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REPORT ON LEAD AND OPACITY COMPLIANCE TESTING

Performed for:

BATTERY BUILDERS, INC.
MIXER COOLING EXHAUST FILTER AND BAGHOUSE NO. 1
NAPERVILLE, IL

Client Reference No: 24578
CAE Project No: 8670
Revision 0: May 30, 2000

To the best of our knowledge, the data presented in this report are accurate and complete.

Submitted by,

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PROJECT OVERVIEW

Battery Builders, Inc. contracted Clean Air Engineering to perform lead and opacity testing at their facility located in Naperville, IL for compliance purposes. Testing was conducted at both the Baghouse No. 1 Stack and the Mixer Cooling Exhaust Filter Stack.

The testing included the following parameters at both locations:

- lead (Pb);
- opacity;
- exhaust gas composition (O_2, CO_2, H_2O);
- exhaust gas temperature and
- exhaust gas flow.

These sources were tested to meet the State of Illinois New Source Performance Standard (NSPS) and Permit requirements. The testing was performed on April 26 and April 27, 2000. The field testing was coordinated by :

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Dan Askin - ESCA Tech, Inc.; ph : (414) 962-5323
Brian Koziczkowski - Clean Air Engineering; ph : (847) 991-6200 ext. 2045

The test program consisted of three runs for each of the above pollutants at each source outlet. Each mixer outlet run was tested over a period of three 2,400 pound batches. A blank correction of 3.4 ug was made in calculating the lead emissions. No deviations from standard test practices occurred. All sampling runs were 60 minutes.

Data is in the Field Data section of the Appendix. A summary of test results is shown in Table 1-1.

PROJECT OVERVIEW

Table 1-1:
Summary of Test Results

Source Constituent	Sampling Method	Average Emission	Permit Limit [1]
Baghouse No. 1			
Lead (gr/dscf)	EPA M12	0.00031	0.00044
Opacity	EPA M9	0	0
Mixer			
Lead (gr/dscf)	EPA M12	0.00005	0.00044
Opacity	EPA M9	0	0

[1] Permit limits obtained from NSPS permits issued March 29,1984 for the baghouse and November 10, 1999 for the mixer cooling exhaust filter.

The test conditions and results of analysis are presented in Tables 2-1 through 2-5 on pages 2-1 through 2-3.

RESULTS

Table 2-1:
Baghouse No. 1 Stack - Lead Emissions

LEAD PARAMETERS

Run No.		1	2	3	Average
Date (2000)		April 26	April 26	April 26	
Start Time (approx.)		10:44	12:39	14:21	
Stop Time (approx.)		11:47	13:42	15:24	
Process Conditions					
	Lead Oxide Charge Weight (lbs)	4,800	7,200	4,800	**5,600**
	Oxide Delivery	none	16,576	none	
Gas Conditions					
Ts	Temperature (oF)	132	134	140	**135**
Bwo	Moisture (volume %)	2.58	2.70	2.37	**2.55**
O_2	Oxygen (dry volume %)	20.8	20.8	20.8	**20.8**
CO_2	Carbon dioxide (dry volume %)	0.2	0.2	0.2	**0.2**
Vmstd	Volume metered, standard (ft3)	39.08	38.61	37.18	**38.29**
Volumetric Flow Rate					
Qa	Actual conditions (acfm)	6,900	7,117	7,073	**7,030**
Qstd	Standard conditions (dscfm)	5,888	6,045	5,961	**5,965**
Lead (Pb)					
Mn	Net weight (µg)	676.6	906.6	746.6	**776.6**
C	Concentration (gr/dscf)	0.00027	0.00036	0.00031	**0.00031**
C	Concentration (mg/dscm)	0.611	0.829	0.709	**0.716**

Table 2-2:
Baghouse No. 1 - Visual Emissions

Run No.		1	2	3	Average
Date (2000)		April 26	April 26	April 26	
Start Time (approx.)		10:45	12:40	14:22	
Stop Time (approx.)		11:45	13:40	15:22	
Opacity					
	Average opacity 1 hour, (percent)	0	0	0	**0**
	Maximum reading 15 second, (percent)	0	0	0	**0**
	Maximum average 6 minute, (percent)	0	0	0	**0**
	No. of readings >20% 15 second, (percent)	0	0	0	**0**

RESULTS

Table 2-3:
Mixer Stack – Lead Emissions

Run No.		1	2	3	Average
Date (2000)		April 27	April 27	April 27	
Start Time (approx.)		08:36	10:44	12:37	
Stop Time (approx.)		10:01	12:09	14:16	
Process Conditions					
	Lead Oxide Charge Weight (lbs)	7,200	7,200	7,200	**7,200**
Gas Conditions					
Ts	Temperature (»F)	88	91	95	**91**
Bwo	Moisture (volume %)	4.68	5.42	5.49	**5.19**
O_2	Oxygen (dry volume %)	20.8	20.8	21.0	**20.9**
CO_2	Carbon dioxide (dry volume %)	0.2	0.2	0.0	**0.1**
Vmstc	Volume metered, standard (ft3)	53.24	52.91	51.87	**52.7**
Volumetric Flow Rate					
Qa	Actual conditions (acfm)	2,130	2,185	2,235	**2,183**
Qstd	Standard conditions (dscfm)	1,919	1,945	1,966	**1,943**
Lead (Pb)					
Mn	Net weight (µg)	126.6	156.6	186.6	**156.6**
C	Concentration (gr/dscf)	0.000037	0.000046	0.000056	**0.00005**
C	Concentration (mg/dscm)	0.084	0.105	0.127	**0.105**

Table 2-4:
Mixer - Visual Emissions

Run No.		1	2	3	Average
Date (2000)		April 27	April 27	April 27	
Start Time (approx.)		08:36	10:44	12:37	
Stop Time (approx.)		09:59	12:08	14:15	
Opacity					
	Average opacity 1 hour, (percent)	0	0	0	**0**
	Maximum reading 15 second, (percent)	0	0	0	**0**
	Maximum average 6 minute, (percent)	0	0	0	**0**
	No. of readings >20% 15 second, (percent)	0	0	0	**0**

RESULTS

Table 2-5:
Lead – Quality Control and Quality Assurance

EPA Method 12

Method Detction Limit (µg) 0.25

	Method Blank Results (µg)	Reagent Blank Results (µg)
Lead (gfaa)	ND(0.25)	3.4

Sample ID: Mixer Run 3

Fraction	Results (µg)	Duplicate (µg)	M. Spike (µg)	MS % Rec.	MS Dup. (µg)	MSD % Rec.
Lead (gfaa)	190	180	560	95	550	92

Sample ID: Blank Spike

Fraction	BS #1 (µg)	BS % Rec. #1	BS #2 (µg)	BS % Rec. #2
Lead (gfaa)	1.9	94	1.9	94

ND - Not detected. The detection limit is denoted in parentheses.
MS - Matrix Spike
MS % Rec. - Matrix Spike Percent Recovery
MS Dup. - Matrix Spike Duplicate
MSD % Rec. - Matrix Spike Duplicate Percent Recovery
BS - Blank spike
BS % Rec. - Blank Spike Percent Recovery

DESCRIPTION OF INSTALLATION

Battery Builder's Inc. manufactures Lead Acid Batteries and is subject to the NSPS standard - CFR 60.370, Subpart KK. The two (2) stacks that were tested are both part of the Paste Mixing Facility. Currently three (3) sources are vented to Baghouse No. 1: the paste mixer, the flash drying oven and the bin vent.

