4.2	1148	234.956	0.05	1.55	1.55	105	92	5.5	471				
														Estimates:
														MW=
														%H2O=

SYSTEM LEAK CHECK

	Vacuum (in. Hg)	DGM Rate (cfm)
Before		
After		

PITOT LEAK CHECK

	Positive	Negative
Before		
After		

	1	2
CO2		
O2		
CO		
N2		

Impinger No.	Impinger Contents	Final	Initial	Difference
1.				
2.				
3.				
4.				
5.				

KEYSTONE ENVIRONMENTAL RESOURCES INC

D/C

STACK SAMPLING DATA SHEET

CLIENT USS CLAIRTON
TEST UNIT B Battery Stack
PROJECT NO. 6050274-07
CONTROL BOX OPERATOR BB
BAROMETRIC PRESSURE 29.68

TEST DATE 5-7-92
TEST NO. CLR-BBS-2
NOZZLE (SIZE,#) 0.504 #55
STATIC PRESSURE -1.5
PORT DIRECTION D, C, B

ORIFICE CORRECTION 1.840
METER CORRECTION 0.9940
CALIBRATION DATE 4-2A-92
PITOT CORRECTION 0.84
CONTROL BOX NO. 1

HOT BOX NO. 6
COLD BOX NO. 6
PROBE NO. 10-3
FILTER NO. 811
STACK DIA. 195"

	Traverse Point (inches)	Time	Dry Gas Meter Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Req'd. (in. H20)	Orifice ΔH Act. (in. H20)	Meter Temperature In (°F)	Meter Temperature Out (°F)	Vacuum (in. Hg)	Stack Temp. (°F)	Probe Temp. (°F)	Impinger Temp. (°C/°F)	Hot Box Temp. (°F)	Comments
D	69.4	1208	235.188	0.06	1.86	1.85	95	91	18.0	469	250	ICE BATH <68°F	250	5 min/pt
	48.8			0.065	2.01	2.00	99	91	15.0	480				
	34.6			0.07	2.17	2.15	100	92	16.0	497				
	23.0			0.07	2.17	2.15	100	93	19.0	500				
	13.1			0.065	2.01	2.00	96	92	18.5	508				
D	4.2	1238	259.465	0.05	1.55	1.55	97	91	9.0	502				removed &
C	69.4	1246	260.114	0.05	1.60	1.60	92	92 85	9.5	477	250	51	240	Checked Silica
	48.8			0.05	1.60	1.60	95	86	10.0	485				gel impinger for
	34.6			0.055	1.76	1.76	99	87	11.5	493	250			restriction, assembled &
	23.0			0.065	1.97	2.00	102	90	14.0	460		56	240	re-leak checked
	13.1			0.065	1.97	2.00	102	91	14.0	462				system leak check
C	4.2	1316	283.082	0.05	1.60	1.60	104	94	10.0	471				OK.
B	69.4	1321	283.082	0.065	1.97	2.00	98	94	14.0	478		57		Check orifice
	48.8			0.06	1.82	1.80	99	91	13.0	509	250		250	on GBS impinger
	34.6			0.055	1.67	1.65	99	90	12.5	460				may cause high
	23.0			0.055	1.67	1.65	99	90	12.6	461				vacuum
	13.1			0.055	1.67	1.65	102	90	12.5	463	250	54	250	Estimates:
B	4.2	1351	306.360	0.055	1.67	1.65	104	93	12.5	470				MW= 27.7
														%H2O= 13.5

SYSTEM LEAK CHECK

	Vacuum (in. Hg)	DGM Rate (cfm)
Before	5.0	0.007
After	16.0	0.015

PITOT LEAK CHECK

	Positive	Negative
Before	OK 15sec	OK 15sec
After	OK 15sec	OK 15sec

	1	2
CO2	2.5	3.0
O2	12.5	12.5
CO		
N2		

Impinger No.	Impinger Contents	Final	Initial	Difference
1.	100mL DI H_2O	743.2	547.9	195.3
GBS 2.	100mL DI H_2O	613.5	580.1	33.4
3.	DRY	463.9	455.7	8.2
4.	SILICA GEL	697.3	673.3	24.0
5.				

