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

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

1990

USS CLAIRTON WORKS
RESULTS OF THE
COMPLIANCE DEMONSTRATION
OF THE
#14 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 NO. 601050-03

NOVEMBER 1990

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ABSTRACT

On June 20, 1990, a compliance test program was conducted for USS Clairton Works, Clairton, PA, on the #14 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 0.012 gr/dscf and 3.31 lb/hr, respectively. The allowable concentration is 0.015 gr/dscf. Thus, the emissions from the stack are in compliance. The visible emissions observed from the stack during the tests were also in compliance.

1.0 INTRODUCTION

On June 20, 1990, a compliance test program was conducted for USS Clairton Works, Clairton, PA, on the #14 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, Daniel Keller, and John Shimshock of Keystone, and Richard Casselberry of Environmental Technical Services (ETS). Keystone and ETS are sister companies under the Chester Environmental Group. Visible emissions determinations were performed by Jim McKoy of ETS. 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 exhausted 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 CO_2, O_2, and N_2 (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.

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

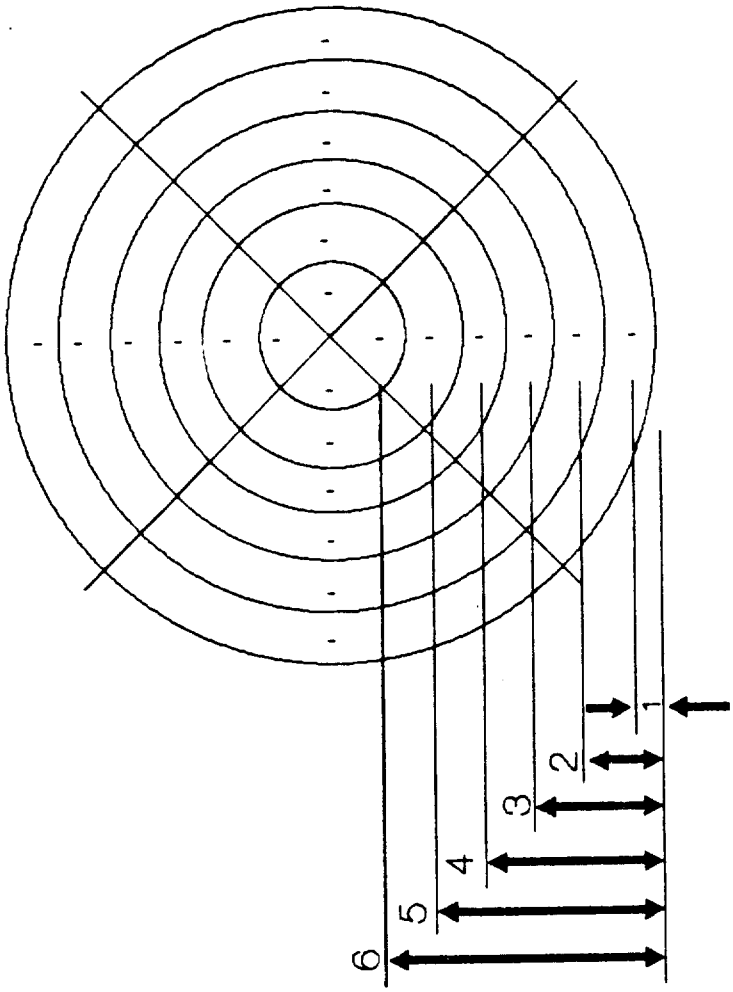
3000 TECH CENTER DRIVE
MONROEVILLE, PA 15146

SKETCH SHEET

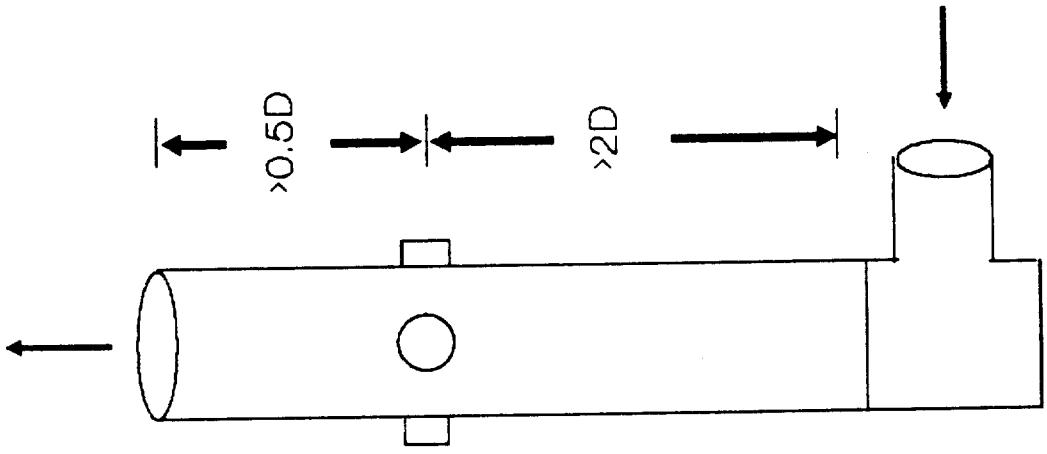
NAME DATE

DRAWN

CHECKED



Traverse Point	Distance (in.)
1	2.6
2	8.0
3	14.2
4	21.3
5	30.0
6	42.7



Stack Diameter (in.) = 120
D

ACTIVITY No.

REVISION 2-1a

TLE Schematic Diagram of the Stack and Traverse Points

Figure 2-1

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 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 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 0.012 grains per dry standard cubic foot (gr/dscf) and 3.31 pounds per hour (lb/hr), respectively.

As promulgated by the Amended Mon Valley Consent Decree, Paragraph V.A.(6), the particulate matter standard for #14 Battery Combustion Stack is 0.015 gr/dscf. 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:

Test #	Sample Volume (mL)	Concentration (mg/L)	Total Sulfate (mg)
1	750	31.5	23.6
2	890	40.8	36.4
3	880	51.9	45.6

USS CLAIRTON WORKS
CLAIRTON, PA

TABLE 3-1

PARTICULATE MATTER EMISSIONS DATA

EMISSIONS	TEST #1	TEST #2	TEST #3	AVERAGE
gr/dscf	0.012	0.016	0.009	0.012
lb/hr	3.00	4.52	2.41	3.31
STACK CONDITIONS				
Flow (acfm)	68016	73645	66674	69445
Flow (scfm)	35663	38666	35292	36540
Moisture Content (%)	15.08	15.16	13.58	14.61
Stack Temp. (^{O}F)	517	516	508	514
SAMPLING CONDITIONS				
Sampling Time (min)	120	120	120	
Sample Volume (scfd)	75.521	83.939	77.739	
Isokinetics (%)	96.80	99.32	98.94	

Copies of the field data sheets for the visible emissions determinations can be found in Appendix F. All visible emissions observed during the three tests were less than or equal to 15% opacity. 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 NUMBER 14 BATTERY COMBUSTION STACK

APPENDIX A

OPERATIONAL RECORDS

15-15 [illegible]

:C-10385 REV. 1181
13.001.0020

UNITED STATES STEEL CORPORATION
CLAIRTON COKE AND COAL CHEMICAL WORKS

PUSHING AND CHARGING REPORT
UNIT NO. #5
12 Hrs. Beginning 12:00 AM
Date 6-20-90

BATTERY NO. B-14						BATTERY NO. A-13						BATTERY NO. B-13					
OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES	OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES	OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES
1	2	48	3	22		1	3	02	3	40		1	3	12	3	50	
3	3	24	4	00		3	3	42	4	10		3	3	52	4	22	
5	4	02	4	34		5	4	12	4	46		5	4	24	5	00	
7	4	36	5	10		7	4	48	5	22		7	5	02	5	34	
9	5	12	5	46		9	5	24	6	00		9	5	36	6	10	
11	5	48	6	22		11	6	02	6	34		11	6	12	6	46	
13	6	24	7	04		13	6	36	7	15		13	6	48	7	26	
15	7	06	7	38		15	7	17	7	51		15	7	28	8	02	-5-
17	7	40	8	19		17	7	53	8	30		17	8	04	8	52	
19	8	21	9	04		19	8	32	9	20		19	8	54	9	31	
21	9	06	9	49		21	9	22	10	00		21	9	33	10	12	
23	9	51	10	35		23	10	02	11	47		23	10	14	11	57	
25	10	37				25	10	49				25	10	59			
27						27						27					
29						29						29					
31	X	X	X	X		31						31	X	X	X	X	
2						2						2					
4						4						4					
6						6						6					
8						8						8					
10						10						10					
12						12						12					
14						14						14					
16						16						16			11	01	
18						18			11	24		18	11	03	11	35	
20	11	15	11	46		20	11	26	12	00		20	11	37	12	10	
22	11	48	12	22		22	12	02	12	34		22	12	12	12	46	
24	12	24	1	00		24	12	36	1	10		24	12	48	1	22	
26	1	02	1	34		26	1	12	1	46		26	1	24	2	00	
28	1	36	2	10		28	1	48	2	22		28	2	02	2	34	
30	2	12	2	46		30	2	24	3	00		30	2	36	3	10	
1	X	X	X	X	19/18	1	X	X	X	X		1	X	X	X	X	
2	X	X	X	X		2	X	X	X	X		2	X	X	X	X	

REMARKS:

Condition of Signals OK

Condition of Pusher OK

HOURLY REPORT OF OPERATION

TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED	TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED
11-12	5	4		56	5	5	
12-1	5	5		67	5	5	
1-2	5	5		78	5	5	
2-3	5	5		89	4	4	
3-4	5	5		910	4	4	
4-5	5	5		1011	5	5	
	30	29		[illegible]	28	28	

JCB

Total Ovens Pushed 56

Total Ovens Charged 51

Pusherman ME

Battery Foreman YOU

PAGE.004

OCT 10 '90 7:06

CC-10295 REV. 1181
33.001.0020

UNITED STATES STEEL CORPORATION
CLAIRTON COKE AND COAL CHEMICAL WORKS

PUSHING AND CHARGING REPORT

UNIT NO. #5
12 Hrs. Beginning 12:00 PM
Date 6-20-90

BATTERY NO. 14B						BATTERY NO. 13A						BATTERY NO. 13B					
OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES	OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES	OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES
1	10	34				1	10	44				1	10	55			
3						3						3					
5						5						5					
7						7						7					
9						9						9					
11						11						11					
13						13						13					
15						15						15					
17						17						17					
19						19						19					
21						21						21					
23						23						23					
25			11	43		25			12	00		25			12	11	
27	11	45	12	31		27	12	02	12	41		27	12	13	1	03	
29	12	33	1	18		29	12	43	12	52		29	1	03	1	39	
31	%	%	%	%		31	12	54	1	28		31	=	=	=	=	
2	1	20	1	54		2	1	30	2	06		2	1	41	2	20	
4	1	8	2	35		4	2	08	2	47		4	2	22	2	57	
6	2	37	4	39	*	6	2	49	3	26		6	2	59	3	41	
8	3	15	3	24		8	3	28	3	48		8	3	43	4	25	
10	4	02	4	09		10	4	12	4	30		10	4	27	5	02	
12	4	41	5	13		12	4	53	5	23		12	5	04	5	34	
14	5	15	5	44		14	5	25	5	56		14	5	36	6	06	
16	5	46	6	17		16	5	58	6	27		16	6	08	6	37	
18	6	19	6	47		18	6	29	6	57		18	6	39	7	43	
20	6	49	7	54		20	6	59	8	04		20	7	45	8	15	
22	7	56	8	24		22	8	06	8	36		22	8	17	8	47	
24	8	28	8	57		24	8	38	9	07		24	8	49	9	17	
26	8	59	9	27		26	9	09	9	37		26	9	19	9	47	
28	9	29	9	57		28	9	39	10	10		28	9	49	10	21	
30	9	54	10	32		30	10	12	10	42		30	10	23	10	53	
o/o	−	+	+	o/o	18/18	o/o	×	÷	÷	×	17/17	o/o	o	?	?	o	18/18
o/o	+	−	−	o/o		o/o	÷	×	×	÷		o/o	?	o	o	?	