The bin vent is connected to the lead oxide storage silo and operates only during lead oxide delivery. The lead oxide delivery occurs once or twice a week and has a duration of approximately 40 minutes. A lead oxide delivery occurred during Run 2 of the stack test on Baghouse No. 1.

The paste mixer is a batch operation. During dry blending, it is vented to Baghouse No. 1. After the liquid is added to the mix, the damper is closed to Baghouse No. 1 and the cooling exhaust fan is started. This source is vented to the baghouse about 5 minutes per mixing batch. Each mixing batch takes 20 to 25 minutes.

The other source tested was the cooling air exhaust from the paste mixer. The cooling exhaust fan only runs during the 10 to 15 minutes when cooling is required. Then it is shut off until it is needed for the next batch. As a result, the stack test runs were stopped and restarted so that sampling only occurred when the exhaust fan was operating.

METHODOLOGY

The sampling will follow procedures as detailed in U.S. Environmental Protection Agency (EPA) Methods 1, 2, 3, 4, 9 and 12. The following table summarizes the methods and their respective sources.

Table 4-1:
Summary of Sampling Procedures

Title 40 CFR Part 60 Appendix A	
Method 1	"Sample and Velocity Traverses for Stationary Sources"
Method 2	"Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"
Method 3	"Gas Analysis for the Determination of Dry Molecular Weight"
Method 4	"Determination of Moisture Content in Stack Gases"
Method 9	"Visual Determination of the Opacity of Emissions from Stationary Sources"
Method 12	"Determination of Inorganic Lead Emissions from Stationary Sources"

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR).

Major aspects of the sampling, recovery and analytical procedures are summarized on pages 4-2 through 4-7.

All equipment was calibrated at the Clean Air Engineering laboratory prior to shipment to the job site. A post calibration was performed on the meter box at the conclusion of testing to verify that calibration was maintained throughout the test program. Calibration sheets can be found in Appendix Section C.

METHODOLOGY

SAMPLING POINT DETERMINATION

Sampling point locations was determined according to EPA Method 1.

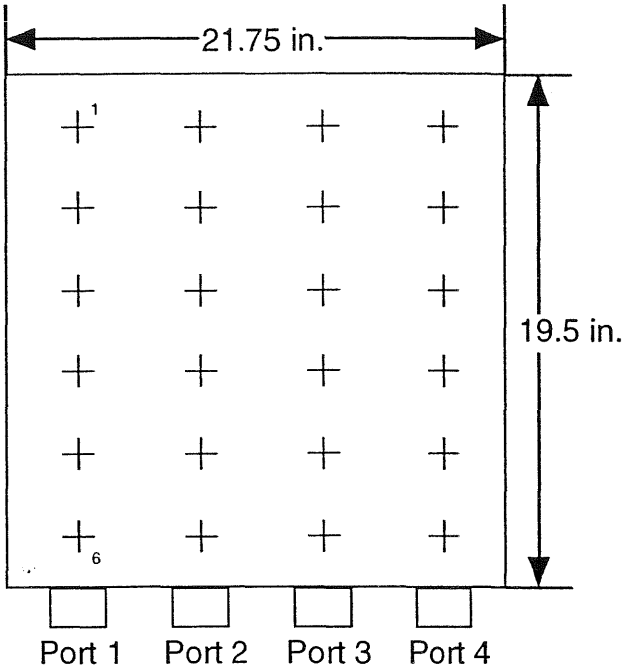
Table 4-2 outlines the sampling point configurations. Figure 4-1 through 4-2 illustrate the sampling points and orientation of sampling ports for each of the sources tested in the program.

Table 4-2:
Sampling Points

Stack	Constituent	Method	Runs	Ports	Points per Port	Minutes per Point	Total Minutes	Figure
Baghouse No. 1	Lead	12	3	4	6	2.5	60	4-1
Cooling Exhaust Filter	Lead	12	3	2	12	2.5	60	4-2

METHODOLOGY

SAMPLING POINT DETERMINATION (CONTINUED)



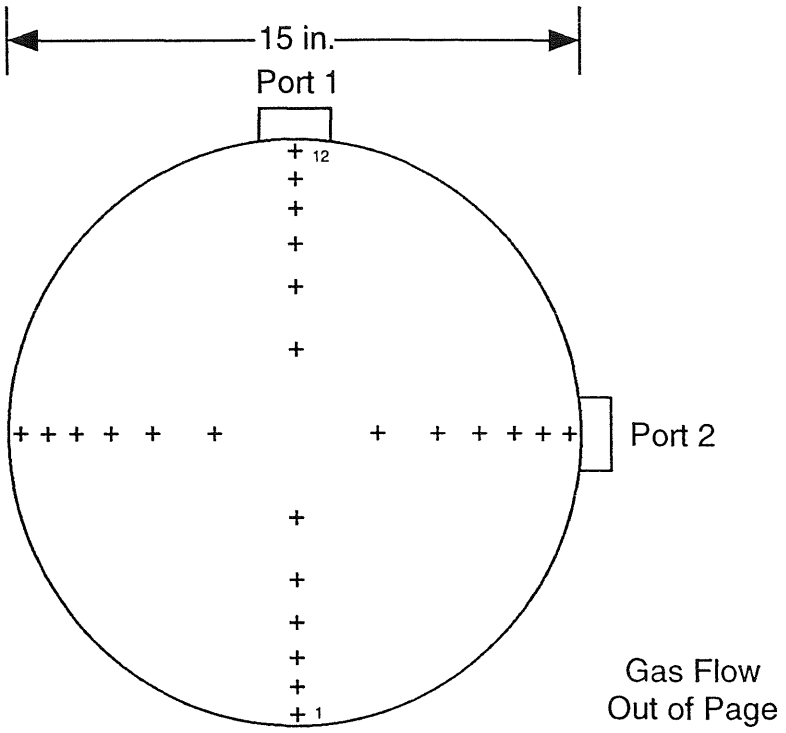
Sampling Point	Port to Point Distance (in.)
1	17.88
2	14.63
3	11.38
4	8.13
5	4.88
6	1.63

Diameters to upstream disturbance: 4.62 Limit: 2.0
Diameters to downstream disturbance: 1.22 Limit: 0.5

Figure 4-1: Baghouse No. 1 Stack Sampling Point Determination (EPA Method 1)

METHODOLOGY

SAMPLING POINT DETERMINATION (CONTINUED)



Sampling Point	Port to Point Distance (in.)
1	14.5
2	14.0
3	13.2
4	12.3
5	11.3
6	9.7
7	5.3
8	3.8
9	2.7
10	1.8
11	1.0
12	0.5

Diameters to upstream disturbance: 2.87 Limit: 2.0
Diameters to downstream disturbance: 1.87 Limit: 0.5

Figure 4-2: Mixer Cooling Exhaust Filter Stack Sampling Point Determination (EPA Method 1)

METHODOLOGY

VELOCITY AND VOLUMETRIC FLOW RATE - EPA METHOD 2

EPA Method 2 was used, in conjunction with the wet method testing, to determine the gas velocity and flow rate at each of the test locations.

Each set of velocity determinations included the measurement of gas velocity pressure and gas temperature at each of the EPA Method 1 traverse points. The velocity pressures were measured with a Type S pitot tube. Gas temperature measurements were made using a Type K thermocouple and digital pyrometer. Velocity was measured in conjuction with the isokinetic test.

GAS COMPOSITION AND MOLECULAR WEIGHT - EPA METHOD 3

In order to determine the oxygen (O_2) concentration, carbon dioxide (CO_2) concentration and gas molecular weight, a time-integrated sample of the gas was obtained for each sampling train and analyzed in accordance with EPA Method 3. The gas sample was collected into a vinyl sample bag from the isokinetic test method. The contents of the bag was analyzed for O_2 and CO_2 concentrations using an Orsat.