KEYSTONE

STACK SAMPLING DATA SHEET

CLIENT USS CLAIRTON	TEST DATE 5-7-92	ORIFICE CORRECTION 1.840	HOT BOX NO. 6
TEST UNIT B Battery Stack	TEST NO. CLR-BBS-2	METER CORRECTION 0.9940	COLD BOX NO. 6
PROJECT NO.	NOZZLE (SIZE,#) 0.50A #55	CALIBRATION DATE 4-24-92	PROBE NO. 10-3
CONTROL BOX OPERATOR	STATIC PRESSURE -1.5	PITOT CORRECTION 0.84	FILTER NO. 811
BAROMETRIC PRESSURE 29.68	PORT DIRECTION A	CONTROL BOX NO. 1	STACK DIA. 195"

	Traverse Point (inches)	Time	Dry Gas Meter Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Req'd. (in. H2O)	Orifice ΔH Act. (in. H2O)	Meter Temperature In (°F)	Meter Temperature Out (°F)	Vacuum (in. Hg)	Stack Temp. (°F)	Probe Temp. (°F)	Impinger Temp. (°C/°F)	Hot Box Temp. (°F)	Comments
A	69.4	1357	306.360	0.05	1.52	1.50	98	91	9.5	495	250	54	250	
	48.8			0.055	1.67	1.65	104	94	11.0	458				
	34.6			0.055	1.67	1.65	106	95	11.0	474				
	23.0			0.05	1.52	1.50	109	98	10.0	477				
	13.1			0.05	1.52	1.50	111	99	10.0	487				
A	4.2	1427	328.135	0.05	1.52	1.50	~~100~~ 111	100	10.0	480				
														Estimates:
														MW=
														%H2O=

SYSTEM LEAK CHECK

	Vacuum (in. Hg)	DGM Rate (cfm)
Before		
After		

PITOT LEAK CHECK

	Positive	Negative
Before		
After		

	1	2
CO2		
O2		
CO		
N2		

Impinger No.	Impinger Contents	Final	Initial	Difference
1.				
2.				
3.				
4.				
5.				

KEYSTONE ENVIRONMENTAL RESOURCES, INC.

STACK SAMPLING DATA SHEET

CLIENT USS CLAIRTON	TEST DATE 5-7-92	ORIFICE CORRECTION 1.840	HOT BOX NO. 7
TEST UNIT B BATTERY STACK	TEST NO. CLR-BBS-3	METER CORRECTION 0.9940	COLD BOX NO. 7
PROJECT NO. 005024-02	NOZZLE (SIZE,#) 0.504 #55	CALIBRATION DATE 4-24-92	PROBE NO. 10-2
CONTROL BOX OPERATOR DB	STATIC PRESSURE -1.5	PITOT CORRECTION 0.84	FILTER NO. 820
BAROMETRIC PRESSURE 29.54	PORT DIRECTION A,B,C	CONTROL BOX NO. 1	STACK DIA. 195"

	Traverse Point (inches)	Time	Dry Gas Meter Reading (dcf)	Pitot ▲P (in. H2O)	Orifice ▲H Req'd. (in. H20)	Orifice ▲H Act. (in. H20)	Meter Temperature In (°F)	Meter Temperature Out (°F)	Vacuum (in. Hg)	Stack Temp. (°F)	Probe Temp. (°F)	Impinger Temp. (°C/°F)	Hot Box Temp. (°F)	Comments
A	69.4	1449	328.564	0.06	1.82	1.80	93	91	5.5	478	250	ICE BATH <68°F	250	5 min/pt
	48.8			0.05	1.61	1.60	99	91	5.0	502				
	34.6			0.045	1.45	1.45	102	91	4.5	470				
	23.0			0.055	1.78	1.80	105	93	5.5	463	250	58	240	
	13.1			0.05	1.61	1.60	111	97	5.0	473				
A	4.2	1519	350.533	0.035	1.13	1.15	112	101	3.5	468				
B	69.4	1522	350.533	0.06	1.82	1.80	105	99	5.5	481	250	56	260	
	48.8			0.065	2.10	2.10	~~88~~112	101	6.5	517				
	34.6			0.06	1.82	1.80	114	101	5.5	460				
	23.0			0.06	1.82	1.80	115	103	5.5	464	250	50	250	
	13.1			0.06	1.82	1.80	117	104	5.5	493				
B	4.2	1552	374.324	0.05	1.61	1.60	118	105	5.0	481				
C	69.4	1555	374.324	0.055	1.78	1.80	111	104	5.5	474	250	47	240	
	48.8			0.05	1.61	1.60	114	105	5.0	471				
	34.6			0.07	2.26	2.25	117	105	7.0	475				
	23.0			0.07	2.26	2.25	119	107	7.0	481	250	48	250	Estimates: MW=27.7
	13.1			0.065	2.10	2.10	118	106	7.0	491				%H2O=13.5
C	4.2	1625	399.022	0.05	1.61	1.60	116	107	5.5	495				