REMARKS:

Condition of Signals OK | Condition of Pusher OK

HOURLY REPORT OF OPERATION

TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED	TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED
12-1	1	1		6T	6	6	
1-2	5	5		7	6	6	
2-3	5	5		8	2	2	
3-4	5	5		9	6	6	
4-5	3	4		10	6	6	
5-6	5	4		11	5	5	
	24	24			31	31	

HA HA HA
Hi Joe
Total Ovens Pushed 55
Total Ovens Charged 55
Pusherman ME
Battery Foreman YOU

CC-10295 REV. 1181
03.001.0020

UNITED STATES STEEL CORPORATION
CLAIRTON COKE AND COAL CHEMICAL WORKS

PUSHING AND CHARGING REPORT

UNIT NO. 5

12 Hrs. Beginning 12:00 A. M

Date 6-20-90

BATTERY NO. 15-A					
OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES
1	2	20	2	48	
3	2	50	3	55	
5	3	57	4	25	
7	4	27	4	57	
9	4	59	5	30	
11	5	32	6	06	
13	6	08	6	42	
15	6	44	7	33	
17	7	35	8	14	
19	8	16	9	00	
21	9	02	9	45	
23	9	47	10	33	
25	10	35			
27					
29					
31					
2					
4					
6					
8					
10					
12					
14					
16					
18			11	07	
20	11	09	11	40	
22	11	42	12	11	
24	12	13	12	44	
25	12	46	1	17	
28	1	19	1	47	
30	1	49	2	18	
1	X		X		19/19
2					

BATTERY NO. 15-B					
OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES
1	2	30	3	34	
3	3	36	4	05	
5	4	07	4	36	
7	4	38	5	07	
9	5	09	5	42	
11	5	44	6	18	
13	6	20	7	10	
15	7	12	7	43	
17	7	45	8	28	
19	8	30	9	18	
21	9	20	9	56	
23	9	58	10	43	
25	10	45			
27					
29					
31					
2					
4					
6					
8					
10					
12					
14					
16			11	18	
20	11	20	11	50	
22	11	52	12	22	
24	12	24	12	62	
26	12	58	1	27	
28	1	29	1	56	
30	1	58	2	28	
1	X		X		19/19
2					

BATTERY NO. 14-A					
OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES
1	2	40	3	45	
3	3	47	4	15	
5	4	17	4	47	
7	4	49	5	18	
9	5	20	5	51	
11	5	56	6	30	
13	6	32	7	23	
15	7	25	7	56	
17	7	58	8	40	
19	8	42	9	28	
21	9	30	10	08	
23	10	10	10	15	
25	10	55			
27					
29					
31					
2					
4					
6					
8					
10					
12					
14					
16			11	29	
20	11	31	12	02	
22	12	04	12	32	
24	12	35	1	07	
26	1	09	1	37	
28	1	39	2	07	
30	2	09	2	38	
1	X		X		19/19
2					

REMARKS:

Condition of Signals

Condition of Pusher

HOURLY REPORT OF OPERATION

TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED
12-12	6	6	
12-1	6	6	
1-2	6	6	
2-3	5	5	
3-4	3	3	
4-5	6	6	
	31	31	

TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED
5-6	5	5	
6-7	4	4	
7-8	5	5	
8-9	3	3	
9-10	5	5	
10-11	4	4	
	26	26	

JCB

Total Ovens Pushed 57

Total Ovens Charged 57

Pusherman

Battery Foreman

CC-10295 REV. 1181
03.001.0020

UNITED STATES STEEL CORPORATION
CLAIRTON COKE AND COAL CHEMICAL WORKS

PUSHING AND CHARGING REPORT

UNIT NO. 5
12 Hrs. Beginning 12:00 P M
Date 6-20-90

BATTERY NO. 15A						BATTERY NO. 15B						BATTERY NO. 14A					
OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES	OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES	OVEN NO.	TIME PUSHED		TIME CHARGED		NOTES
1	10	27				1	10	38				1	10	57			
3						3						3					
5						5						5					
7						7						7					
9						9						9					
11						11						11					
13						13						13					
15						15						15					
17						17						17					
19						19						19					
21						21						21					
23						23						23					
25			11	40		25			11	D		25					
27	11	42	12	18		27	11	55	12	34		27	12	13	11	05	
29	12	20	12	24		29	12	40	1	23		29	12	50	12	59	
31	12	26	1	13		31	X	X	X	X		31	1	05	1	10	
2	1	15	1	46		2	1	25	2	00		2	1	35	1	40	
4	1	48	2	36		4	2	04	2	49		4	2	13	2	26	
6	2	32	3	14		6	2	43	3	25		6	2	54	3	04	
8	3	10	4	02		8	3	22	4	10		8	3	38	3	49	
10	3	56	4	39		10	4	07	4	50		10	4	21	4	28	
12	4	35	5	05		12	4	47	5	13		12	4	57	5	22	
14	5	09	5	37		14	5	17	5	46		14	5	33	5	58	
16	5	42	6	08		16	5	53	6	18		16	6	03	6	33	
18	6	14	6	26		18	6	24	6	39		18	6	35	7	46	
20	6	45	7	47		20	6	52	7	54		20	7	42	8	09	
22	7	51	8	17		22	8	01	8	26		22	8	12	8	37	
24	8	22	8	47		24	8	33	8	58		24	8	43	9	11	
26	8	54	9	22		26	9	04	9	30		26	9	14	9	40	
28	9	24	9	52		28	9	35	10	01		28	9	45	10	12	
30	9	55	10	05		30	10	08	10	22		30	10	17	10	44	
1	X		X		18/18	1	X		X		18/18	1	X		X		19/19
2	X		X		19/19	2	X		X		18/18	2	X		X		19/19

REMARKS:

Condition of Signals

Condition of Pusher

HOURLY REPORT OF OPERATION

TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED	TIME	OVENS PUSHED	OVENS CHARGED	OVENS SCHEDULED
12-12	2	3		5-6	5	6	
12-1	5	4		6-7	6	5	
1-2	5	5		7-8	2	3	
2-3	5	4		8-9	6	6	
3-4	4	4		9-10	6	5	
4-5	5	5		10-11	5	5	
	26	25			30	30	

Total Ovens Pushed 56
Total Ovens Charged 55

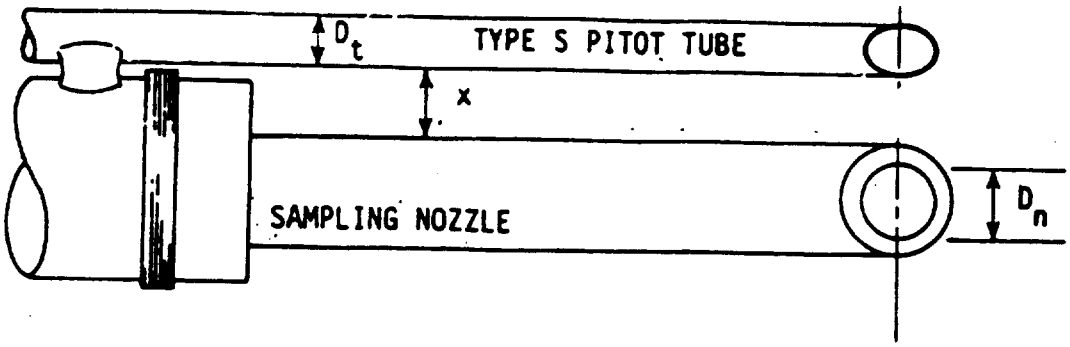
Pusherman

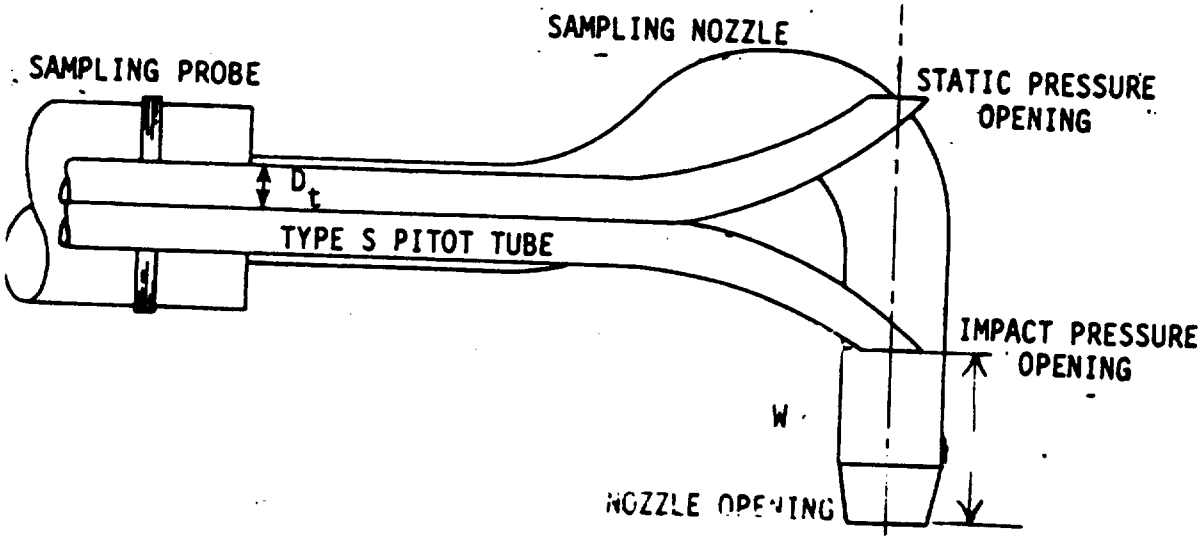
Battery Foreman

PAGE.001

USS CLAIRTON WORKS
RESULTS OF THE
COMPLIANCE DEMONSTRATION
OF THE NUMBER 14 BATTERY COMBUSTION STACK

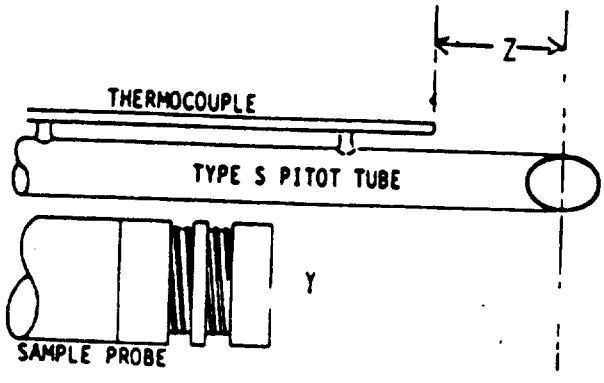
APPENDIX B
PRE-TEST AND POST-TEST
CALIBRATION AND AUDIT RESULTS





D_n = Nozzle diameter

D_t = 3/16 to 3/8"