MOISTURE CONTENT - EPA METHOD 4

The flue gas moisture content at each of the test locations was determined in accordance with EPA Method 4, in conjunction with the isokinetic test method. The gas moisture was determined by quantitatively condensing the water in chilled impingers. The amount of moisture condensed was determined gravimetrically. A dry gas meter was used to measure the volume of gas sampled. The amount of water condensed and the volume of gas sampled was used to calculate the gas moisture content in accordance with EPA Method 4.

OPACITY - EPA METHOD 9

Opacity readings were taken for one hour at 15 second intervals by a certified visible emissions reader. The visible emissions readings were conducted simultaneously with each of the lead (EPA Method 12) test runs. The results are reported as a maximum opacity reading for the one hour period as well as the one hour average opacity.

METHODOLOGY

LEAD EMISSIONS - EPA METHOD 12

EPA Method 12 was used to measure lead at both locations. This method defines lead emissions as particulate and gaseous material isokinetically withdrawn through a temperature controlled probe and collected on a high-efficiency filter and in dilute nitric acid.

Figure 4-3 illustrates the EPA Method 12 sampling apparatus. The sampling apparatus contained a glass lined temperature-controlled probe equipped with a Type S pitot tube (for measuring stack gas flow rate) and a sharp-edged glass button-hook nozzle. The exit of the probe was connected to a high efficiency glass fiber filter supported in a glass filter holder inside an oven. The exit of the filter holder was connected to a series of four full size impingers. The first two impingers each contained 100 milliliters of 0.1 N nitric acid (HNO_3). The third impinger was empty, and the fourth contained a tared quantity of silica gel. The impingers were immersed in an ice bath for the duration of each test.

Procedures for selecting sampling locations and for operation of the apparatus were derived from EPA Method 12 and associated EPA Methods 1 through 4. The sampling apparatus was leak-checked before and after each test run. Sampling was performed at an isokinetic rate greater than 90% and less than 110%.

At the conclusion of each test run, the probe and nozzle was rinsed and brushed with 0.1 HNO_3. The HNO_3 rinse was collected into a glass sample container. The quartz fiber filter was recovered and placed into the original filter container. The volume of liquid collected in each of the impingers was quantified.

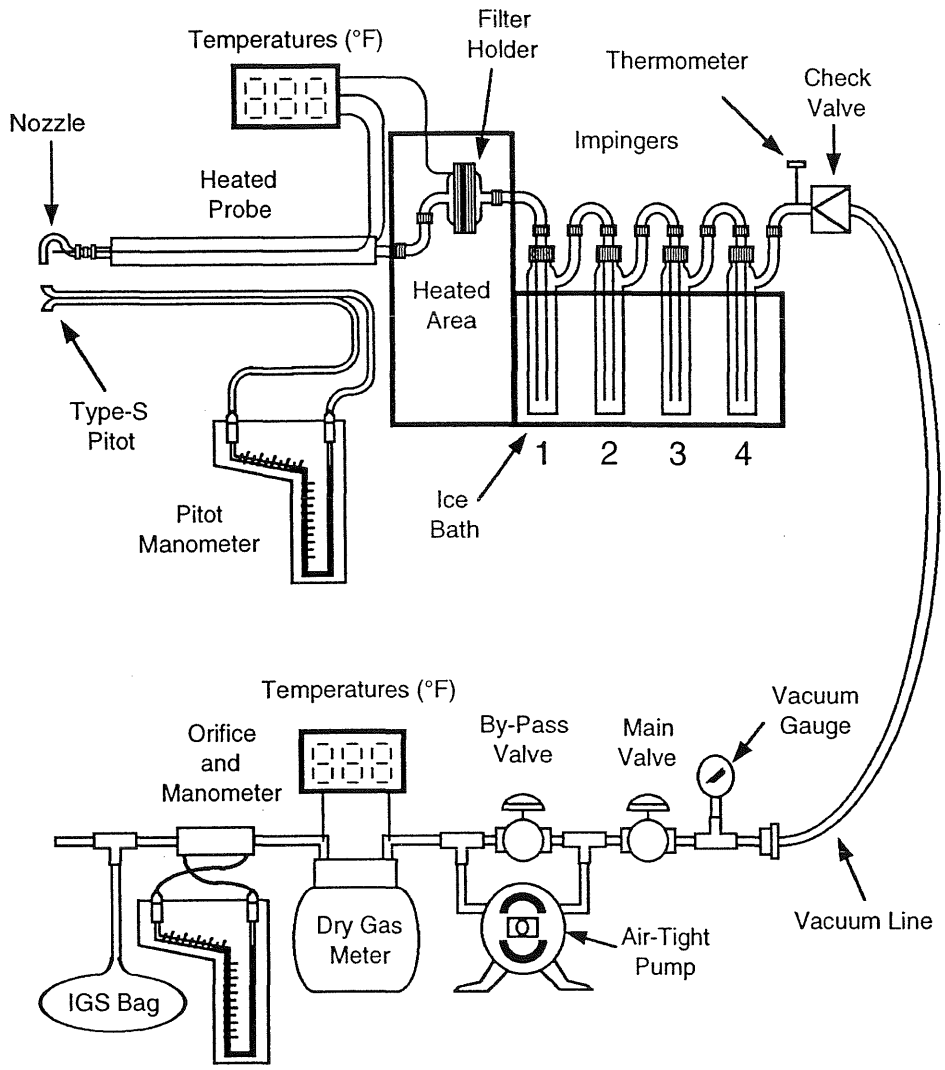
The liquid from the first three impingers was transferred to a leak-free polyethylene storage container. The back-half of the filter housing, the first three impingers, and all connecting glassware was quantitatively rinsed with 0.1 Normal nitric acid, which was added to the storage container.

All containers were sealed, labeled and liquid levels marked prior to transport to the laboratory. The silica gel weight and the volume of condensate collected in the impingers was used to determine moisture content of the stack gas.

The nitric acid probe rinses and samples recovered from impingers 1 through 3 were reduced to near dryness and digested with an acid solution. The filters will also be digested with an acid solution. The digested samples were analyzed by graphite furnace atomic absorption spectroscopy (GFAAS) by Philip Analytical Services located in Burlington, Ontario.

METHODOLOGY

LEAD EMISSIONS (CONTINUED)



Impinger Contents
1) 100 ml 0.1 N HNO_3
2) 100 ml 0.1 N HNO_3
3) empty
4) 300 g silica gel

Figure 4-3: Lead Sampling Apparatus (EPA Method 12)

APPENDIX

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SAMPLE CALCULATIONS

A

SAMPLE CALCULATIONS

The tables presenting the results are generated electronically from raw data. It may not be possible to exactly duplicate these results using a calculator. The reference method data, results and all calculations are carried to sixteen decimal places throughout. The final table is formatted to an appropriate number of significant figures.