SYSTEM LEAK CHECK

	Vacuum (in. Hg)	DGM Rate (cfm)
Before	5.0	0.003
After	8.0	0.006

PITOT LEAK CHECK

	Positive	Negative
Before	OK 15sec	OK 15sec
After	OK 15sec	OK 15sec

	1	2
CO2	3.0	3.0
O2	11.0	11.5
CO		
N2		

Impinger No.	Impinger Contents	Final	Initial	Difference
1.	100mL DI H_2O	689.1	534.1	155.0
GBS 2.	100mL DI H_2O	591.1	558.7	32.4
3.	DRY	426.9	423.2	3.7
4.	SILICA GEL	690.1	669.7	20.4
5.				

AQE 2/92

KEYSTONE ENVIRONMENTAL RESOURCES, INC.

STACK SAMPLING DATA SHEET

CLIENT USS CLAIRTON
TEST UNIT B BATTERY STACK
PROJECT NO.
CONTROL BOX OPERATOR
BAROMETRIC PRESSURE 29.64

TEST DATE 5-7-92
TEST NO. CLR-BBS-3
NOZZLE (SIZE,#) 0.504 #55
STATIC PRESSURE -1.5
PORT DIRECTION D

ORIFICE CORRECTION 1.840
METER CORRECTION 0.9940
CALIBRATION DATE 4-24-92
PITOT CORRECTION 0.84
CONTROL BOX NO. 1

HOT BOX NO. 1
COLD BOX NO. 2
PROBE NO. 10-2
FILTER NO. 820
STACK DIA. 195"

	Traverse Point (inches)	Time	Dry Gas Meter Reading (dcf)	Pitot ΔP (in. H2O)	Orifice ΔH Req'd. (in. H2O)	Orifice ΔH Act. (in. H2O)	Meter Temperature In (°F)	Meter Temperature Out (°F)	Vacuum (in. Hg)	Stack Temp. (°F)	Probe Temp. (°F)	Impinger Temp. (°C/°F)	Hot Box Temp. (°F)	Comments
D	69.4	1627	399.022	0.07	2.26	2.25	106	101	7.0	497				
	48.8			0.055	1.78	1.80	109	100	6.0	473				
	34.6			0.06	1.82	1.80	110	99	6.0	478				
	23.0			0.06	1.82	1.80	111	99	6.0	476				
	13.1			0.055	1.78	1.80	112	100	6.0	477				
D	4.2	1657	423.351	0.05	1.61	1.60	113	101	5.0	480				

SYSTEM LEAK CHECK

	Vacuum (in. Hg)	DGM Rate (cfm)
Before		
After		

PITOT LEAK CHECK

	Positive	Negative
Before		
After		

	1	2
CO2		
O2		
CO		
N2		

Impinger No.	Impinger Contents	Final	Initial	Difference
1.				
2.				
3.				
4.				
5.				