$W \geq 0$

$X \geq 3/4"$ for 1/2" Nozz

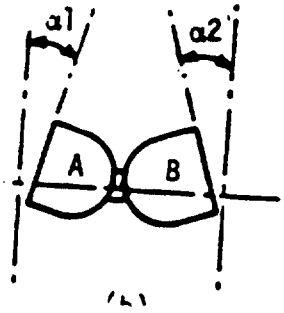
$Y \geq 3"$

$Z \geq 2"$

GEOMETRIC PITOT CALIBRATION

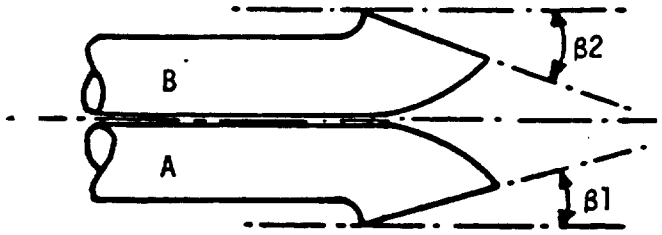
Probe No. 7-81
Date 4-24-90
Initials [illegible]

pre-test

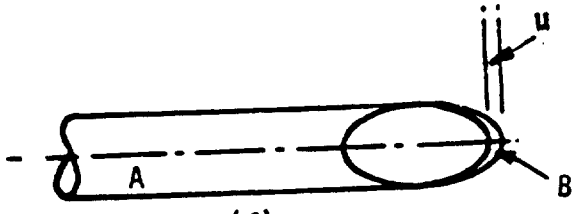


α1, α2 <10°

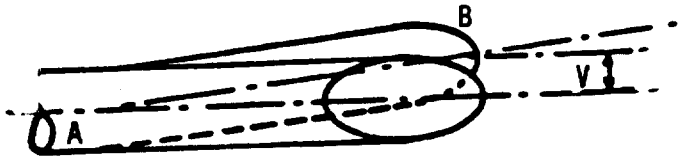
α1 = .5°
α2 = 4°
β1 = 1°
β2 = 2°
A = 1.57
μ = .054
V = .082
W = ≥ 0
X = .880
Y = ≥ 3"
Z = ≥ 2"
D_t = .322

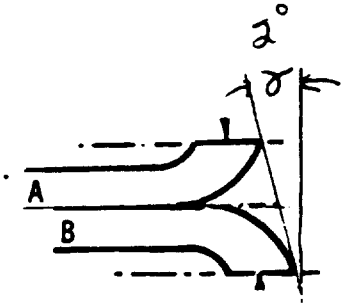


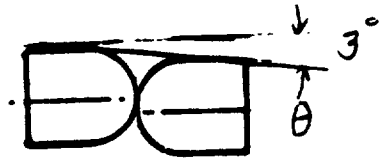
β1, β2 <5



(f)



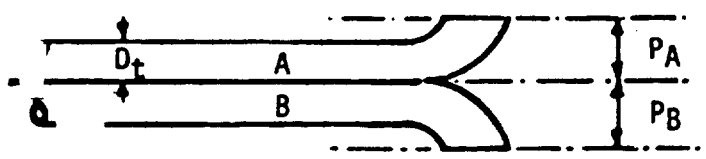




μ = A SIN γ

V = A SIN θ

A-SIDE PLANE



B-SIDE PLANE

.325 .565

1.05 D_t <P <1.50 D_t

P_A = P_B

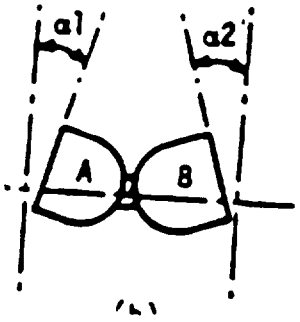
2.10 D_t <A <3.00 D_t

.791 1.131

GEOMETRIC PITOT CALIBRATION

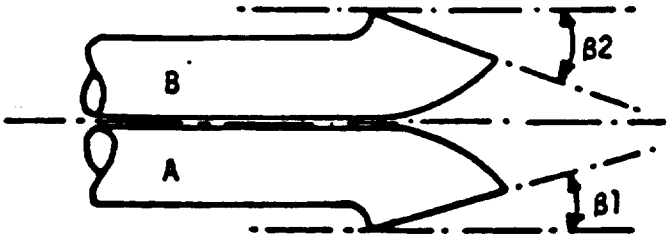
Probe No. 1-1
Date 6/29/90
Initials MS

post-test

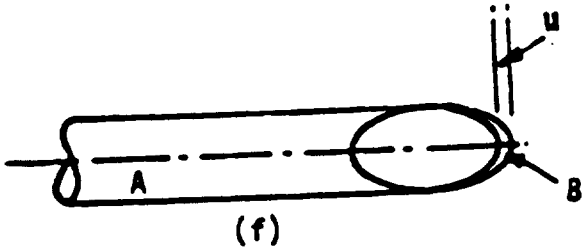


α1, α2 <10°

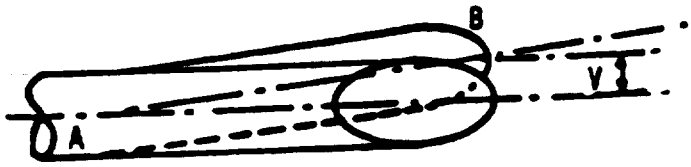
α1 = 2°
α2 = 1°
β1 = 2°
β2 = 4°
A = 1.059
μ = .018
V = 0
W = ≥0
X = ≥3/4"
Y = ≥3"
Z = ≥2"
D_t = .380

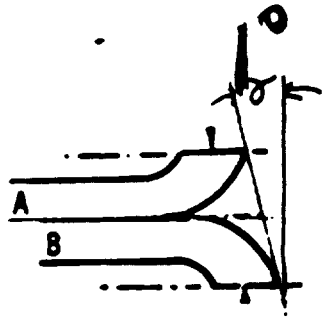


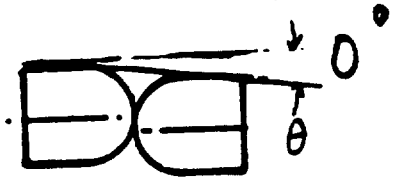
β1, β2 <5



(f)



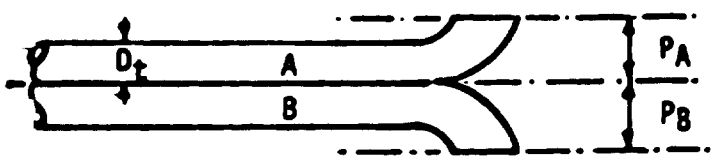




μ = A SIN γ

V = A SIN θ

A-SIDE PLANE



B-SIDE PLANE

.399 .570

1.05 D_t <P <1.50 D_t

$P_A = P_B$

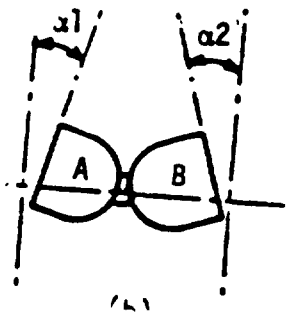
2.10 D_t <A <3.00 D_t

.798 1.14

GEOMETRIC PITOT CALIBRATION

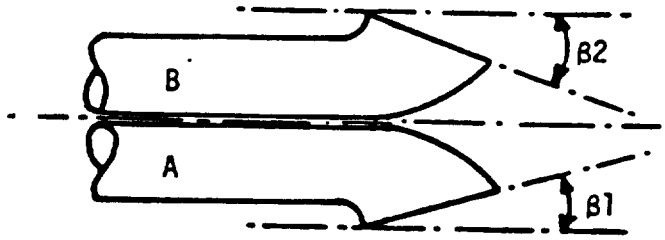
Probe No. 7-2
Date 4-24-90
Initials TGH

pre-test

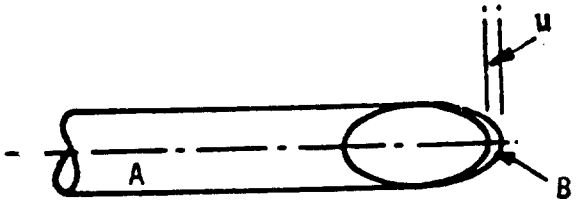


α1, α2 <10°

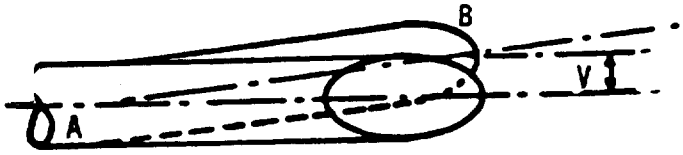
α1 = 1°
α2 = 3°
β1 = 4°
β2 = 1°
A = .962
μ = .067
V = .033
W = ≥0
X = .989
Y = ≥3"
Z = ≥2"
D_t = .376

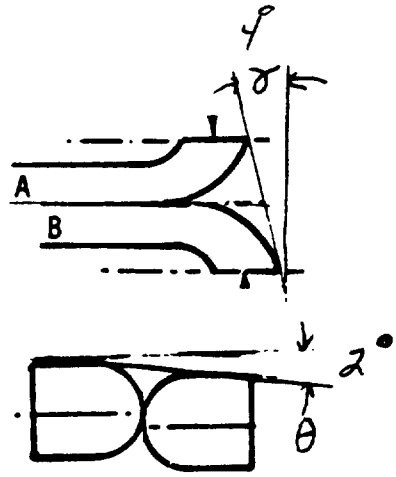


β1, β2 <5



(f)

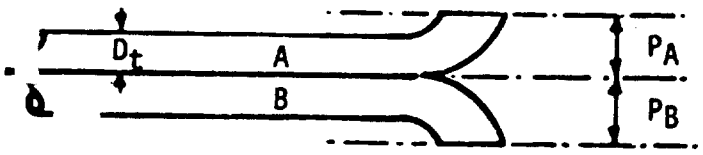




μ = A SIN γ

V = A SIN θ

A-SIDE PLANE



B-SIDE PLANE

~~.774~~ ~~.564~~

1.05 D_t <P <1.50 D_t

P_A = P_B

2.10 D_t <A <3.00 D_t

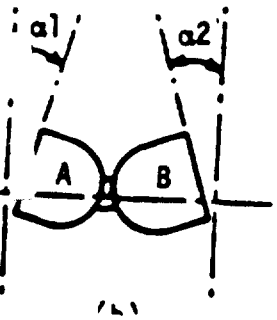
~~.789~~ ~~1.128~~

GEOMETRIC PITOT CALIBRATION

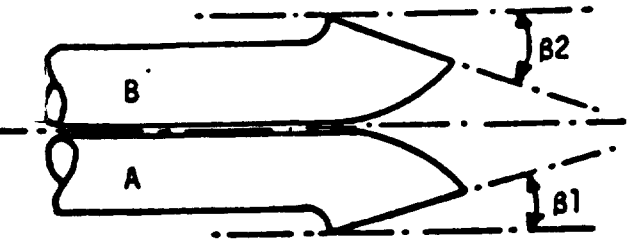
Probe No. 7-L
Date 6-29-90
Initials ATS

post-test

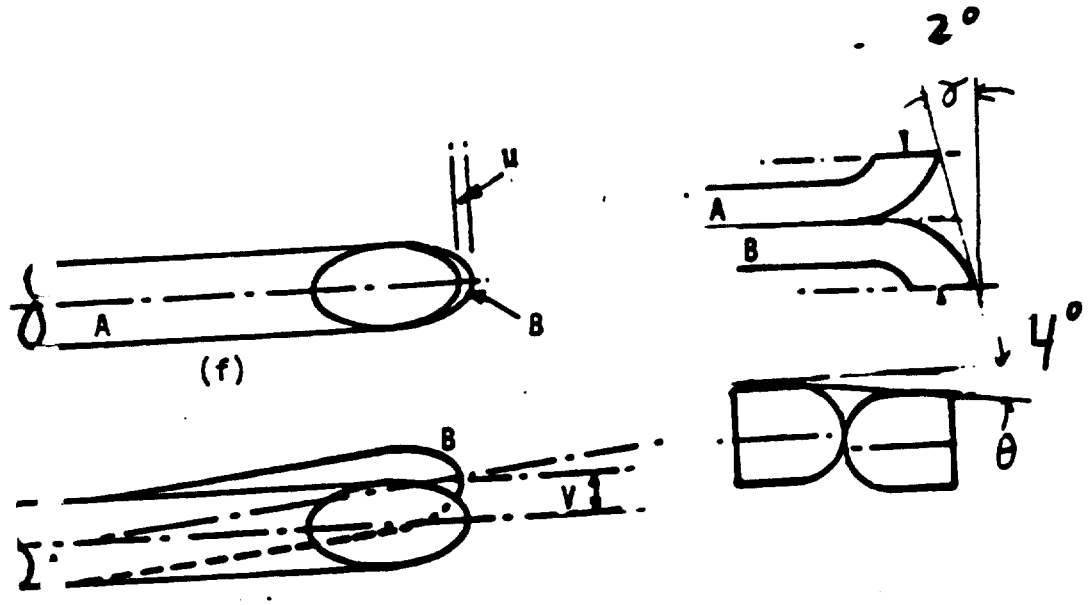
$\alpha 1$ = 4°
$\alpha 2$ = 3°
$\beta 1$ = 1°
$\beta 2$ = 3°
A = .988
μ = .034
V = .069
W = ≥0
X = ≥3/4"
Y = ≥3"
Z = ≥2"
D_t = .385