1. Volume of water collected (wscf)

$$V_{wstd} = (0.04707)(V_{lc})$$

Where:

V_{lc}	total volume of liquid collected in impingers and silica gel (ml)
V_{wstd}	volume of water collected at standard conditions (ft^3)
0.04707	conversion factor (ft^3/ml)

2. Volume of gas metered, standard conditions (dscf)

$$V_{mstd} = \frac{(17.64)(V_m)\left(P_{bar} + \frac{\Delta H}{13.6}\right)(Y_d)}{(460 + T_m)}$$

Where:

P_{bar}	barometric pressure (in. Hg)
T_m	average dry gas meter temperature (°F)
V_m	volume of gas sample through the dry gas meter at meter conditions (ft^3)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
Y_d	gas meter correction factor (dimensionless)
ΔH	average pressure drop across meter box orifice (in. H_2O)
17.64	conversion factor (°R/in. Hg)
13.6	conversion factor (in. H_2O/in. Hg)
460	°F to °R conversion constant

3. Sample gas pressure (in. Hg)

$$P_s = P_{bar} + \left(\frac{P_g}{13.6}\right)$$

Where:

P_{bar}	barometric pressure (in. Hg)
P_g	sample gas static pressure (in. H_2O)
P_s	absolute sample gas pressure (in. Hg)
13.6	conversion factor (in. H_2O/in. Hg)

4. Actual vapor pressure (in. Hg)

$$P_v = \frac{e^{\left(18.3036 - \frac{3816.44}{\frac{5}{9}(T_s - 32) + 273.15 - 46.13}\right)}}{25.4}$$

Where:

P_v	vapor pressure, actual (in. Hg)
T_s	average sample gas temperature (°F)

SAMPLE CALCULATIONS (CONTINUED)

5. Actual vapor pressure (in. Hg)[1]

$$P_v = P_s$$

Where:

P_v	vapor pressure, actual (in. Hg)
P_s	absolute sample gas pressure (in. Hg)

6. Moisture content (%)

$$B_{wo} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}} \times 100\%$$

Where:

B_{wo}	proportion of water vapor in the gas stream by volume (%)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
V_{wstd}	volume of water collected at standard conditions (ft^3)

7. Saturated moisture content (%)

$$B_{ws} = \frac{(P_v)}{(P_s)} \times 100\%$$

Where:

B_{ws}	proportion of water vapor in the gas stream by volume at saturated conditions (%)
P_s	absolute sample gas pressure (in. Hg)
P_v	vapor pressure, actual (in. Hg)

Whichever moisture value is smaller is used for B_{wo} in the following calculations.

8. Molecular weight of dry gas stream (lb/lb·mole)

$$M_d = M_{CO_2}\frac{(CO_2)}{(100)} + M_{O_2}\frac{(O_2)}{(100)} + M_{CO+N_2}\frac{(CO+N_2)}{(100)}$$

Where:

M_d	dry molecular weight of sample gas (lb/lb·mole)
M_{CO_2}	molecular weight of carbon dioxide (lb/lb·mole)
M_{O_2}	molecular weight of oxygen (lb/lb·mole)
M_{CO+N_2}	molecular weight of carbon monoxide and nitrogen (lb/lb·mole)
CO_2	proportion of carbon dioxide in the gas stream by volume (%)
O_2	proportion of oxygen in the gas stream by volume (%)
$CO+N_2$	proportion of carbon monoxide and nitrogen in the gas stream by volume (%)
100	conversion factor (%)

[1] For effluent gas temperatures over 212°F, P_v is assumed to be equal to P_s.

SAMPLE CALCULATIONS (CONTINUED)

9. Molecular weight of sample gas (lb/lb·mole)

$$M_s = (M_d)(1 - B_{wo}) + (M_{H_2O})(B_{wo})$$

Where:

B_{wo}	proportion of water vapor in the gas stream by volume
M_d	dry molecular weight of sample gas (lb/lb·mole)
M_{H_2O}	molecular weight of water (lb/lb·mole)
M_s	molecular weight of sample gas, wet basis (lb/lb·mole)

10. Velocity of sample gas (ft/sec)

$$V_s = (K_p)(C_P)\left(\overline{\sqrt{\Delta P}}\right)\left(\sqrt{\frac{(\overline{T_s} + 460)}{(M_s)(P_s)}}\right)$$

Where:

K_p	velocity pressure constant $\left(\frac{ft}{sec}\left[\frac{(lb/lb \cdot mole)(in.\ Hg)}{(°R)(in.\ H_2O)}\right]\right)$
C_p	pitot tube coefficient
M_s	molecular weight of sample gas, wet basis (lb/lb·mole)
P_s	absolute sample gas pressure (in. Hg)
T_s	average sample gas temperature (°F)
V_s	sample gas velocity (ft/sec)
$\overline{\sqrt{\Delta P}}$	average square roots of velocity heads of sample gas (in. H_2O)
460	°F to °R conversion constant

11. Total flow of sample gas (acfm)

$$Q_a = (60)(A_s)(V_s)$$

Where:

A_s	cross sectional area of sampling location (ft^2)
Q_a	volumetric flow rate at actual conditions (acfm)
V_s	sample gas velocity (ft/sec)
60	conversion factor (sec/min)

12. Total flow of sample gas (dscfm)

$$Q_{std} = \frac{(Q_a)(P_s)(17.64)(1 - B_{wo})}{(\overline{T_s} + 460)}$$

Where:

B_{wo}	proportion of water vapor in the gas stream by volume
P_s	absolute sample gas pressure (in. Hg)
Q_a	volumetric flow rate at actual conditions (acfm)
Q_{std}	volumetric flow rate at standard conditions, dry basis (dscfm)
T_s	average sample gas temperature (°F)
17.64	conversion factor (°R/in. Hg)
460	°F to °R conversion constant

SAMPLE CALCULATIONS (CONTINUED)

13. Percent isokinetic (%)

$$I = \frac{(0.09450)(\overline{T_s} + 460)(V_{mstd})}{(P_s)(V_s)\left(\frac{(D_n)^2(\pi)}{(144)(4)}\right)(\Theta)(1 - B_{wo})}$$

Where:

D_n	diameter of nozzle (in)
B_{wo}	proportion of water vapor in the gas stream by volume
I	percent of isokinetic sampling (%)
P_s	absolute sample gas pressure (in. Hg)
T_s	average sample gas temperature (°F)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
V_s	sample gas velocity (ft/sec)
Θ	total sampling time (min)
0.09450	constant
460	°F to °R conversion constant

14. Lead concentration (gr/dscf)

$$C_{gr/dscf} = \frac{(15.43)(m_n)}{V_{mstd}}$$

Where:

$C_{gr/dscf}$	measured concentration in the gas stream (gr/dscf)
m_n	total amount of lead collected (g)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
15.43	conversion factor (gr/g)

15. Lead concentration (gr/dscf corrected to 7% O_2)

$$C_{gr/dscf\ @\ 7\%\ O_2} = (C_{gr/dscf})\frac{(20.9 - 7)}{(20.9 - O_2)}$$

Where:

$C_{gr/dscf}$	measured concentration in the gas stream (gr/dscf)
$C_{gr/dscf\ @\ 7\%\ O_2}$	measured concentration in the gas stream (gr/dscf corrected to 7% O_2)
O_2	proportion of oxygen in the gas stream by volume (%)
20.9	proportion of oxygen in ambient air by volume (%)

16. Lead concentration (gr/dscf corrected to 12% CO_2)

$$C_{gr/dscf\ @\ 12\%\ CO_2} = (C_{gr/dscf})\frac{(12)}{(CO_2)}$$

Where:

$C_{gr/dscf}$	measured concentration in the gas stream (gr/dscf)
$C_{gr/dscf\ @\ 12\%\ CO_2}$	measured concentration in the gas stream (gr/dscf corrected to 12% CO_2)
CO_2	proportion of carbon dioxide in the gas stream by volume (%)

SAMPLE CALCULATIONS (CONTINUED)

17. Lead concentration (gr/acf)

$$C_{gr/acf} = \left(C_{gr/dscf}\right)\left(\frac{Q_{std}}{Q_a}\right)$$

Where:

$C_{gr/dscf}$	measured concentration in the gas stream (gr/dscf)
$C_{gr/acf}$	measured concentration in the gas stream (gr/acf)
Q_a	volumetric flow rate at actual conditions (acfm)
Q_{std}	volumetric flow rate at standard conditions, dry basis (dscfm)

18. Lead emission (lb/hr)

$$E_{lb/hr} = \frac{\left(C_{gr/dscf}\right)\left(Q_{std}\right)(60)}{7,000}$$

Where:

$C_{gr/dscf}$	measured concentration in the gas stream (gr/dscf)
$E_{lb/hr}$	emission rate (lb/hr)
Q_{std}	volumetric flow rate at standard conditions, dry basis (dscfm)
60	conversion factor (min/hr)
7,000	conversion factor (gr/lb)

19. Lead concentration (µg/dscm)

$$C_{\mu g/dscm} = \frac{\left(m_n\right)}{\left(V_{mstd}\right)}(35.31)(1,000)$$

Where:

$C_{\mu g/dscm}$	concentration (µg/dscm)
m_n	net mass of metal collected (mg)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
35.31	conversion factor (ft^3/m^3)
1,000	conversion factor (µg/mg)

20. Lead concentration (lb/dscf)

$$C_{lb/dscf} = \frac{\left(m_n\right)}{\left(V_{mstd}\right)(453,590)}(1,000)$$

Where:

$C_{lb/dscf}$	concentration (lb/dscf)
m_n	net mass of metal collected (mg)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
453,590	conversion factor (mg/lb)
1,000	conversion factor (µg/mg)

SAMPLE CALCULATIONS (CONTINUED)

21. Lead concentration (µg/dscm corrected to 7% O_2)

$$C_{\mu g/dscm @ 7\% O_2} = \frac{(C_{\mu g/dscm})(20.9 - 7.0)}{(20.9 - O_2)}$$

Where:

$C_{\mu g/dscm}$	concentration (µg/dscm)
$C_{\mu g/dscm @ 7\% O_2}$	concentration (µg/dscm corrected to 7% O_2)
O_2	proportion of oxygen in the gas stream by volume (%)
20.9	proportion of oxygen in ambient air by volume (%)

22. Lead concentration (µg/dscm corrected to 12% CO_2)

$$C_{\mu g/dscm @ 12\% CO_2} = (C_{\mu g/dscm})\frac{(12)}{(CO_2)}$$

Where:

$C_{\mu g/dscm}$	concentration (µg/dscm)
$C_{\mu g/dscm @ 12\% CO_2}$	concentration (µg/dscm corrected to 12% CO_2)
CO_2	proportion of carbon dioxide in the gas stream by volume (%)

23. Lead emission (g/sec)

$$E_{g/sec} = \frac{(m_n)(Q_{std})}{(V_{mstd})(10^6)(60)}$$

Where:

$E_{g/sec}$	emission rate (g/sec)
m_n	net mass of metal collected (mg)
Q_{std}	volumetric flow rate at standard conditions, dry basis (dscfm)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
60	conversion factor (sec/min)
10^6	conversion factor (µg/g)

24. Lead emission (g/hr)

$$E_{g/hr} = \frac{(m_n)(Q_{std})(60)}{(V_{mstd})(10^6)}$$

Where:

$E_{g/hr}$	emission rate (g/hr)
m_n	net mass of metal collected (mg)
Q_{std}	volumetric flow rate at standard conditions, dry basis (dscfm)
V_{mstd}	volume of gas sample through the dry gas meter at standard conditions (ft^3)
60	conversion factor (min/hr)
10^6	conversion factor (µg/g)

SAMPLE CALCULATIONS (CONTINUED)

25. Leademission (lb/hr)

$$E_{lb/hr} = \frac{(C_{\mu g/dscm})(Q_{std})(60)}{(453{,}590)(1{,}000)(35.31)}$$

Where:

$C_{\mu g/dscm}$	concentration (µg/dscm)
Q_{std}	volumetric flow rate at standard conditions, dry basis (dscfm)
$E_{lb/hr}$	emission rate (lb/hr)
60	conversion factor (min/hr)
35.31	conversion factor (ft^3/m^3)
1,000	conversion factor (µg/mg)
453,590	conversion factor (mg/lb)

PARAMETERS

B

BATTERY BUILDERS, INC.
CAE Project No: 8670
Baghouse Stack

LEAD
VELOCITY AND MOISTURE PARAMETERS

Run No.		1	2	3
Date (2000)		April 26	April 26	April 26
Start Time (approx.)		10:44	12:39	14:21
Stop Time (approx.)		11:47	13:42	15:24
Sampling Conditions				
Y_d	Dry gas meter correction factor	0.9912	0.9912	0.9912
C_p	Pitot tube coefficient	0.84	0.84	0.84
P_g	Static pressure (in. H_2O)	-0.2	-0.2	-0.2
A_s	Sample location area (ft^2)	2.95	2.95	2.95
P_{bar}	Barometric pressure (in. Hg)	29.40	29.40	29.40
D_n	Nozzle diameter (in.)	0.240	0.240	0.240
O_2	Oxygen (dry volume %)	20.8	20.8	20.8
CO_2	Carbon dioxide (dry volume %)	0.2	0.2	0.2
V_{lc}	Liquid collected (ml)	22.0	22.8	19.2
V_m	Volume metered, meter conditions (ft^3)	40.49	40.42	39.45
T_m	Dry gas meter temperature (°F)	74	80	87
T_s	Sample temperature (°F)	132	134	140
ΔH	Meter box orifice pressure drop (in. H_2O)	1.40	1.38	1.35
Θ	Total sampling time (min)	60	60	60
Flow Results				
V_{wstd}	Volume of water collected (ft^3)	1.04	1.07	0.90
V_{mstd}	Volume metered, standard (ft^3)	39.08	38.61	37.18
P_s	Sample gas pressure, absolute (in. Hg)	29.39	29.39	29.39
P_v	Vapor pressure, actual (in. Hg)	4.75	5.00	5.95
B_{wo}	Moisture in sample (% by volume)	2.58	2.70	2.37
B_{ws}	Saturated moisture (% by volume)	16.15	17.01	20.24
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.648	0.667	0.660
M_d	MW of sample gas, dry (lb/lb-mole)	28.86	28.86	28.86
M_s	MW of sample gas, wet (lb/lb-mole)	28.58	28.57	28.61
V_s	Velocity of sample (ft/sec)	39.1	40.3	40.0
%I	Isokinetic sampling (%)	103.7	99.8	97.5
Q_a	Volumetric flow rate, actual (acfm)	6,900	7,117	7,073
Q_{std}	Volumetric flow rate, standard (dscfm)	5,888	6,045	5,961

BATTERY BUILDERS, INC.
CAE Project No: 8670
Baghouse Stack

LEAD PARAMETERS

Run No.		1	2	3	Average
Date (2000)		April 26	April 26	April 26	
Start Time (approx.)		10:44	12:39	14:21	
Stop Time (approx.)		11:47	13:42	15:24	
Process Conditions					
	Lead Oxide Charge Weight (lbs)	4,800	7,200	4,800	**5,600**
	Oxide Delivery	none	16,576	none	
Gas Conditions					
Ts	Temperature (oF)	132	134	140	**135**
Bwo	Moisture (volume %)	2.58	2.70	2.37	**2.55**
O_2	Oxygen (dry volume %)	20.8	20.8	20.8	**20.8**
CO_2	Carbon dioxide (dry volume %)	0.2	0.2	0.2	**0.2**
Vmstd	Volume metered, standard (ft3)	39.08	38.61	37.18	**38.29**
Volumetric Flow Rate					
Qa	Actual conditions (acfm)	6,900	7,117	7,073	**7,030**
Qstd	Standard conditions (dscfm)	5,888	6,045	5,961	**5,965**
Lead (Pb)					
Mn	Net weight (µg)	676.6	906.6	746.6	**776.6**
C	Concentration (gr/dscf)	0.00027	0.00036	0.00031	**0.00031**
C	Concentration (mg/dscm)	0.611	0.829	0.709	**0.716**
E	Emission rate (lb/hr)	0.013	0.019	0.016	**0.016**