Estimates:
MW=
%H2O=

AQE 2/92

KEYSTONE

COMPLIANCE DEMONSTRATION
B BATTERY COMBUSTION STACK

USS CLAIRTON WORKS
CLAIRTON, PA

APPENDIX E

EMISSIONS CALCULATIONS

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA
CLR-BBS-1

B BATTERY STACK
5-7-92

FIELD DATA AND VELOCITY CALCULATIONS

POINT	TIME	METER READING (DRY) CF	DELTA P IN.H2O	ORIFICE DELTA H REQ	ORIFICE DELTA H ACT	METER TEMP DEG F IN	METER TEMP DEG F OUT	VACUUM IN.HG.	STACK TEMP DEG F	CORRECTED VELOCITY FFT/SEC
69.4A	915.0	147.021	.040	1.25	1.25	65.	61.	5.0	485.	15.4
48.8			.050	1.55	1.55	73.	62.	6.0	514.	17.5
34.6			.045	1.39	1.40	79.	66.	5.5	521.	16.7
23.0			.045	1.39	1.40	82.	68.	5.5	470.	16.2
13.1			.040	1.24	1.25	88.	72.	5.0	472.	15.3
4.2A	945.0	167.103	.040	1.24	1.25	89.	76.	5.0	471.	15.3
69.4B	949.0	167.103	.050	1.55	1.55	90.	80.	5.5	487.	17.2
48.8			.050	1.55	1.55	94.	81.	5.5	502.	17.4
34.6			.050	1.55	1.55	99.	84.	5.5	508.	17.4
23.0			.055	1.70	1.70	102.	89.	6.0	474.	18.0
13.1			.055	1.70	1.70	103.	90.	6.0	481.	18.0
4.2B	1019.0	189.400	.040	1.24	1.24	107.	93.	6.0	476.	15.3
69.4C	1044.0	189.925	.050	1.55	1.55	89.	84.	6.0	465.	17.0
48.8			.050	1.55	1.55	94.	85.	5.0	488.	17.3
34.6			.050	1.55	1.55	96.	85.	5.0	493.	17.3
23.0			.050	1.55	1.55	96.	86.	5.0	501.	17.4
13.1			.060	1.86	1.85	98.	85.	5.5	473.	18.8
4.2C	1114.0	211.793	.040	1.24	1.25	97.	87.	4.5	480.	15.4
69.4D	1118.0	211.793	.055	1.70	1.70	89.	83.	5.5	501.	18.2
48.8			.065	2.01	2.00	94.	84.	6.5	518.	20.0
34.6			.060	1.86	1.85	100.	85.	6.0	524.	19.3
23.0			.065	1.70	1.70	101.	88.	6.0	470.	19.5
13.1D	1148.0	234.956	.050	1.55	1.55	102.	89.	5.5	473.	17.1

O R S A T	
CO2	3.0
O2	12.8
CO	.0
N	84.3

IMPINGER NO.	
1	183.3
2	46.5
3	6.4
4	.0
ABSORBED H2O	19.8

CONTROL BOX CALIBRATIONS

	FACTOR	DATE
ORIFICE	1.840	4-24-92
METER	0.9940	4-24-92
PITOT	0.84	4-10-92

LEAK CHECK

	RATE	IN.HG
INITIAL	0.007 CFM	6.0
FINAL	0.006 CFM	6.0

CONTROL BOX NO. 1

PROBE NO. 10-2

NOZZLE NO. 55

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA — B BATTERY STACK
CLR-BBS-1 — 5-7-92

STACK SAMPLING CALCULATIONS

A.	BAROMETRIC PRESSURE IN. HG.	29.68
B.	AVG. DELTA H (IN H2O)	1.54
C.	METER PRESSURE (IN. HG.)	29.79
D.	STATIC PRESSURE (IN. H2O)	-1.50
E.	STATIC PRESSURE (IN. HG.)	-.110
F.	STACK PRESSURE (IN. HG.) (A+E)	29.57
G.	STACK DIAMETER (IN.)	195.00
H.	STACK AREA (SQ. FT.)	207.39
	NOZZLE DIAMETER	.5040
I.	NOZZLE AREA (SQ. FT.)	.001385
J.	AVG. STACK TEMP (DEG. R.)	949.0
K.	AVG. METER TEMP (DEG. R.)	546.7
L.	CONDENSATE VOL. (ML)	236.2
M.	ABSORBED H2O (ML)	19.8
N.	TOTAL H2O (ML)	256.0
O.	METERED GAS (CF)	87.410
P.	GAS METER CORRECTION	.9940
Q.	CORRECTED METERED GAS (CF)	86.886
R.	H2O GAS VOLUME (CF) (0.00267N(K/C)	12.543
S.	TOTAL SAMPLED VOLUME (CF) (Q+R)	99.429
T.	PERCENT H2O (100R/S)	12.62
	THEORETICAL MAXIMUM	100.00
	PERCENT WATER USED	12.62
U.	SCFD GAS SAMPLED (528*Q*C/(29.9*K))	83.609

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	.8738	X	44.0	=	1.15
CO	.000	X	.8738	X	28.0	=	.00
O2	.127	X	.8738	X	32.0	=	3.57
N2	.843	X	.8738	X	28.2	=	20.76
H2O		X T/100=	.1262	X	18.0	=	2.27
					MOLECULAR WEIGHT OF STACK GAS	=	27.75

W.	PITOT CORRECTION	.840
X.	AVERAGE CORRECTED VELOCITY (FPS)	17.26
	[85.49*W*SQRT{(J*DELTA P)/(V*F)}]	
Y.	AVG. FLOW RATE (CFM) (X*H*60)	214768.
Z.	STACK FLOW RATE (SCFM) (528*Y/J*F/29.92)	118093.
	STACK FLOW RATE (DRY)	103195.
AA.	SAMPLE TIME (SEC)	7200.
BB.	PERCENT ISOKINETIC	101.07
	(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
CLR-BBS-1