$\alpha 1, \alpha 2 < 10°$



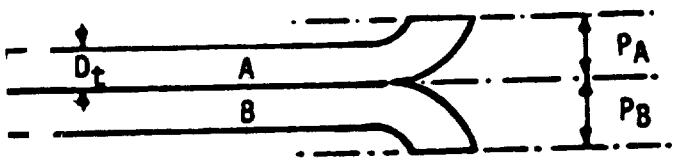
$\beta 1, \beta 2 < 5$



$\mu = A \sin \gamma$

$V = A \sin \theta$

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

CONTROL BOX CALIBRATION

THREE POINT CALIBRATION

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

	TIME	WET TEST METER TEMP T_W	VOLUME V_M	P_W	PRESSURE T_I	T_O	DRY TEST METER TEMP IN T_A	TEMP OUT P_D	V_D	TEMP AVG Y	ORIFICE $H_@$	VOLUME	METER CORRECT	ORIFICE COEIFFICE
START				0.000		29.10					0.50	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 6-25-90
BP 28.94
OPERATOR DRK

	TIME	WET TEST METER TEMP T_W	WET TEST METER VOLUME V_M	WET TEST METER VOLUME P_W	PRESSURE T_I	PRESSURE T_O	DRY TEST METER TEMP IN T_A	DRY TEST METER TEMP OUT P_D	DRY TEST METER TEMP AVG V_D	ORIFICE Y	ORIFICE $H_@$	VOLUME	METER CORRECT	ORIFICE COEIFFICE
START				0.000		28.94					1.00	88.800		
HALF			82.0				95.0		87.0	91.0				
STOP	8.88			5.000								93.752		
CALCULATION	8.88	542.0		5.057	28.94					551.0	29.01	4.952	1.0354	1.801
START				0.000	28.94						1.00	94.000		
HALF			81.0				98.0		90.0	94.0				
STOP	8.87			5.000								99.095		
CALCULATION	8.87	541.0		5.057	28.94					554.0	29.01	5.095	1.0137	1.781
START				0.000	28.94						1.00	99.300		
HALF			81.0				100.0		91.0	95.5				
STOP	8.88			5.000								104.418		
CALCULATION	8.88	541.0		5.057	28.94					555.5	29.01	5.118	1.0119	1.780
AVERAGE													1.0203	1.787
DIFFERENCE													3.10%	-12.01%

MAGNAHELIC CALIBRAATION

DATE 6-25-90

OPERATOR DRK

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 6-25-90

OPERATOR DRK

	START CF	STOP CF	VOL	TIME	LEAK RATE
DRY	576.760	576.960	0.200	10.000	-0.001
WET	0.000	0.190	0.190		

PYROMETER CALIBRATION

DATE 04-28-88

OPERATOR AGL

mV input	temp $^{o}_{F}$	temp rdg $^{o}_{F}$
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 6-25-90

OPERATOR DRK

mV input	temp $^{o}_{F}$	temp rdg $^{o}_{F}$
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	301	300.0
8.31	400	400.0
10.57	500	500.0

Name: Keystone Env. Resources Phone: 825-9761

Date 6/17/90 Train ID Box 1 DGM Cal. Factor, Y 1.0350 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	354.211	362.653	370.285
Initial reading	ft^3	946.602	347.500	355.400	363.000
Difference, V_m	ft^3	9.859	7.211	7.253	7.285
Percent Accuracy, %A					
Inlet/Outlet temperatures					
Initial	°F.	108/88	82/79	87/83	87/80
After 5 minutes		110/88	83/80	86/84	88/80
After 10 minutes		112/88	84/81	87/85	88/82
Final		112/89	87/82	87/85	88/82
Avg. temperature, t_d	°F/°R	99.3/559.3	81.9/541.9	85.1/545.1	87.1/547
Time, θ	min	15.0	15.0	15.0	15.0
Orifice man. rdg., delta H		1.35	.65	.65	.65
Bar. pressure, P_{bar}		29.75	29.13	29.13	29.13
Ambient temperature, t_i	°F/°C	74/23.3	72°/22°	72°/22°	72°/22°
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 m^3/ft^3 to obtain the volume in metric units.

Data Sheet

6-1-10
Box 1

VOLUMETRIC FLOW DEVICE CALCULATION SHEET

Eq. 8-1 $$Vm(std) = VmY \left(\frac{Tstd}{Tm}\right) \left(\frac{Pbar + \frac{Delta\ H}{13.6}}{Pstd}\right)$$

Run #1 $$Vm(std)' = Vm \times Y \times \frac{528}{Tm} \times \left(\frac{Pbar + \frac{Delta\ H}{13.6}}{29.92}\right)$$

$Vm(std)' = \frac{(7.211)(1.0350)(.9743)(.9751)}{}$

$Vm(std)' = \underline{7.091}$ ft³ (round to 3 decimals)

Run #2 $Vm(std)' = \frac{(7.253)(1.0350)(.9686)(.9751)}{}$

$Vm(std)' = \underline{7.090}$ ft³

Run #3 $Vm(std)' = \frac{(7.285)(1.0350)(.9653)(.9751)}{}$

$Vm(std)' = \underline{7.097}$ ft³

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

$Vstd(M) = \underline{7.093}$ ft³

(To Be Completed By Auditor)

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

$\%\ A = \underline{\qquad\qquad}$ x 100

$\%\ A = \underline{\qquad\qquad}$ %

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, %A					
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	90.6 550.6	89.5 549.5	90.5 550.5
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_i	$°F/°C$	74/23.3	74 123.3	74 123.3	74 123.3
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			
*Vm(std)(M)	m^3	0.2629			

*If you calculate dry gas volume in English Units, use the conversion factor of 0.02832 m^3/ft^3 to obtain the volume in metric units.

Box #1 Box 1

VOLUMETRIC FLOW DEVICE CALCULATION SHEET

Eq. 8-1 $$Vm(std) = VmY \left(\frac{Tstd}{Tm}\right) \left(\frac{Pbar + \frac{Delta\ H}{13.6}}{Pstd}\right)$$

Run #1 $$Vm(std)' = Vm \times Y \times \frac{528}{Tm} \times \left(\frac{Pbar + \frac{Delta\ H}{13.6}}{29.92}\right)$$

Vm(std)' = (7.040)(1.0519)(.9580)(.9690)

Vm(std)' = 6.882 ft³ (round to 3 decimals)

Run #2 Vm(std)' = (6.975)(1.0519)(.9608)(.9690)

Vm(std)' = 6.831 ft³

Run #3 Vm(std)' = (6.975)(1.0519)(.9591)(.9690)

Vm(std)' = 6.819 ft³

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

Vstd(M) = 6.844 ft³

(To Be Completed By Auditor)

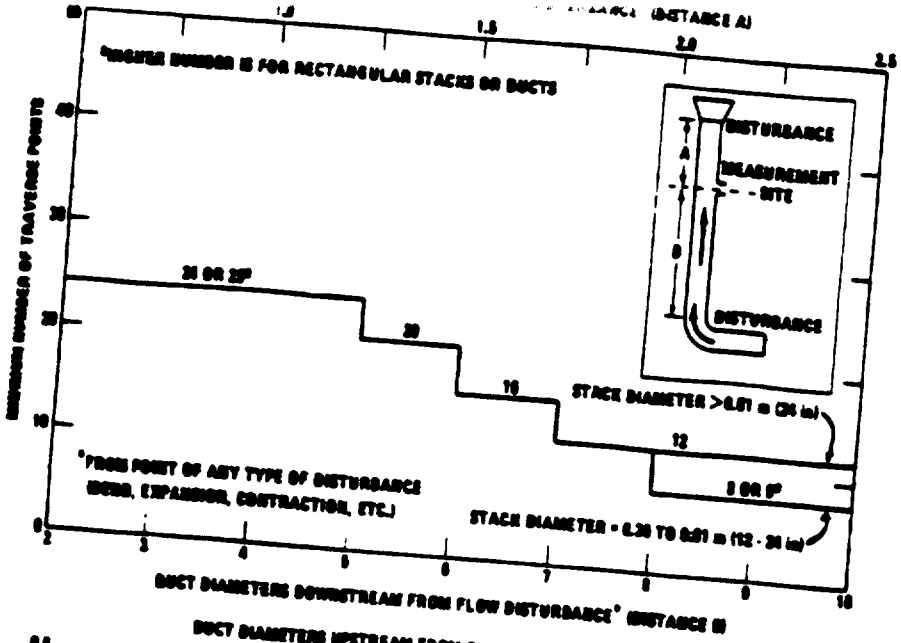
$$\%\ A = \frac{Vstd(M) - Vstd(A)}{Vstd(A)} \times 100 \leq \pm 3\%$$

% A = _____ x 100

% A = _____ %

USS CLAIRTON WORKS
RESULTS OF THE
COMPLIANCE DEMONSTRATION
OF THE NUMBER 14 BATTERY COMBUSTION STACK

APPENDIX C
FIELD DATA SHEETS
FOR PARTICULATE MATTER EMISSIONS



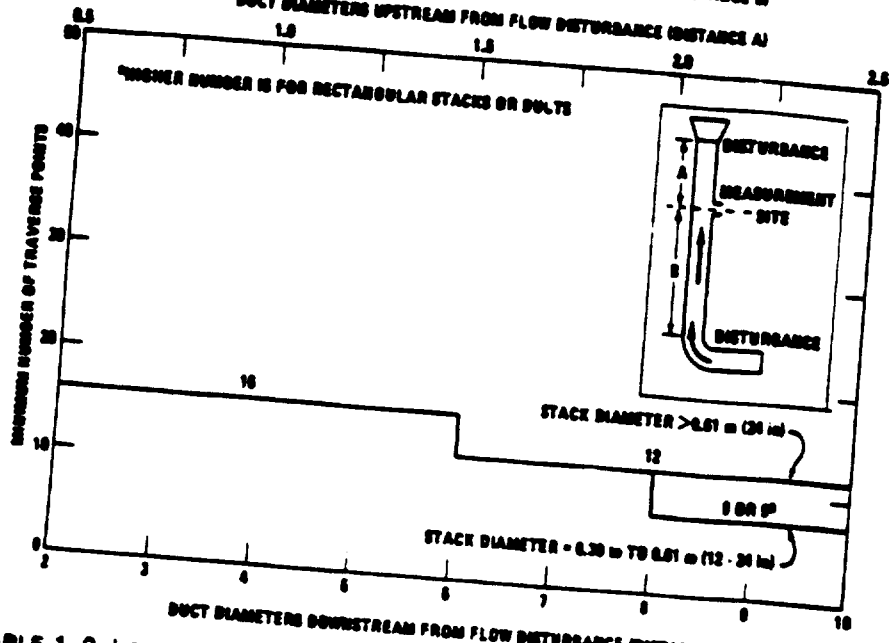


TABLE 1-2. LOCATION OF TRAVERSE POINTS IN CIRCULAR STACKS

(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	85.4	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		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8				96.8	85.4	75.0	63.4	37.5	28.6	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	36.3	32.3
12						97.9	90.1	83.1	76.4	69.4	60.7	36.8
13							94.3	87.5	81.2	76.0	68.5	60.2
14							98.2	91.5	85.4	79.6	73.8	67.7
15								95.1	89.1	83.5	78.2	72.8
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											96.5	92.1
22											98.9	94.5
23												96.8
24												98.9