Battery Builders, Inc.
CAE Project No: 8670
Baghouse No. 1

VISIBLE EMISSION PARAMETERS

Run 1

Date (2000) April 26
Start Time 10:45

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

Average Opacity (1 hour) **0**
Minimum Reading (15 second) **0**
Maximum Reading (15 second) **0**
No. of Readings >0% (15 second) **0**

SIX MINUTE RUNNING AVERAGES

Time (sec) 15	30	45	60
			0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Maximum Average (6 minute) **0**

Revision 0

Battery Builders, Inc.
CAE Project No: 8670
Baghouse No. 1

VISIBLE EMISSION PARAMETERS

Run 2

Date (2000) April 26
Start Time 12:40

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

Average Opacity (1 hour)	**0**
Minimum Reading (15 second)	**0**
Maximum Reading (15 second)	**0**
No. of Readings >0% (15 second)	**0**

SIX MINUTE RUNNING AVERAGES

Time (sec) 15	30	45	60
			0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
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0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Maximum Average (6 minute) **0**

Revision 0

Battery Builders, Inc.
CAE Project No: 8670
Baghouse No. 1

VISIBLE EMISSION PARAMETERS

Run 3

Date (2000) April 26
Start Time 14:22

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

Average Opacity (1 hour) **0**
Minimum Reading (15 second) **0**
Maximum Reading (15 second) **0**
No. of Readings >0% (15 second) **0**

SIX MINUTE RUNNING AVERAGES

Time (sec) 15	30	45	60
			0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
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0	0	0	0
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0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
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0	0	0	0
0	0	0	0
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0	0	0	0
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0	0	0	0
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0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Maximum Average (6 minute) **0**

Revision 0

BATTERY BUILDERS, INC.
CAE Project No: 8670
Mixer Stack

LEAD
VELOCITY AND MOISTURE PARAMETERS

Run No.		1	2	3
Date (2000)		April 27	April 27	April 27
Start Time (approx.)		08:36	10:44	12:37
Stop Time (approx.)		10:01	12:09	14:16
Sampling Conditions				
Y_d	Dry gas meter correction factor	0.9912	0.9912	0.9912
C_p	Pitot tube coefficient	0.84	0.84	0.84
P_g	Static pressure (in. H_2O)	0.0	-0.1	-0.1
A_s	Sample location area (ft^2)	1.23	1.23	1.23
P_{bar}	Barometric pressure (in. Hg)	29.30	29.30	29.30
D_n	Nozzle diameter (in.)	0.316	0.316	0.316
O_2	Oxygen (dry volume %)	20.8	20.8	21.0
CO_2	Carbon dioxide (dry volume %)	0.2	0.2	0.0
V_{lc}	Liquid collected (ml)	55.5	64.4	64.0
V_m	Volume metered, meter conditions (ft^3)	53.72	54.34	54.33
T_m	Dry gas meter temperature (°F)	60	70	80
T_s	Sample temperature (°F)	88	91	95
ΔH	Meter box orifice pressure drop (in. H_2O)	2.50	2.55	2.58
Θ	Total sampling time (min)	60	60	60
Flow Results				
V_{wstd}	Volume of water collected (ft^3)	2.61	3.03	3.01
V_{mstd}	Volume metered, standard (ft^3)	53.24	52.91	51.87
P_s	Sample gas pressure, absolute (in. Hg)	29.30	29.29	29.29
P_v	Vapor pressure, actual (in. Hg)	1.32	1.47	1.66
B_{wo}	Moisture in sample (% by volume)	4.68	5.42	5.49
B_{ws}	Saturated moisture (% by volume)	4.52	5.02	5.68
$\sqrt{\Delta P}$	Velocity head ($\sqrt{\text{in. } H_2O}$)	0.496	0.507	0.516
M_d	MW of sample gas, dry (lb/lb-mole)	28.86	28.86	28.84
M_s	MW of sample gas, wet (lb/lb-mole)	28.37	28.32	28.24
V_s	Velocity of sample (ft/sec)	28.9	29.7	30.4
%I	Isokinetic sampling (%)	104.2	102.1	99.1
Q_a	Volumetric flow rate, actual (acfm)	2,130	2,185	2,235
Q_{std}	Volumetric flow rate, standard (dscfm)	1,919	1,945	1,966

/ Runs 1 and 2 were saturated. Saturated moisture values were used in all calculations.

BATTERY BUILDERS, INC.
CAE Project No: 8670
Mixer Stack

LEAD PARAMETERS

Run No.		1	2	3	Average
Date (2000)		April 27	April 27	April 27	
Start Time (approx.)		08:36	10:44	12:37	
Stop Time (approx.)		10:01	12:09	14:16	
Process Conditions					
	Lead Oxide Charge Weight (lbs)	7,200	7,200	7,200	**7,200**
Gas Conditions					
Ts	Temperature (»F)	88	91	95	**91**
Bwo	Moisture (volume %)	4.68	5.42	5.49	**5.19**
O_2	Oxygen (dry volume %)	20.8	20.8	21.0	**20.9**
CO_2	Carbon dioxide (dry volume %)	0.2	0.2	0.0	**0.1**
Vmstc	Volume metered, standard (ft3)	53.24	52.91	51.87	**52.7**
Volumetric Flow Rate					
Qa	Actual conditions (acfm)	2,130	2,185	2,235	**2,183**
Qstd	Standard conditions (dscfm)	1,919	1,945	1,966	**1,943**
Lead (Pb)					
Mn	Net weight (µg)	126.6	156.6	186.6	**156.6**
C	Concentration (gr/dscf)	0.000037	0.000046	0.000056	**0.00005**
C	Concentration (mg/dscm)	0.084	0.105	0.127	**0.105**
E	Emission rate (lb/hr)	0.00060	0.00076	0.00094	**0.00077**

Battery Builders, Inc.
CAE Project No: 8670
Mixer

VISIBLE EMISSION PARAMETERS

Run 1

Date (2000) April 27
Start Time 8:36

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

Average Opacity (1 hour) 0
Minimum Reading (15 second) 0
Maximum Reading (15 second) 0
No. of Readings >0% (15 second) 0

SIX MINUTE RUNNING AVERAGES

Time (sec) 15	30	45	60
			0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Maximum Average (6 minute) 0

Revision 0

Battery Builders, Inc.
CAE Project No: 8670
Mixer

VISIBLE EMISSION PARAMETERS

Run 2

Date (2000) April 27
Start Time 10:44

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

Average Opacity (1 hour) **0**
Minimum Reading (15 second) **0**
Maximum Reading (15 second) **0**
No. of Readings >0% (15 second) **0**

SIX MINUTE RUNNING AVERAGES

Time (sec) 15	30	45	60
			0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Maximum Average (6 minute) **0**

Revision 0

Battery Builders, Inc.
CAE Project No: 8670
Mixer

VISIBLE EMISSION PARAMETERS

Run 3

Date (2000) April 27
Start Time 12:37

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

Average Opacity (1 hour) 0
Minimum Reading (15 second) 0
Maximum Reading (15 second) 0
No. of Readings >0% (15 second) 0

SIX MINUTE RUNNING AVERAGES

Time (sec) 15	30	45	60
			0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	0

Maximum Average (6 minute) 0

CALIBRATION DATA

C

NOZZLE CALIBRATION SHEET

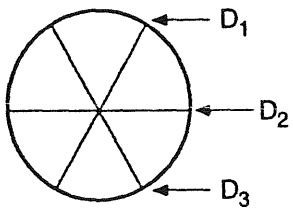
Client	Battery Builders	Project Number	8670
Calibrated by	B. Kozicakowski	Unit	Mixer Cooling Exhaust
Date	4/27/00	Runs	1-3

Nozzle Identification	D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	ΔD_{ave} (inches)
	.316	.316	.317	.001	.316

D_1, D_2, D_3 = three nozzle diameter measurements

ΔD = maximum difference between any two diameters
$\Delta D \leq 0.004$ inches*

ΔD_{avg} = average of D_1, D_2, D_3



* (40 CFR 60, Appendix A, Method 5, Section 5.1)

Nozzle Calibration Sheet

Client: Battery Builders Inc.