B BATTERY STACK
5-7-92

PARAMETER	CYCLONE WT. (G)	MATL.ON FILTER(G)	INSOL.MATL. IN PROBE(G)	SOL.MATL. IN PROBE(G)
PARTICULATE	.00000	.01260	.00000	.02750

PARAMETER	INSOL.MATL. IN IMP.(G)	SOLUBLE MATL. IN IMP.(G)
PARTICULATE	.00370	.00790

PARTICULATE	.05170
ALL MATLS.	.05170

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.00807	7.13601

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

/ DEB

KEYSTONE ENVIRONMENTAL RESOURCES
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA
B BATTERY STACK

DATE: 5-7-92
CHARGE #: ...150-605024
TEST #: CLR-BBS-2

1. EMISSION RESULTS

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.00712	6.76779

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2. STACK CONDITIONS

FLOW (ACFM)	228137.
(SCFM)	126695.
MOISTURE CONTENT (%)	12.41
STACK TEMPERATURE (F)	479.6

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3. SAMPLING CONDITIONS

SAMPLE TIME (MIN.)	120.0
SCFD GAS SAMPLED	86.789
PERCENT ISOKINETIC	97.57

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA — B BATTERY STACK
CLR-BBS-2 — 5-7-92

FIELD DATA AND VELOCITY CALCULATIONS

POINT	TIME	METER READING (DRY) CF	DELTA P IN.H2O	ORIFICE DELTA H REQ	ORIFICE DELTA H ACT	METER TEMP DEG F IN	METER TEMP DEG F OUT	VACUUM IN.HG.	STACK TEMP DEG F	CORRECTED VELOCITY FT/SEC
69.4D	1208.0	235.188	.060	1.86	1.85	95.	91.	12.0	469.	18.7
48.8			.065	2.01	2.00	99.	91.	15.0	480.	19.6
34.6			.070	2.17	2.15	100.	92.	16.0	497.	20.5
23.0			.070	2.17	2.15	100.	93.	19.0	500.	20.6
13.1			.065	2.01	2.00	96.	92.	18.5	508.	19.9
4.2D	1238.0	259.465	.050	1.55	1.55	97.	91.	9.0	502.	17.4
69.4C	1246.0	260.114	.050	1.60	1.60	92.	85.	9.5	472.	17.1
48.8			.050	1.60	1.60	95.	86.	10.0	485.	17.2
34.6			.055	1.76	1.75	99.	87.	11.5	493.	18.2
23.0			.065	1.97	2.00	102.	90.	14.0	460.	19.4
13.1			.065	1.97	2.00	102.	91.	~~140.0~~ 14.0	462.	19.4
4.2C	1316.0	283.082	.050	1.60	1.60	104.	94.	10.0	471.	17.1
69.4D	1321.0	283.082	.065	1.97	2.00	98.	94.	14.0	478.	19.6
48.8			.060	1.85	1.80	99.	91.	13.0	509.	19.1
34.6			.055	1.67	1.65	99.	90.	12.5	460.	17.8
23.0			.055	1.65	1.65	99.	90.	12.5	461.	17.8
13.1			.055	1.67	1.65	102.	90.	12.5	463.	17.9
4.2B	1351.0	306.360	.055	1.67	1.65	104.	93.	12.5	470.	17.9
69.4A	1357.0	306.360	.050	1.52	1.50	98.	91.	9.5	495.	17.3
48.8			.055	1.67	1.65	104.	94.	11.0	458.	17.8
34.6			.055	1.67	1.65	106.	95.	11.0	474.	18.0
23.0			.050	1.52	1.50	109.	98.	10.0	477.	17.2
13.1			.050	1.52	1.50	111.	99.	10.0	487.	17.3
4.2A	1427.0	328.135	.050	1.52	1.50	111.	100.	10.0	480.	17.2

O R S A T

CO2	2.8
O2	12.5
CO	.0
N	84.8

IMPINGER NO.	1	195.3
	2	33.4
	3	8.2
	4	.0
ABSORBED H2O		24.0

CONTROL BOX CALIBRATIONS

	FACTOR	DATE
ORIFICE	1.840	4-24-92
METER	0.9940	4-24-92
PITOT	0.84	4-10-92

LEAK CHECK

	RATE	IN.HG
INITIAL	0.007 CFM	5.0
FINAL	0.015 CFM	15.0

CONTROL BOX NO. 1 — PROBE NO. 10-3 — NOZZLE NO. 55

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA — B BATTERY STACK
CLR-BBS-2 — 5-7-92