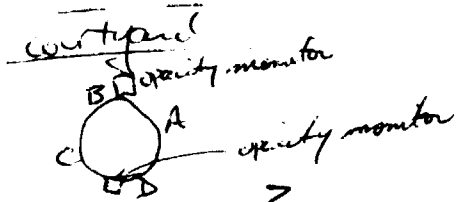
TABLE 1-1. CROSS-SECTION LAYOUT FOR RECTANGULAR STACKS

Number of traverse points	Matrix layout
8	
12	
16	
20	
25	
30	
36	
42	
49	

T 4

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

STACK SAMPLING DATA SHEET



PLANT USX Clairton | DATE: 6-20-90 | ΔH@: 1.573 (6-12-90) | HOT BOX NO.: 2

LOCATION: Combustion Stack #4 | TEST NO.: CLR-CSH-1 | METER CORRECTION: 1.0519 | COLD BOX NO.: 2

ACTIVITY NO.: | NOZZLE: #52 0.556 | PITOT CORRECTION: 0.84 | PROBE NO.: 7-2

CONTROL BOX OPERTOR: | STATIC PRESSURE Ps: -1.2 | CONTROL BOX NO.: 1 | FILTER NO.: 387

PROBE HANDLER: | PORT DIRECTION: A, B | NOMOGRAPH SET POINT: | STACK DIA.: 120"

CLEAN UP: | BAROMETRIC PRESSURE: 29.12 | LENGTHS OF UMBILICAL ____ x 25' ____ x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H_2O	Orifice ΔH in. H_2O Reg.	Orifice ΔH in. H_2O Act.	Meter Temp °F In	Meter Temp °F Out	Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp. °C/°F	Hot Box °F	Comments	
42.7	0850	638.020	0.040	1.46	1.46	68	63	6.0	517	260	<68°F Iced Down	250	5 min/pt	↑
30.0			0.035	1.27	1.27	75	66	6.0	522					
21.3			0.035	1.27	1.27	79	68	6.0	527					A
14.2			0.035	1.30	1.30	82	71	6.0	531					
8.0			0.035	1.30	1.30	83	72	6.0	494		56°F			↓
2.6	0920	656.960	0.035	1.30	1.30	86	74	6.0	490					
42.7	0923	656.960	0.040	1.48	1.48	84	76	6.0	520					↑
30.0			0.040	1.51	1.51	87	77	6.0	533		43°F			
21.3			0.035	1.32	1.32	89	79	6.0	538					B
14.2			0.030	1.13	1.13	89	79	5.0	544					
8.0			0.030	1.13	1.13	90	80	5.0	490					
2.6	0953	675.535	0.020	0.76	0.76	90	81	4.0	482					↓

LEAK CHECK

	in. Hg.	Rate
C-2	5.0	<0.02 cfm
fter	6.5	0.005 cfm

ORSAT

	1	2
CO_2	4.5	3.5
O_2	10.5	10.5
CO	0	0
N	85.0	86.0

PITOT LEAK CHECK

POS.	NEG.
OK 15sec	OK 15sec

Impinger No.	Final	Initial	Difference	
1	747.1	531.9	215.2	100 mL H_2O
2	540.2	494.8	45.4	100 mL H_2O
3	484.0	478.8	5.2	empty
4	605.4	586.8	18.6	Silica Gel

5 4

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

STACK SAMPLING DATA SHEET

PLANT: USX Clairton
LOCATION: Combustion Stack 14
ACTIVITY NO.:
CONTROL BOX OPERTOR:
PROBE HANDLER:
CLEAN UP:

DATE: 6-20-90
TEST NO.: CLR-CS14-1
NOZZLE: #52 0.556
STATIC PRESSURE Ps: -1.2
PORT DIRECTION: C,D
BAROMETRIC PRESSURE: 29.12

ΔH@: 1.573 (6-12-90)
METER CORRECTION: 1.0579
PITOT CORRECTION: 0.84
CONTROL BOX NO.: 1
NOMOGRAPH SET POINT:
LENGTHS OF UMBILICAL ____ x 25' ____ x 50'

HOT BOX NO.: 2
COLD BOX NO.: 2
PROBE NO.: 7-2
FILTER NO.: 387
STACK DIA.: 120"

Point	Time	Meter Reading (dry) CF	Velocity HD in. H_2O	Orifice ΔH in. H_2O Reg.	Orifice ΔH in. H_2O Act.	Meter Temp °F In	Meter Temp °F Out	Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp. °C/°F	Hot Box °F	Comments
42.7	0957	675.535	0.035	1.32	1.32	86	81	6.0	515	260	<68°F Iced Down	250	5 min/pt
30.0			0.040	1.53	1.53	91	81	6.0	538				
21.3			0.035	1.34	1.34	91	82	6.0	535				
14.2			0.035	1.34	1.34	92	82	6.0	538		40°F		
8.0			0.030	1.15	1.15	93	83	5.0	483				
2.6	1027	693.655	0.010	0.38	0.38	91	84	3.0	480		45°F		
42.7	1031	693.655	0.040	1.53	1.53	91	85	6.0	524				
30.0			0.040	1.53	1.53	95	86	6.0	543				
21.3			0.040	1.52	1.52	96	86	6.5	550				
14.2			0.040	1.52	1.52	97	87	6.5	554		48°F		
8.0			0.030	1.14	1.14	96	87	5.5	483				
2.6	1101	713.675	0.020	0.76	0.76	96	87	4.5	480				

LEAK CHECK

	in. Hg.	Rate

ORSAT

	1	2
CO_2		
O_2		
CO		
N		

PITOT LEAK CHECK

POS.	NEG.

Impinger No.	Final	Initial	Difference
1			
2			
3			
4			

C-3

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

STACK SAMPLING DATA SHEET

PLANT: USX Clairton | DATE: 6-20-90 | ΔH@: 1.573 (6-12-90) | HOT BOX NO.: 6
LOCATION: Combustion Stack 14 | TEST NO.: CLR-CS14-2 | METER CORRECTION: 1.0519 | COLD BOX NO.: 6
ACTIVITY NO.: | NOZZLE: #52 0.556 | PITOT CORRECTION: 0.84 | PROBE NO.: 7-1
CONTROL BOX OPERTOR: | STATIC PRESSURE Ps: -1.2 | CONTROL BOX NO.: 1 | FILTER NO.: 408
PROBE HANDLER: | PORT DIRECTION: D, C | NOMOGRAPH SET POINT: | STACK DIA.: 120"
CLEAN UP: | BAROMETRIC PRESSURE: 29.12 | LENGTHS OF UMBILICAL ____ x 25' ____ x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H_2O	Orifice ΔH in. H_2O Reg.	Orifice ΔH in. H_2O Act.	Meter Temp °F In	Meter Temp °F Out	Vacuum in. Hg	Stack Temp °F	Probe Temp. °F	Imp. Temp. °C/°F	Hot Box °F	Comments
42.7	1125	713.960	0.040	1.52	1.52	97	91	6.0	522	260	<68F Iced Down	250	5 min/pt
30.0			0.040	1.55	1.55	100	92	6.0	530				
21.3			0.040	1.55	1.55	100	92	6.0	535				
14.2			0.040	1.55	1.55	100	91	6.0	539				
8.0			0.040	1.55	1.55	101	91	6.0	547		55°F		
2.6	1155	735.351	0.035	1.36	1.36	101	92	5.0	489				
42.7	1159	735.351	0.040	1.55	1.55	97	91	6.0	507				
30.0			0.040	1.58	1.58	101	92	6.0	528				
21.3			0.040	1.58	1.58	102	93	6.0	532				
14.2			0.040	1.58	1.58	103	93	6.0	536				
8.0			0.040	1.58	1.58	103	94	6.0	494				
2.6	1229	756.657	0.025	0.98	0.98	104	95	4.0	488				

LEAK CHECK

	in. Hg.	Rate
C-4	5.0	<0.02 cfm
After	8.0	0.005 cfm

ORSAT

	1	2
CO_2	4.5	4.5
O_2	10.0	10.5
CO	0	0
N	85.5	85.0

PITOT LEAK CHECK

POS.	NEG.
OK 15sec	OK 15sec

Impinger No.	Final	Initial	Difference	
1	805.5	549.7	255.8	100 ml H_2O
2	584.8	550.5	34.3	100 ml H_2O
3	468.6	463.5	5.1	empty
4	661.5	638.7	22.8	Silica Gel

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

STACK SAMPLING DATA SHEET

PLANT USX Clairton | DATE: 6-20-90 | ΔH@: 1.573 (6-12-90) | HOT BOX NO.: 6
LOCATION: Combustion Stack 14 | TEST NO.: CLR-CS14-2 | METER CORRECTION: 1.0579 | COLD BOX NO.: 6
ACTIVITY NO.: | NOZZLE: #52 0.556 | PITOT CORRECTION: 0.84 | PROBE NO.: 7-1
CONTROL BOX OPERTOR: | STATIC PRESSURE Ps: -1.2 | CONTROL BOX NO.: 1 | FILTER NO.: 408
PROBE HANDLER: | PORT DIRECTION: A, B | NOMOGRAPH SET POINT: | STACK DIA.: 120"
CLEAN UP: | BAROMETRIC PRESSURE: 29.12 | LENGTHS OF UMBILICAL ____ x 25' ____ x 50'

Point	Time	Meter Reading (dry) CF	Velocity HD in. H_2O	Orifice ΔH in. H_2O Reg.	Orifice ΔH Act.	Meter Temp °F In	Meter Temp °F Out	Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp. °C/°F	Hot Box °F	Comments	
42.7	1232	756.657	0.050	1.97	1.97	103	96	8.0	520	260	<68°F Iced Down	250	5 min/pt	↑
30.0			0.050	1.97	1.97	104	95	8.0	538					
21.3			0.050	1.94	1.94	104	95	8.0	544		43°F			
14.2			0.045	1.75	1.75	105	95	7.0	518					B
8.0			0.040	1.65	1.65	105	96	6.5	458					
2.6	1302	779.514	0.025	1.04	1.04	104	96	4.5	447		50°F			↓
42.7	1306	779.514	0.045	1.76	1.76	104	97	7.5	521					↑
30.0			0.040	1.57	1.57	107	98	7.0	531					
21.3			0.040	1.56	1.56	108	99	7.0	533		56°F			
14.2			0.030	1.17	1.17	108	100	5.0	511					A
8.0			0.025	1.00	1.00	108	100	5.0	510					
2.6	1336	800.364	0.040	1.60	1.60	108	100	7.5	496					↓

LEAK CHECK

	in. Hg.	Rate

C-5

ORSAT

	1	2
CO_2		
O_2		
CO		
N		

PITOT LEAK CHECK

POS.	NEG.