Job or Ref No: 8670

Calibrated by: B. Koziarkarski

Unit: Baghouse No. 1

Date: 4/26/00

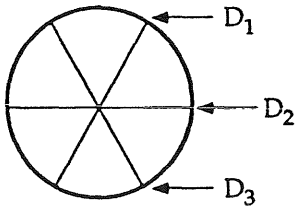
Runs: 1 - 3

Nozzle Identification	D_1 (inches)	D_2 (inches)	D_3 (inches)	ΔD (inches)	ΔD_{ave} (inches)
	.240	.240	.240	.000	.240

D_1, D_2, D_3 = three nozzle diameter measurements

ΔD = maximum difference between any two diameters
$\Delta D \leq 0.004$ inches*

ΔD_{avg} = average of D_1, D_2, D_3



* (40 CFR 60, Appendix A, Method 5, Section 5.1)

Sample Probe Calibration

Probe Type: M-5 I.D. Number: 47-4-1

Thermocouple Calibration

rence Type: _____ Reference I.D. No: _____ Pyrometer I.D. No: _____ Degrees:

Point No.	Target Temp.	Reference Temp.	Indicated Temp.	Temp. Difference	% Difference*
1	Ice-32F				
2	Ambient-70F				
3	Hot Oil-150F				
4	Boiling H_2O-212F				
5	Hot Oil-320F				

Specification: %Difference ≤ 1.5

* Based on Absolute Temperature (Rankine)

Does assembly meet specifications?

Geometric Pitot Calibration

"S" Pitot

Measurement			Specification
=	1	α2(°)= 3	≤10°
=	0	β2(°)= 1	≤05°
(°)=	0	θ(°)= 1	
)=	.370	Pb(°)= .366	Pa + Pb = A
=	.236	Dt(°)= .250	

Calculations

Z(°)= A sin γ =	0	≤ 0.125"
Y(°)= A sin θ =	.01284	≤ 0.03125"

Standard Pitot

Measurement (inches)		Specification
Tube O.D.		(D)
Static Hole I.D.		≈ 0.1 x (D)
Length:		
Tip to Static		≥ 6 x (D)
Static to Bend		≥ 8 x (D)

Does assembly meet specifications? YES → If "Yes", "S" pitot Cp=0.84; Std. Pitot=0.99. If "No", wind tunnel calibration is required.

Wind Tunnel Calibration

Reference Pitot I.D. No: _____ Reference Pitot Cp: _____

Pitot Side 'A':

Trial No.	Reference P	Probe P	Probe Cp*	Deviation from Average Cp*
1				
2				
3				

Side 'A' Average Probe Cp= _____

Specification: Cp Deviations ≤ 0.01

Pitot Side 'B':

Trial No.	Reference P	Probe P	Probe Cp*	Deviation from Average Cp*
1				
2				
3				

Side 'B' Average Probe Cp= _____

Specification: Cp Deviations ≤ 0.01

*Probe Cp= (Reference Cp)√(Reference ΔP/ Probe ΔP); Cp Deviation= Trial Cp - Average Probe Cp

'A' Average Cp	—	'B' Average Cp	=	Difference

|Difference| ≤ 0.01

Does assembly meet specifications? → If "Yes", Cp= Average of Side 'A' and 'B' Cp values. If "No", Pitot must be replaced.

All specifications are from EPA-600/8-76-005, section 3.1

Probe Cp= 0.84 Calibrated by: [signature] Date: 8-26-99

Clean Air Engineering

Meter Box Critical Orifice Post-Test Calibration Data

CAE Project No. 8670

Location

Date 4.27.2000

Operator Name G. Pavlovics

Meter No. 666

Meter Y_d .9912

Meter $\Delta H_@$ 1.8310

Full-Test Cal. Date 2.22.00

Orifice I.D. N-3

Orifice K' .5704

Orifice Cal. Date 10.4.99

Leak Checks

Negative Pressure
No Movement of Meter in 1 minute ☒ Pass ☐ Fail

Positive Pressure
No Movement of Manometer in 1 minute ☐ Pass ☐ Fail

Important: All leak checks must pass in order for calibration to be valid.

Barom. Press. (P_b) 29.20 in. Hg

Run	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp. - T_{amb} (°F)	Orifice ΔH (in.W.C.)	Vacuum (in. Hg)	Net Run Time - θ (minutes)	Net Meter Volume for Run - V_m (dcf)	Avg Meter Temp. for Run - T_m	DGM Calibration Factor - Y_i	Percent Variation - ΔY_i
	0.0	326.00	82	82	77							
1	5	329.85	81	82	78	1.8	13.0	5				%
2	10	333.70	81	82	78	1.8	13.0	5				%
3	15	337.54	81	82	79	1.8	13.0	5				%

Average Y_i

Cal.Error %

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y}_i}{\overline{Y}_i} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y}_i - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

Clean Air Engineering

CS 005 Critical Orifice
EXCL/D68 B3-10/15/95

Meter Box Critical Orifice Post-Test Calibration Data

CAE Project No.	8670	Meter No.	66-6	Orifice I.D.	N-3
Location	Both	Meter Y_d	0.9912	Orifice K'	0.5704
Date	7/27/00	Meter $\Delta H_@$	1.8310	Orifice Cal. Date	10/4/99
Operator Name	G. Pavlovics	Full-Test Cal. Date	2/22/00		

Leak Checks

Negative Pressure
No Movement of Meter in 1 minute — ■ Pass ☐ Fail

Positive Pressure
No Movement of Manometer in 1 minute — ■ Pass ☐ Fail

Important: All leak checks must pass in order for calibration to be valid.