STACK SAMPLING CALCULATIONS

A.	BAROMETRIC PRESSURE IN. HG	29.68
B.	AVG. DELTA H (IN H2O)	1.75
C.	METER PRESSURE (IN. HG.)	29.81
D.	STATIC PRESSURE (IN. H2O)	-1.50
E.	STATIC PRESSURE (IN. HG.)	-.110
F.	STACK PRESSURE (IN. HG.) (A+E)	29.57
G.	STACK DIAMETER (IN.)	195.00
H.	STACK AREA (SQ. FT.)	207.39
	NOZZLE DIAMETER	.5040
I.	NOZZLE AREA (SQ. FT.)	.001385
J.	AVG. STACK TEMP (DEG. R.)	939.6
K.	AVG. METER TEMP (DEG. R.)	556.4
L.	CONDENSATE VOL. (ML)	236.9
M.	ABSORBED H2O (ML)	24.0
N.	TOTAL H2O (ML)	260.9
O.	METERED GAS (CF)	92.298
P.	GAS METER CORRECTION	.9940
Q.	CORRECTED METERED GAS (CF)	91.744
R.	H2O GAS VOLUME (CF) (0.00267N(K/C)	13.004
S.	TOTAL SAMPLED VOLUME (CF) (Q+R)	104.748
T.	PERCENT H2O (100R/S)	12.41
	THEORETICAL MAXIMUM	100.00
	PERCENT WATER USED	12.41
U.	SCFD GAS SAMPLED (528*Q*C/(29.9*K))	86.789

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	.027	X	.8759	X	44.0	=	1.06
CO	.000	X	.8759	X	28.0	=	.00
O2	.125	X	.8759	X	32.0	=	3.50
N2	.848	X	.8759	X	28.2	=	20.93
H2O		X	T/100= .1241	X	18.0	=	2.23
					MOLECULAR WEIGHT OF STACK GAS	=	27.73

W.	PITOT CORRECTION	.840
X.	AVERAGE CORRECTED VELOCITY (FPS) [85.49*W*SQRT{(J*DELTA P)/(V*F)}]	18.33
Y.	AVG. FLOW RATE (CFM) (X*H*60)	228137.
Z.	STACK FLOW RATE (SCFM) (528*Y/J*F/29.92)	126695.
	STACK FLOW RATE (DRY)	110967.
AA.	SAMPLE TIME (SEC)	7200.
BB.	PERCENT ISOKINETIC (J*100*U*29.92)/(528*X*AA*I*F*(1-T/100))	97.57

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA
CLR-BBS-2

B BATTERY STACK
5-7-92

PARAMETER	CYCLONE WT. (G)	MATL.ON FILTER(G)	INSOL.MATL. IN PROBE(G)	SOL.MATL. IN PROBE(G)
PARTICULATE	.00000	.01420	.00000	.02420

PARAMETER	INSOL.MATL. IN IMP.(G)	SOLUBLE MATL. IN IMP.(G)
PARTICULATE	.00170	.00410

PARTICULATE	.04420
ALL MATLS.	.04420

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.00712	6.76779

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

✓ KB

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA — B BATTERY STACK
CLR-BBS-3 — 5-7-92