Impinger No.	Final	Initial	Difference
1			
2			
3			
4			

5 4

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

STACK SAMPLING DATA SHEET

PLANT: USX Clairton
LOCATION: Combustion Stack #4
ACTIVITY NO.:
CONTROL BOX OPERTOR:
PROBE HANDLER:
CLEAN UP:

DATE: 6-20-90
TEST NO.: CLR - CSM-3
NOZZLE: #52 0.556
STATIC PRESSURE Ps: -1.2
PORT DIRECTION: A, B
BAROMETRIC PRESSURE: 29.12

ΔH@: 1.573 (6-12-90)
METER CORRECTION: 1.0519
PITOT CORRECTION: 0.84
CONTROL BOX NO.: 1
NOMOGRAPH SET POINT:
LENGTHS OF UMBILICAL ____ x 25' ____ x 50'

HOT BOX NO.: 7
COLD BOX NO.: 7
PROBE NO.: 7-1
FILTER NO.: 420
STACK DIA.: 120"

Point	Time	Meter Reading (dry) CF	Velocity HD in. H_2O	Orifice ΔH in. H_2O Reg.	Orifice ΔH in. H_2O Act.	Meter Temp °F In	Meter Temp °F Out	Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp. °C/°F	Hot Box °F	Comments	
42.7	1402	800.541	0.035	1.36	1.36	96	94	4.5	516	260	<66°F Iced Down	250	5 min/pt	1
30.0			0.040	1.55	1.55	101	94	5.0	520					
21.3			0.040	1.55	1.55	103	94	5.0	524					
14.2			0.040	1.55	1.55	104	94	5.0	527					A
8.0			0.025	0.97	0.97	104	95	3.5	505					
2.6	1432	821.219	0.035	1.39	1.39	103	94	5.0	496					
42.7	1435	821.219	0.045	1.78	1.78	102	95	6.0	503					
30.0			0.045	1.76	1.76	104	95	6.0	523					
21.3			0.030	1.18	1.18	103	94	4.0	528					
14.2			0.030	1.20	1.20	102	94	4.0	508					B
8.0			0.030	1.20	1.20	102	94	4.0	503					
2.6	1505	841.715	0.040	1.60	1.60	102	94	5.0	493		50°F			

LEAK CHECK

	in. Hg.	Rate
	5.0	<0.002 cfm
fic.	6.0	0.005 cfm

ORSAT

	1	2
CO_2	11.0	11.5
O_2	3.5	4.5
CO	0	0
N	85.5	84.0

PITOT LEAK CHECK

POS.	NEG.
15 sec OK	15 sec OK

Impinger No.	Final	Initial	Difference	
1	751.6	545.8	205.8	100 ml H_2O
2	554.5	522.4	32.1	100 ml H_2O
3	451.3	447.6	3.7	empty
4	661.9	644.4	17.5	Silica Gel

5 7

KEYSTONE
ENVIRONMENTAL RESOURCES, INC.

-2

STACK SAMPLING DATA SHEET

PLANT USX Clairton
LOCATION: Combustion Stack 14
ACTIVITY NO.:
CONTROL BOX OPERTOR:
PROBE HANDLER:
CLEAN UP:

DATE: 6-20-90
TEST NO.: CLR - CS14 - 3
NOZZLE: #52 0.556
STATIC PRESSURE Ps: -1.2
PORT DIRECTION: C, D
BAROMETRIC PRESSURE: 29.12

ΔH@: 1.573 (6-12-90)
METER CORRECTION: 1.0519
PITOT CORRECTION: 0.84
CONTROL BOX NO.: 1
NOMOGRAPH SET POINT:
LENGTHS OF UMBILICAL ____ x 25' ____ x 50'

HOT BOX NO.: 7
COLD BOX NO.: 7
PROBE NO.: 7-1
FILTER NO.: 420
STACK DIA.: 120"

Point	Time	Meter Reading (dry) CF	Velocity HD in. H_2O	Orifice ΔH in. H_2O Reg.	Orifice ΔH in. H_2O Act.	Meter Temp °F In	Meter Temp °F Out	Vacuum in. Hg	Stack Temp °F	Probe Temp °F	Imp. Temp. °C/°F	Hot Box °F	Comments	
42.7	1510	841.715	0.040	1.57	1.57	96	92	5.0	508	260	<68°F Iced Bath	250	5 min/pt	1
30.0			0.030	1.18	1.18	100	92	4.0	525					
21.3			0.030	1.16	1.16	100	92	4.0	505					
14.2			0.035	1.39	1.39	101	92	5.0	509					C
8.0			0.035	1.39	1.39	101	91	5.0	500		55°F			
2.6	1540	860.920	0.015	0.60	0.60	101	92	2.5	482					
42.7	1542	860.920	0.040	1.59	1.59	99	92	5.0	495					
30.0			0.030	1.19	1.19	101	93	4.0	526					
21.3			0.030	1.19	1.19	101	93	4.0	502					D
14.2			0.030	1.19	1.19	103	93	4.0	505					
8.0			0.030	1.19	1.19	101	93	4.0	494					
2.6	1612	880.367	0.025	0.99	0.99	101	93	4.0	492					

LEAK CHECK

	in. Hg.	Rate

ORSAT

	1	2
CO_2		
O_2		
CO		
N		

PITOT LEAK CHECK

POS.	NEG.

Impinger No.	Final	Initial	Difference
1			
2			
3			
4			

USS CLAIRTON WORKS
RESULTS OF THE
COMPLIANCE DEMONSTRATION
OF THE NUMBER 14 BATTERY COMBUSTION STACK

APPENDIX D
PARTICULATE MATTER
EMISSIONS CALCULATIONS

Plant: Clairton Steel **Date:** 6/25/90

Activity No. 601050-03

PARTICULATE REPORTING FORM

Imp - Chloroform and Ethyl Ether †

Test Number	Component	Molecular Weight	Cyclone Weight	Particulate Filter Weight (g)	Insol. Part. in Front Half	0.22 μ Millipore Filter Insol. Part. in Back Half (g)	Imp.-Acetone Soluble Part. in Back Half (g)	Soluble Part. in Front Half
CLR-14CS-1	Particulate			0.0386		0.0019	~~0.0034~~ 0.0050	0.0162
CLR-14CS-2	Particulate			0.0432		0.0011	~~0.0044~~ 0.0073	0.0433
CLR-14CS-3	Particulate			0.0380		0.0010	~~0.0033~~ 0.0081	0.0076

D-1

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
COMBUSTION
STACK 14

DATE: 6/20/90
CHARGE #: ...150-601050
TEST #: CLR-CS14-1

1. EMISSION RESULTS

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.01156	3.00147

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2. STACK CONDITIONS

FLOW (ACFM)	68016.
(SCFM)	35663.
MOISTURE CONTENT (%)	15.08
STACK TEMPERATURE (F)	517.1

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3. SAMPLING CONDITIONS

SAMPLE TIME (MIN.)	120.0
SCFD GAS SAMPLED	75.521
PERCENT ISOKINETIC	96.80

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
COMBUSTION STACK 14
CLR-CS14-1 6/20/90

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
42.7A	850.0	638.020	.040	1.46	1.46	68.	63.	6.0	516.	15.9
30.0			.035	1.27	1.27	75.	66.	6.0	522.	14.9
21.3			.035	1.27	1.27	79.	68.	6.0	527.	14.9
14.2			.035	1.30	1.30	82.	71.	6.0	531.	15.0
8.0			.035	1.30	1.30	83.	72.	6.0	494.	14.7
2.6A	920.0	656.960	.035	1.30	1.30	85.	74.	6.0	490.	14.6
47.2B	923.0	656.960	.040	1.48	1.48	84.	76.	6.0	520.	15.9
30.0			.040	1.51	1.51	87.	77.	6.0	533.	16.0
21.3			.035	1.32	1.32	89.	79.	6.0	538.	15.0
14.2			.030	1.13	1.13	89.	79.	5.0	544.	13.9
8.0			.030	1.13	1.13	90.	80.	5.0	490.	13.6
2.6B	953.0	675.535	.020	.76	.76	90.	81.	4.0	482.	11.0
42.7C	957.0	675.535	.035	1.32	1.32	86.	81.	6.0	515.	14.8
30.0			.040	1.53	1.53	91.	81.	6.0	538.	16.0
21.3			.035	1.34	1.34	91.	82.	6.0	535.	15.0
14.2			.035	1.34	1.34	92.	82.	6.0	538.	15.0
8.0			.030	1.15	1.15	93.	83.	5.0	483.	13.5
2.6C	1027.0	693.655	.010	.38	.38	91.	84.	3.0	480.	7.8
42.7D	1031.0	693.655	.040	1.53	1.53	91.	85.	6.0	524.	15.9
30.0			.040	1.53	1.53	95.	86.	6.0	543.	16.1
21.3			.040	1.52	1.52	96.	86.	6.5	550.	16.1
14.2			.040	1.52	1.52	97.	87.	6.5	554.	16.2
8.0			.030	1.14	1.14	96.	87.	5.5	483.	13.5
2.6D	1101.0	713.675	.020	.76	.76	96.	87.	4.5	480.	11.0

O R S A T	
CO2	4.0
O2	10.5
CO	.0
N	85.5

IMPINGER NO.	
1	215.2
2	45.4
3	5.2
4	.0
ABSORBED H2O	18.6

CONTROL BOX CALIBRATIONS

	FACTOR	DATE
ORIFICE	1.573	6-12-90
METER	1.0519	6-12-90
PITOT	0.84	4-24-90

LEAK CHECK

	RATE	IN.HG
INITIAL LT	0.02CFM	5.0
FINAL LT	0.02CFM	6.5

CONTROL BOX NO. 1 PROBE NO. 7-2 NOZZLE NO. 52

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
COMBUSTION STACK 14
CLR-CS14-1 6/20/90

STACK SAMPLING CALCULATIONS

A.	BAROMETRIC PRESSURE IN. HG.	29.12
B.	AVG. DELTA H (IN H2O)	1.26
C.	METER PRESSURE (IN. HG.)	29.21
D.	STATIC PRESSURE (IN. H2O)	-1.20
E.	STATIC PRESSURE (IN. HG.)	-.088
F.	STACK PRESSURE (IN. HG.) (A+E)	29.03
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.)	977.1
K.	AVG. METER TEMP (DEG. R.)	543.6
L.	CONDENSATE VOL. (ML)	265.8
M.	ABSORBED H2O (ML)	18.6
N.	TOTAL H2O (ML)	284.4
O.	METERED GAS (CF)	75.655
P.	GAS METER CORRECTION	1.0519
Q.	CORRECTED METERED GAS (CF)	79.581
R.	H2O GAS VOLUME (CF) (0.00267N(K/C)	14.130
S.	TOTAL SAMPLED VOLUME (CF) (Q+R)	93.712
T.	PERCENT H2O (100R/S)	15.08
	THEORETICAL MAXIMUM	100.00
	PERCENT WATER USED	15.08
U.	SCFD GAS SAMPLED (528*Q*C/(29.9*K))	75.521

V. MOLECULAR WEIGHT OF STACK GAS

COMPONENT	ORSAT-DRY VOL.PCT./100		MOISTURE CORRECTION (1-T/100)		MOLECULAR WEIGHT		WEIGHT PER MOLE
CO2	.040	X	.8492	X	44.0	=	1.49
CO	.000	X	.8492	X	28.0	=	.00
O2	.105	X	.8492	X	32.0	=	2.85
N2	.855	X	.8492	X	28.2	=	20.48
H2O		X	T/100= .1508	X	18.0	=	2.71
					MOLECULAR WEIGHT OF STACK GAS	=	27.54

W.	PITOT CORRECTION	.840
X.	AVERAGE CORRECTED VELOCITY (FPS) [85.49*W*SQRT((J*DELTA P)/(V*F))]	14.43
Y.	AVG. FLOW RATE (CFM) (X*H*60)	68016.
Z.	STACK FLOW RATE (SCFM) (528*Y/J*F/29.92)	35663.
	STACK FLOW RATE (DRY)	30286.
AA.	SAMPLE TIME (SEC)	7200.
BB.	PERCENT ISOKINETIC (J*100*U*29.92)/(528*X*AA*I*F*(1-T/100))	96.80

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
COMBUSTION STACK 14
CLR-CS14-1 6/20/90

PARAMETER	CYCLONE WT. (G)	MATL.ON FILTER(G)	INSOL.MATL. IN PROBE(G)	SOL.MATL. IN PROBE(G)
PARTICULATE	.00000	.03860	.00000	.01620

PARAMETER	INSOL.MATL. IN IMP.(G)	SOLUBLE MATL. IN IMP.(G)
PARTICULATE	.00190	.00500

PARTICULATE	.06170
ALL MATLS.	.06170

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.01156	3.00147

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

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
COMBUSTION
STACK 14

DATE: 6/20/90
CHARGE #: ...150-601050
TEST #: CLR-CS14-2

1. EMISSION RESULTS

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.01607	4.51929

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2. STACK CONDITIONS

FLOW (ACFM)	73645.
(SCFM)	38666.
MOISTURE CONTENT (%)	15.16
STACK TEMPERATURE (F)	515.8

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3. SAMPLING CONDITIONS

SAMPLE TIME (MIN.)	120.0
SCFD GAS SAMPLED	83.939
PERCENT ISOKINETIC	99.32

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
COMBUSTION STACK 14
CLR-CS14-2 6/20/90

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
42.7D	1125.0	713.960	.040	1.52	1.52	97.	91.	6.0	522.	15.9
30.0			.040	1.55	1.55	100.	92.	6.0	535.	16.0
21.3			.040	1.55	1.55	100.	92.	6.0	535.	16.0
14.2			.040	1.55	1.55	100.	91.	6.0	539.	16.0
8.0			.040	1.55	1.55	101.	91.	6.0	547.	16.1
2.6D	1155.0	735.351	.035	1.36	1.36	101.	92.	5.0	489.	14.6
42.7C	1159.0	735.351	.040	1.55	1.55	97.	91.	6.0	507.	15.8
30.0			.040	1.58	1.58	101.	92.	6.0	528.	15.9
21.3			.040	1.58	1.58	101.	93.	6.0	532.	16.0
14.2			.040	1.58	1.58	103.	93.	6.0	536.	16.0
8.0			.040	1.58	1.58	103.	94.	6.0	494.	15.7
2.6C	1229.0	756.657	.025	.98	.98	104.	95.	4.0	488.	12.4
42.7B	1232.0	756.657	.050	1.97	1.97	103.	96.	8.0	520.	17.8
30.0			.050	1.97	1.97	104.	95.	8.0	538.	17.9
21.3			.050	1.94	1.94	104.	95.	8.0	544.	18.0
14.2			.045	1.75	1.75	105.	95.	7.0	518.	16.8
8.0			.040	1.65	1.65	105.	96.	6.5	458.	15.4
2.6B	1302.0	779.514	.025	1.04	1.04	104.	96.	4.5	447.	12.1
42.7A	1306.0	779.514	.045	1.76	1.76	104.	97.	7.5	521.	16.9
30.0			.040	1.57	1.57	107.	98.	7.0	531.	16.0
21.3			.040	1.56	1.56	108.	99.	7.0	533.	16.0
14.2			.030	1.17	1.17	108.	100.	5.0	511.	13.7
8.0			.025	1.00	1.00	108.	100.	5.0	510.	12.5
2.6A	1336.0	800.364	.040	1.60	1.60	108.	100.	7.5	496.	15.7

O R S A T

CO2	4.5
O2	10.3
CO	.0
N	85.3

IMPINGER NO. 1	255.8
2	34.3
3	5.1
4	.0
ABSORBED H2O	22.8

CONTROL BOX CALIBRATIONS

	FACTOR	DATE
ORIFICE	1.573	6-12-90
METER	1.0519	6-12-90
PITOT	0.84	4-24-90

LEAK CHECK

	RATE	IN.HG
INITIAL LT	0.02CFM	5.0
FINAL LT	0.02CFM	8.0

CONTROL BOX NO. 1 PROBE NO. 7-1 NOZZLE NO. 52

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
COMBUSTION STACK 14
CLR-CS14-2 6/20/90

STACK SAMPLING CALCULATIONS

A.	BAROMETRIC PRESSURE IN. HG.	29.12
B.	AVG. DELTA H (IN H2O)	1.54
C.	METER PRESSURE (IN. HG.)	29.23
D.	STATIC PRESSURE (IN. H2O)	-1.20
E.	STATIC PRESSURE (IN. HG.)	-.088
F.	STACK PRESSURE (IN. HG.) (A+E)	29.03
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.)	975.8
K.	AVG. METER TEMP (DEG. R.)	559.0
L.	CONDENSATE VOL. (ML)	295.2
M.	ABSORBED H2O (ML)	22.8
N.	TOTAL H2O (ML)	318.0
O.	METERED GAS (CF)	86.404
P.	GAS METER CORRECTION	1.0519
Q.	CORRECTED METERED GAS (CF)	90.888
R.	H2O GAS VOLUME (CF) (0.00267N(K/C)	16.235
S.	TOTAL SAMPLED VOLUME (CF) (Q+R)	107.123
T.	PERCENT H2O (100R/S)	15.16
	THEORETICAL MAXIMUM	100.00
	PERCENT WATER USED	15.16
U.	SCFD GAS SAMPLED (528*Q*C/(29.9*K))	83.939

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	.8484	X	44.0	=	1.68
CO	.000	X	.8484	X	28.0	=	.00
O2	.102	X	.8484	X	32.0	=	2.78
N2	.853	X	.8484	X	28.2	=	20.40
H2O		X	T/100= .1516	X	18.0	=	2.73
					MOLECULAR WEIGHT OF STACK GAS	=	27.59

W.	PITOT CORRECTION	.840
X.	AVERAGE CORRECTED VELOCITY (FPS) [85.49*W*SQRT{(J*DELTA P)/(V*F)}]	15.63
Y.	AVG. FLOW RATE (CFM) (X*H*60)	73645.
Z.	STACK FLOW RATE (SCFM) (528*Y/J*F/29.92)	38666.
	STACK FLOW RATE (DRY)	32806.
AA.	SAMPLE TIME (SEC)	7200.
BB.	PERCENT ISOKINETIC (J*100*U*29.92)/(528*X*AA*I*F*(1-T/100))	99.32

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
COMBUSTION STACK 14
CLR-CS14-2 6/20/90

PARAMETER	CYCLONE WT. (G)	MATL.ON FILTER(G)	INSOL.MATL. IN PROBE(G)	SOL.MATL. IN PROBE(G)
PARTICULATE	.00000	.04320	.00000	.04330

PARAMETER	INSOL.MATL. IN IMP.(G)	SOLUBLE MATL. IN IMP.(G)
PARTICULATE	.00110	.00730

PARTICULATE	.09490
ALL MATLS.	.09490

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.01607	4.51929

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

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
COMBUSTION
STACK 14

DATE: 6/20/90
CHARGE #: ...150-601050
TEST #: CLR-CS14-3

1. EMISSION RESULTS

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.00923	2.41340

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2. STACK CONDITIONS

FLOW (ACFM)	66676.
(SCFM)	35293.
MOISTURE CONTENT (%)	13.58
STACK TEMPERATURE (F)	507.9

---

3. SAMPLING CONDITIONS

SAMPLE TIME (MIN.)	120.0
SCFD GAS SAMPLED	77.739
PERCENT ISOKINETIC	98.94

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
COMBUSTION STACK 14
CLR-CS14-3 6/20/90

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
42.7A	1402.0	800.541	.035	1.36	1.36	96.	94.	4.5	516.	14.6
30.0			.040	1.55	1.55	101.	94.	5.0	520.	15.6
21.3			.040	1.55	1.55	103.	94.	5.0	524.	15.7
14.2			.040	1.55	1.55	104.	94.	5.0	527.	15.7
8.0			.025	.97	.97	104.	95.	3.5	505.	12.3
2.6A	1432.0	821.219	.035	1.39	1.39	103.	94.	5.0	496.	14.4
42.7B	1435.0	821.219	.045	1.78	1.78	102.	95.	6.0	503.	16.4
30.0			.045	1.76	1.76	104.	95.	6.0	523.	16.6
21.3			.030	1.18	1.18	103.	94.	4.0	528.	13.6
14.2			.030	1.20	1.20	102.	94.	4.0	508.	13.5
8.0			.030	1.20	1.20	102.	94.	4.0	503.	13.4
2.6B	1505.0	841.715	.040	1.60	1.60	102.	94.	5.0	493.	15.4
42.7C	1510.0	841.715	.040	1.57	1.57	96.	92.	5.0	508.	15.5
30.0			.030	1.18	1.18	100.	92.	4.0	525.	13.6
21.3			.030	1.16	1.16	100.	92.	4.0	505.	13.4
14.2			.035	1.39	1.39	101.	92.	5.0	509.	14.5
8.0			.035	1.39	1.39	101.	91.	5.0	500.	14.5
2.6C	1540.0	860.920	.015	.60	.60	101.	92.	2.5	482.	9.4
42.7D	1542.0	860.920	.040	1.59	1.59	99.	92.	5.0	495.	15.4
30.0			.030	1.19	1.19	101.	93.	4.0	526.	13.6
21.3			.030	1.19	1.19	101.	93.	4.0	502.	13.4
14.2			.030	1.19	1.19	103.	93.	4.0	505.	13.4
8.0			.030	1.19	1.19	101.	93.	4.0	494.	13.4
2.6D	1612.0	880.367	.025	.99	.99	101.	93.	4.0	492.	12.2

O R S A T

CO2	11.3
O2	4.0
CO	.0
N	84.8

IMPINGER NO. 1	205.8
2	32.1
3	3.7
4	.0
ABSORBED H2O	17.5

CONTROL BOX CALIBRATIONS

	FACTOR	DATE
ORIFICE	1.573	6-12-90
METER	1.0519	6-12-90
PITOT	0.84	4-24-90

LEAK CHECK

	RATE	IN.HG
INITIAL LT	0.02CFM	5.0
FINAL LT	0.02CFM	6.0

CONTROL BOX NO. 1 PROBE NO. 7-1 NOZZLE NO. 52

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
COMBUSTION STACK 14
CLR-CS14-3 6/20/90

STACK SAMPLING CALCULATIONS

A.	BAROMETRIC PRESSURE IN. HG	29.12
B.	AVG. DELTA H (IN H2O)	1.32
C.	METER PRESSURE (IN. HG.)	29.22
D.	STATIC PRESSURE (IN. H2O)	-1.20
E.	STATIC PRESSURE (IN. HG.)	-.088
F.	STACK PRESSURE (IN. HG.) (A+E)	29.03
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.)	967.9
K.	AVG. METER TEMP (DEG. R.)	557.3
L.	CONDENSATE VOL. (ML)	241.6
M.	ABSORBED H2O (ML)	17.5
N.	TOTAL H2O (ML)	259.1
O.	METERED GAS (CF)	79.826
P.	GAS METER CORRECTION	1.0519
Q.	CORRECTED METERED GAS (CF)	83.969
R.	H2O GAS VOLUME (CF) (0.00267N(K/C)	13.195
S.	TOTAL SAMPLED VOLUME (CF) (Q+R)	97.164
T.	PERCENT H2O (100R/S)	13.58
	THEORETICAL MAXIMUM	100.00
	PERCENT WATER USED	13.58
U.	SCFD GAS SAMPLED (528*Q*C/(29.9*K))	77.739

V. MOLECULAR WEIGHT OF STACK GAS

COMPONENT	ORSAT-DRY VOL.PCT./100		MOISTURE CORRECTION (1-T/100)		MOLECULAR WEIGHT		WEIGHT PER MOLE
CO2	.112	X	.8642	X	44.0	=	4.28
CO	.000	X	.8642	X	28.0	=	.00
O2	.040	X	.8642	X	32.0	=	1.11
N2	.848	X	.8642	X	28.2	=	20.65
H2O		X	T/100= .1358	X	18.0	=	2.44
					MOLECULAR WEIGHT OF STACK GAS	=	28.48

W.	PITOT CORRECTION	.840
X.	AVERAGE CORRECTED VELOCITY (FPS) [85.49*W*SQRT((J*DELTA P)/(V*F))]	14.15
Y.	AVG. FLOW RATE (CFM) (X*H*60)	66676.
Z.	STACK FLOW RATE (SCFM) (528*Y/J*F/29.92)	35293.
	STACK FLOW RATE (DRY)	30500.
AA.	SAMPLE TIME (SEC)	7200.
BB.	PERCENT ISOKINETIC (J*100*U*29.92)/(528*X*AA*I*F*(1-T/100))	98.94

AIR QUALITY ENGINEERING

USX CLAIRTON COKE WORKS
COMBUSTION STACK 14
CLR-CS14-3 6/20/90

PARAMETER	CYCLONE WT. (G)	MATL.ON FILTER(G)	INSOL.MATL. IN PROBE(G)	SOL.MATL. IN PROBE(G)
PARTICULATE	.00000	.03800	.00000	.00760

PARAMETER	INSOL.MATL. IN IMP.(G)	SOLUBLE MATL. IN IMP.(G)
PARTICULATE	.00100	.00810

PARTICULATE	.05470
ALL MATLS.	.05470

PARAMETER	GR/SCFD	LB/HR
PARTICULATE	.00923	2.41340

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 NUMBER 14 BATTERY COMBUSTION STACK