FIELD DATA AND VELOCITY CALCULATIONS

POINT	TIME	METER READING (DRY) CF	DELTA P IN.H2O	ORIFICE DELTA H REQ	ORIFICE DELTA H ACT	METER TEMP DEG F IN	METER TEMP DEG F OUT	VACUUM IN.HG.	STACK TEMP DEG F	CORRECTED VELOCITY FT/SEC
69.4A	1449.0	328.564	.060	1.82	1.80	93.	91.	5.5	478.	18.8
48.8			.050	1.61	1.60	99.	91.	5.0	502.	17.4
34.6			.045	1.45	1.45	102.	91.	4.5	470.	16.2
23.0			.055	1.78	1.80	105.	93.	5.5	463.	17.8
13.1			.050	1.61	1.60	111.	97.	5.0	473.	17.1
4.2A	1519.0	350.533	.035	1.13	1.15	112.	101.	3.5	468.	14.3
694.0B	1522.0	350.533	.060	1.82	1.80	105.	99.	5.5	481.	18.8
48.8			.065	2.10	2.10	112.	101.	6.5	517.	19.9
34.6			.060	1.82	1.80	114.	101.	5.5	460.	18.6
23.0			.060	1.82	1.80	115.	103.	5.5	464.	18.6
13.1			.060	1.82	1.80	117.	104.	5.5	483.	18.8
4.2B	1552.0	374.324	.050	1.61	1.60	118.	105.	5.0	481.	17.2
69.4C	1555.0	374.324	.055	1.78	1.80	111.	104.	5.5	474.	17.9
48.8			.050	1.61	1.60	114.	105.	5.0	471.	17.1
34.6			.070	2.26	2.25	117.	105.	7.0	475.	20.2
23.0			.070	2.26	2.25	119.	107.	7.0	481.	20.3
13.1			.065	2.10	2.10	118.	106.	7.0	491.	19.7
4.2C	1625.0	399.022	.050	1.61	1.60	116.	107.	5.5	495.	17.3
69.4D	1627.0	399.022	.070	2.26	2.25	106.	101.	7.0	497.	20.5
48.8			.055	1.78	1.80	109.	100.	6.0	473.	17.9
34.6			.060	1.82	1.80	110.	99.	6.0	478.	18.8
23.0			.060	1.82	1.80	111.	99.	6.0	475.	18.7
13.1			.055	1.78	1.80	112.	100.	6.0	477.	18.0
4.2D	1657.0	423.351	.050	1.61	1.60	113.	101.	5.0	480.	17.2

O R S A T	
CO2	3.0
O2	11.3
CO	.0
N	85.8

IMPINGER NO.	
1	155.0
2	32.4
3	3.7
4	.0
ABSORBED H2O	20.4

CONTROL BOX CALIBRATIONS

	FACTOR	DATE
ORIFICE	1.840	4-24-92
METER	0.9940	4-24-92
PITOT	0.84	4-10-92

LEAK CHECK

	RATE	IN.HG
INITIAL	0.003 CFM	5.0
FINAL	0.006 CFM	8.0

CONTROL BOX NO. 1 — PROBE NO. 10-2 — NOZZLE NO. 55

KEYSTONE ENVIRONMENTAL RESOURCES, INC.
AIR QUALITY ENGINEERING

USS CLAIRTON WORKS
CLAIRTON, PA B BATTERY STACK
CLR-BBS-3 5-7-92

PARAMETER	CYCLONE WT. (G)	MATL.ON FILTER(G)	INSOL.MATL. IN PROBE(G)	SOL.MATL. IN PROBE(G)
PARTICULATE	.00000	.01260	.00000	.02100

PARAMETER	INSOL.MATL. IN IMP.(G)	SOLUBLE MATL. IN IMP.(G)
PARTICULATE	.00230	.00530

PARTICULATE	.04120
ALL MATLS.	.04120

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.00633	6.10523

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

COMPLIANCE DEMONSTRATION
B BATTERY COMBUSTION STACK

USS CLAIRTON WORKS
CLAIRTON, PA

APPENDIX F

VISIBLE EMISSIONS DATA

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

VISIBLE EMISSIONS OBSERVATIONS FORM

OBSERVER: CHARLES DAVIS

DATE: 5-7-92

FACILITY: USX CLAIRTON

OBSERVATION: START TIME: 10:45

END TIME: 12:00

OBSERVATION POINT: WALLDASH PARKING LOT

SOURCE:

DISTANCE: 750

DIRECTION FROM:

HEIGHT: 250'

WIND:

SPEED: 9 MPH.

DIRECTION: N. EAST

TEMPERATURE: 58°

SKY CONDITION: CLEAR

BACKGROUND: SKY

READING CONDITIONS: Good

COLOR OF EMISSION:

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: FOREMAN:

COMMENTS:

B STACK

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

B STACK

OBSERVER: CHARLES DAVIS

DATE: 5-7-92

FACILITY: USN CLAIRTON

OBSERVATION: START TIME: 12.15

END TIME: 1.30

OBSERVATION POINT: WALLBASH PARKING LOT.

SOURCE:

DISTANCE: 750'

DIRECTION FROM:

HEIGHT: 250'

WIND:

SPEED: 13 M.P.H

DIRECTION: N. EAST

TEMPERATURE: 57°

SKY CONDITION: CLEAR

BACKGROUND: SKY

READING CONDITIONS: Good

COLOR OF EMISSION:

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

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

PAGE 5

VISIBLE EMISSIONS OBSERVATIONS FORM

B STACK

OBSERVER: CHARLES DAVIS

DATE: 5-7-92

FACILITY: USX CLAIRTON

OBSERVATION: START TIME: 1:45 PM

END TIME: 2:45

OBSERVATION POINT:
WALLBASH PARKING LOT

SOURCE:

DISTANCE: 750'

DIRECTION FROM:

HEIGHT: 250'

WIND:

SPEED: 12 M.P.H.