APPENDIX E
ANALYTICAL RESULTS

RJ Lee Group

The Materials Characterization Specialists

July 24, 1990

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

Re: RJ Lee Project Number: CHH007012
Customer Purchase Order: 5598

Dear Pat:

At your request, we examined 3 samples, provided by you for total sulfate (SO_4^{-2}) content. The solutions contained a mixture of isopropyl alcohol 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 alcohol. The samples were then analyzed along with standard sulfate solutions on a Dionex 2000i ion chromatography unit. Results are calculated as milligrams per liter and then converted, 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

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

BERKELEY, CA WASHINGTON, D.C. WESTERN NY

Table I

CHH007012

For Keystone Environmental

Client Sample Number	RJ Lee Sample Number	SO_4^{-2} (mg/l)	Solution vol (ml)	SO_4^{-2} Total Mg
CLR-14CS-1	90134	31.5	750	23.6
CLR-14CS-2	90135	40.8	890	36.4
CLR-14CS-3	90136	51.9	880	45.6

Authorized Signature Gary A. Cole

Date 7/30/90

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 NUMBER 14 BATTERY COMBUSTION STACK

APPENDIX F
FIELD DATA SHEETS
FOR VISIBLE EMISSIONS

VISIBLE EMISSIONS OBSERVATIONS FORM

OBSERVER: McKay

DATE: 20 June 1990

FACILITY: USX Clairton Works

OBSERVATION: START TIME: 8:50 AM

END TIME: 9:50 AM

OBSERVATION POINT: Wabash Employee Bath house Lot # 14

SOURCE: Battery Draft Stack #14 Stack

DISTANCE: @ 430'

DIRECTION FROM: S "GF"

HEIGHT: @ 200'

WIND:

SPEED: 6 m.p.h.

DIRECTION: → S C

TEMPERATURE: 61° 62°

SKY CONDITION: Hazy

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: ____ FOREMAN: ____

COMMENTS: ____

	0	0	0	0	0	:20	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
:55	5	0	0	0	0	:25	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
:00	10	0	0	0	0	:30	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
:05	15	0	0	0	0	:35	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
:10	20	0	0	0	0	:40	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
:15	25	0	0	0	0	:45	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

change over

VISIBLE EMISSIONS OBSERVATIONS FORM

OBSERVER: McKoy

DATE: 20 June, 1990

FACILITY: Ash Clairton Works

OBSERVATION: START TIME: 9:50 am

END TIME: 10:50 am

OBSERVATION POINT: Wabash Employee Bath house Lot #14

SOURCE: Battery Draft Stack

DISTANCE: @ 435'

DIRECTION FROM: S"O F"

HEIGHT: @ 200'

WIND:

SPEED: 6-MPH

DIRECTION: → SE

TEMPERATURE: 61°-65°

SKY CONDITION: Hazy

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: ____ FOREMAN: _____

COMMENTS: _____

#14 Stack

	0	0	0	0	0	:20	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
Change	3	0	0	0	0		33	0	0	0	0
	4	0	0	0	0		34	0	0	0	0
:55	5	0	0	0	0	:25	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	Change	38	0	0	0	0
	9	0	0	0	0		39	0	0	0	0
:00	10	0	0	0	0	:30	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
:05	15	0	0	0	0	:35	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
:10	20	0	0	0	0	:40	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
:15	25	0	0	0	0	:45	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: McKoy

DATE: 20 June, 1990

FACILITY: USY Clairton Works

OBSERVATION: START TIME: 10:50 Am

END TIME: 11:01

OBSERVATION POINT: Wabash Employee Bath House lot #14

SOURCE: Battery Draft Stack

DISTANCE: @ 400'

DIRECTION FROM: S'OF

HEIGHT: @ 200'

WIND:

SPEED: 8 mph

DIRECTION: → S-E

TEMPERATURE: 65°-

SKY CONDITION: Hazy

BACKGROUND: Sky

READING CONDITIONS: F dir

COLOR OF EMISSION: N/A

TOTAL No. OF READINGS: _____

No. READINGS >= 20% _____

No. READINGS >= 60% _____

GREATEST OPACITY: _____

CREW: ____ FOREMAN: _____

COMMENTS: _____

#14 Stack

	0	O	O	O	O	:20	30				
	1	O	O	O	O		31				
	2	O	O	O	O		32				
	3	O	O	O	O		33				
	4	O	O	O	O		34				
:55	5	O	O	O	O	:25	35				
	6	O	O	O	O		36				
	7	O	O	O	O		37				
	8	O	O	O	O		38				
	9	O	O	O	O		39				
:00	10	O	O	O	O	:30	40				
stopped	11	O	O	O	O		41				
	12						42				
	13						43				
	14						44				
:05	15					:35	45				
	16						46				
	17						47				
	18						48				
	19						49				
:10	20					:40	50				
	21						51				
	22						52				
	23						53				
	24						54				
:15	25					:45	55				
	26						56				
	27						57				
	28						58				
	29						59				

VISIBLE EMISSIONS OBSERVATIONS FORM

OBSERVER: McKoy

DATE: 20 June, 1990

FACILITY: US Clairton works

OBSERVATION: START TIME: 11:25

END TIME: 12:55

OBSERVATION POINT: Wabash Employee Bath House Lot #14

SOURCE: Battery Draft Stock

DISTANCE: @ 425'

DIRECTION FROM: S'OF"

HEIGHT: @ 200'

WIND:

SPEED: 10 - MPH

DIRECTION: → SW

TEMPERATURE: 70° - 73°

SKY CONDITION: Overcast

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: ____ FOREMAN: ____

COMMENTS: ____

#14 Stock

	0	0	0	0	0	:55	30	0	0	0	0
	1	0	0	0	0	change	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
:30	5	0	0	0	0	:00	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
:35	10	0	0	0	0	:05	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
:40	15	0	0	0	0	:10	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
:45	20	0	0	0	0	:15	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
:50	25	0	0	0	0	:20	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: McKay

DATE: 20 June 1990

FACILITY: USX Clairton Works

OBSERVATION: START TIME: 12:25 P.M.

END TIME: 1:25 pm

OBSERVATION POINT: Wabash Employee Bath House Lot

SOURCE: #14 Battery Left Stack

DISTANCE: @ 440'

DIRECTION FROM: South

HEIGHT: @ 200'

WIND:

SPEED: 10 m.p.h.

DIRECTION: → SE

TEMPERATURE: 73°-78

SKY CONDITION: Sun Cast

BACKGROUND: Sky

READING CONDITIONS: Fair

COLOR OF EMISSION: Gray

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 15%

CREW: ____ FOREMAN: ____

COMMENTS: ____

#14 Stack

0	0	0	0	0	:15
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	:30
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	:45
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	:00
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	:15
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	:30
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	15	5	
34	0	0	0	0	
35	0	0	0	0	:45
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	:00
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	:15
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	:30
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	:45
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: McKay

DATE: 20 June, 1990

FACILITY: US & Clairton Works

OBSERVATION: START TIME: 1:25 pm

END TIME: 1:36

OBSERVATION POINT: Wabash Employee Bath House Lot #14

SOURCE: Battery Draft Stack

DISTANCE: a 450'

DIRECTION FROM: S "of"

HEIGHT: a 200

WIND:

SPEED: 10 m.p.h

DIRECTION: → S.E.

TEMPERATURE: 74°-78

SKY CONDITION: overcast

BACKGROUND: Sky

READING CONDITIONS: Fair

COLOR OF EMISSION: N/A

TOTAL No. OF READINGS: 49

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: ____ FOREMAN: ____

COMMENTS: ____

#14 Stack

	0	0	0	0	0	:55	30				
	1	0	0	0	0		31				
	2	0	0	0	0		32				
	3	0	0	0	0		33				
	4	0	0	0	0		34				
:30	5	0	0	0	0	:00	35				
	6	0	0	0	0		36				
	7	0	0	0	0		37				
	8	0	0	0	0		38				
	9	0	0	0	0		39				
:35	10	0	0	0	0	:05	40				
stop	11	0	0	0	0		41				
	12						42				
	13						43				
	14						44				
:40	15					:10	45				
	16						46				
	17						47				
	18						48				
	19						49				
:45	20					:15	50				
	21						51				
	22						52				
	23						53				
	24						54				
:50	25					:20	55				
	26						56				
	27						57				
	28						58				
	29						59				

VISIBLE EMISSIONS OBSERVATIONS FORM

OBSERVER: McKay

DATE: 20 June, 1990

FACILITY: USE Clinton Works

OBSERVATION: START TIME: 2:02 PM

END TIME: 3:02 PM

OBSERVATION POINT: Wabash Employee Bath House Lot #14

SOURCE: Battery Draft Stack #14 Stack

DISTANCE: @ 435'

DIRECTION FROM: S "OF"

HEIGHT: @ 200'

WIND:

SPEED: 14 m.p.h

DIRECTION: → S E

TEMPERATURE: 76°

SKY CONDITION: Overcast

BACKGROUND: Sky

READING CONDITIONS: Fair

COLOR OF EMISSION: Grey

TOTAL No. OF READINGS: 240

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 10%

CREW: ____ FOREMAN: ____

COMMENTS: ____

:07	0	0	0	0	0	:32 Point change	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	:37	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	Point change #2	38	0	0	0	0
	9	0	0	0	0		39	0	0	0	0
:12	10	0	0	0	0		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
:17	15	0	0	0	0	:47	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
:22	20	0	0	0	0	:52	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
:27	25	0	0	0	0	:57	55	0	0	0	0
	26	5	5	10	5		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: McKoy

DATE: 20 June, 1990

FACILITY: US8 Clairton works

OBSERVATION: START TIME: 3:02 PM

END TIME: 4:02 PM

OBSERVATION POINT: Wabash Employee Bath house Chart point

SOURCE: #14 Battery Draft Stack

DISTANCE: @ 450'

DIRECTION FROM: S'of"

HEIGHT: @ 200'

WIND:

SPEED: 12-MPH

DIRECTION: → SE

TEMPERATURE: 76°

SKY CONDITION: Over Cost

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: ____ FOREMAN: ____

COMMENTS: ____

#14 Stack

	0	0	0	0	0	:32	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
:07	5	0	0	0	0	:37	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
:12	10	0	0	0	0	:42	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
:17	15	0	0	0	0	:47	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
:22	20	0	0	0	0	:52	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
:27	25	0	0	0	0	:57	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: McKoy

DATE: 20 June, 1990

FACILITY: USS Clairton works

OBSERVATION: START TIME: 4:02

END TIME: _____

OBSERVATION POINT: Bath Wabash Employee House Lot #14

SOURCE: Battery Draft Stack

DISTANCE: @ 455'

DIRECTION FROM: S "OF" stopped

HEIGHT: @ 200'

WIND:

SPEED: 12-mph

DIRECTION: → S.E.

TEMPERATURE: 73°

SKY CONDITION: Overcast & Rain

BACKGROUND: Sky

READING CONDITIONS: fair

COLOR OF EMISSION: N/A

TOTAL No. OF READINGS: 44

No. READINGS >= 20% 0

No. READINGS >= 60% 0

GREATEST OPACITY: 0

CREW: ____ FOREMAN: _____

COMMENTS: _____

#14 Stack

0	0	0	0	0	:32	30				
1	0	0	0	0		31				
2	0	0	0	0		32				
3	0	0	0	0		33				
4	0	0	0	0		34				
:07 5	0	0	0	0	:37	35				
6	0	0	0	0		36				
7	0	0	0	0		37				
8	0	0	0	0		38				
9	0	0	0	0		39				
:12 10	0	0	0	0		40				
11						41				
12						42				
13						43				
14						44				
:17 15						45				
16						46				
17						47				
18						48				
19						49				
:22 20						50				
21						51				
22						52				
23						53				
24						54				
:27 25						55				
26						56				
27						57				
28						58				
29						59				