DIRECTION: EAST

TEMPERATURE: 60°-62°

SKY CONDITION: PARTLY CLOUDY

BACKGROUND: SKY + CLOUDS

READING CONDITIONS: GOOD

COLOR OF EMISSION:

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: FOREMAN:

COMMENTS:

PORT B

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 A

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

B STACK

OBSERVER: Charles Davis

DATE: 5-7-92

FACILITY: US 1 & Clairton

OBSERVATION: START TIME: 3:00 pm

END TIME: 4:00

OBSERVATION POINT: Wallbash Parking Lot

SOURCE:

DISTANCE: 750

DIRECTION FROM:

HEIGHT: 250'

WIND:

SPEED: 8 - M.P.H

DIRECTION: South East

TEMPERATURE: 64° - 66°

SKY CONDITION: Part Cloudy

BACKGROUND: Sky + Clouds

READING CONDITIONS: Good

COLOR OF EMISSION:

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

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	6
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

B STACK

OBSERVER: Charles Davis

DATE: 5-7-92

FACILITY: USX Clinton

OBSERVATION: START TIME: 4:00 Pm

END TIME: 5:00 Pm

OBSERVATION POINT: Wallbash Parking Lot

SOURCE:

DISTANCE: 750'

DIRECTION FROM:

HEIGHT: 250'

WIND:

SPEED: 9 M.P.H

DIRECTION: North East

TEMPERATURE: 65°- 66°

SKY CONDITION: Overcast

BACKGROUND: Sky

READING CONDITIONS: Good

COLOR OF EMISSION:

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

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
B BATTERY COMBUSTION STACK

USS CLAIRTON WORKS
CLAIRTON, PA

APPENDIX G

SULFATE ANALYSIS

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

RJ LeeGroup, Inc.

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

May 22, 1992

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

RE: RJ Lee Group Project Number CHH205061
Keystone Purchase Order Number B-7185
Keystone Project/Account Number 605024-02

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 ±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

Kimberly S. DiNatale
Project Manager, Analytical Chemistry

KSD/dcd
Enclosure

Table I

RJ Lee Group Project Number CHH205061
For: Keystone Environmental Resources, Inc.

SULFATE ANALYSIS

Keystone Identification	RJ Lee Group Sample Number	ppm SO_4	Volume (ml)	Total mg SO_4	Analytical Method
CLR-BBS-1	101294	31.2	820	25.6	IC
CLR-BBS-2	101295	30.1	860	25.9	IC
CLR-BBS-3	101296	29.9	760	22.7	IC
CLR-BBS-Blank	101297	0.965	860	0.830	IC

Authorized Signature Kimberly S. Watale
Date 5-22-92

RJ Lee Group, Inc.
Headquarters

350 Hochberg Road
Monroeville, PA 15146

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

CHAIN OF CUSTODY RECORD

PLANT CODE: 605024-02

PROJECT NAME: CLR

SAMPLERS (Signature):

STA NO	DATE	TIME	GRAB	COMP	WATER	STATION LOCATION	NUMBER OF CONTAINERS	SULFATE (SO_4) by IC	CONDUCTIVITY	pH	REMARKS OR OBSERVATIONS
											TOTAL VOL
	5/07/92		✓			CLR-BBS-1	1	✓			820 ml
	5/07/92		✓			CLR-BBS-2	1	✓			860 ml
	5/07/92		✓			CLR-BBS-3	1	✓			760 ml
	5/07/92		✓			CLR-BBS-BLANK	1	✓			860 ml

Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
Samuel L Woodbury			Kim DiNatale		5-14-92		
Relinquished by (Signature)	Date	Time	Received by (Signature)	Relinquished by (Signature)	Date	Time	Received by (Signature)
Relinquished by (Signature)	Date	Time	Received for Laboratory by (Signature)	Date	Time	Ice Chest Temp °C	Ice Chest #

Chain of Custody Tag #

DISTRIBUTION: Original accompanies shipment; Copy to Coordinator Field Files.

DELIVER TO KIM DINATALIC

PAGE ____ OF ____