Barom. Press. (P_b) 29.20 in. Hg

Run	Elapsed Time (minutes)	Meter Volume (dcf)	Meter Temperature Inlet (°F)	Meter Temperature Outlet (°F)	Ambient Temp. - T_{amb} (°F)	Orifice ΔH (in.W.C.)	Vacuum (in. Hg)	Net Run Time - θ (minutes)	Net Meter Volume for Run - V_m (dcf)	Avg Meter Temp. for Run - T_m	DGM Calibration Factor - Y_i	Percent Variation - ΔY_i
	0.0	326.00	82	82								
1	5.0	329.85	81	82	78	1.80	13.0	5.0	3.85	81.8	0.9764	0.0%
2	10.0	333.70	81	82	78	1.80	13.0	5.0	3.85	81.5	0.9760	-0.1%
3	15.0	337.54	81	82	79	1.80	13.0	5.0	3.84	81.5	0.9776	0.1%

Average Y_i	0.9767
Cal.Error	-1.5%

Calculations and Specifications

$$Y_i = \frac{K' \times P_b \times (T_m + 460) \times \theta}{17.64 \times V_m \times \left(P_b + \Delta H/13.6\right) \times \sqrt{T_{amb} + 460}}$$

$$\Delta Y_i = \frac{Y_i - \overline{Y_i}}{\overline{Y_i}} \times 100 \qquad \text{Spec.: } \Delta Y_i \le \pm 2\%$$

$$Cal.Error = \frac{\overline{Y_i} - Y_d}{Y_d} \times 100 \qquad \text{Spec.: } Cal.Error \le \pm 5\%$$

Clean Air Engineering

CS 005 Critical Orifice
EXCL/D68.R3-10/15/95

Pyrometer Calibration Test Report

Pyrometer No.:	66-6	Office:	Palatine, Il
Calibrated By:	MARTIN V.	Client:	
Date:	2/22/00	Job Number:	

Calibration Reference Settings for Fahrenheit Scale	Pyrometer Reading
50 °F	50 °F
100 °F	99 °F
150 °F	150 °F
200 °F	201 °F
250 °F	251 °F
300 °F	301 °F
350 °F	350 °F
400 °F	399 °F
450 °F	449 °F
500 °F	499 °F
550 °F	548 °F
600 °F	598 °F

Calibration Reference Information

Reference Used:	Omega Cl-23	Serial No:	T-87859
Calibrated By:	J.H. Metrology Co.	Date:	6/8/98
Report No:	R022976		

Clean Air Engineering

Meter Box No: 66-6	Meter Box ΔH@: 1.8310	Meter Box Y_d: 0.9912	Barometric Pressure: 29.48

				Standard Meter Gas Volume			Meter Box Gas Volume (ft^3)			Std. Meter Temperature (°F)			Meter Box Temperature (°F)					
Q	ΔH	ΔP	Y_{ds}	Initial	Final	V_{ds}	Initial	Final	V_d	Inlet	Outlet	T_{ds}	Inlet	T_o	T_d	Time	Y_d	H@
0.923	3.00	-2.10	1.0000	0.0	10.000	10.000	418.927	429.118	10.191	72.0	72.0	72.0	88.0	81.0	84.5	10.59	0.9916	1.9046
0.922	3.00	-2.10	1.0000	0.0	10.000	10.000	429.118	439.292	10.174	72.0	72.0	72.0	88.0	81.0	84.5	10.60	0.9933	1.9082
0.392	0.50	-1.30	1.0000	0.0	5.000	5.000	442.823	447.948	5.125	72.0	72.0	72.0	84.0	81.0	82.5	12.48	0.9904	1.7634
0.392	0.50	-1.30	1.0000	0.0	5.000	5.000	447.948	453.072	5.124	72.0	72.0	72.0	84.0	81.0	82.5	12.46	0.9906	1.7577
0.668	1.50	-1.50	1.0000	0.0	10.000	10.000	457.462	467.720	10.258	72.0	72.0	72.0	87.0	82.0	84.5	14.64	0.9903	1.8166
0.664	1.50	-1.50	1.0000	0.0	10.000	10.000	499.543	509.816	10.273	72.0	72.0	72.0	88.0	83.0	85.5	14.73	0.9907	1.8356
															AVERAGE		0.9912	1.8310

Nomenclature

P_b	Barometric Pressure (in. Hg)
Q	Flow Rate (cfm)
ΔH	Orifice Pressure Differential (in. H_20)
ΔP	Inlet Pressure Differential (in. H_20)
V_d	Gas Meter Volume - Dry (ft^3)
V_{ds}	Standard Meter Volume - Dry (ft^3)
T_d	Average Meter Box Temperature (°F)
T_o	Outlet Meter Box Temperature (°F)
T_{ds}	Average Standard Meter Temperature (°F)
Y_d	Meter Correction Factor (unitless)
Y_{ds}	Standard Meter Correction Factor (unitless)
ΔH@	Orifice Pressure Differential giving 0.75 cfm of air at 68°F and 29.92 in. Hg (in. H_20)

Vacuum Gauge

Standard (in. Hg)	Vacuum Gauge
4.9	5.0
10.0	10.0
15.4	15.0
20.4	20.0
23.0	23.0

Thermometers

Standard (°F)	Inlet	Outlet

Equations

$$Y_d = (Y_{ds})\left[\frac{V_{ds}}{V_d}\right]\left[\frac{T_d + 460}{T_{ds} + 460}\right]\left[\frac{P_b + \Delta P / 13.6}{P_b + \Delta H / 13.6}\right]$$

$$\Delta H@ = \frac{0.0319(\Delta H)}{P_b(T_o + 460)}\left[\frac{(T_{ds} + 460)\,\Theta}{(V_{ds})(Y_{ds})}\right]^2$$

$$Q = \frac{17.64\,(V_{ds})\,(P_b)}{(T_{ds} + 460)\,(\Theta)}$$

Clean Air Engineering

FIELD DATA

D

METHOD 1 FIELD DATA SHEET

TEST LOCATION: BAGHOUSE

UNIT : 1

Client	Battery Bldg. Inc.	Project No.	8670
Plant	Naiah Villa, N.C.	Date	4/26/00
Duct Dimensions ~~[illegible]~~ (in.)		Area	2.95 (ft²)
Port Length	0 (in.)	Port Diameter	3 (in.)
Port Height	24 (ft.)		
Duct Diameters Upstream (A)	1.22 (in.)		
Duct Diameters Downstream (B)	4.62 (in.)		
Number of Points Required	24		
Number of Points / Port Required	6		

Point	% Diameter (Round Stacks Only)	Point Distance X	Probe Mark X+ Port Depth
1	1.625		
2	4.875		
3	8.125		
4	11.375		
5	14.625		
6	17.875		

Location Schematic
Show side view of stack, indicating disturbances and port placement.

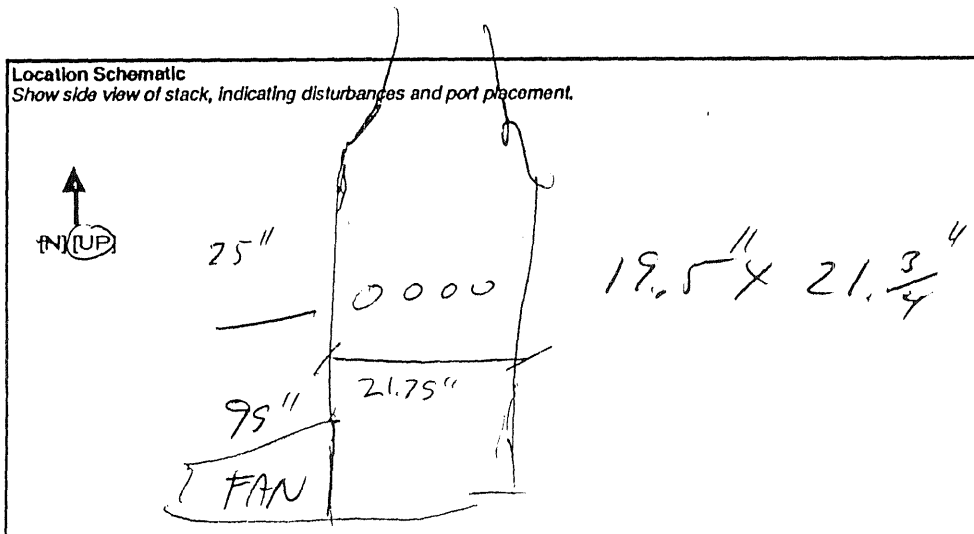
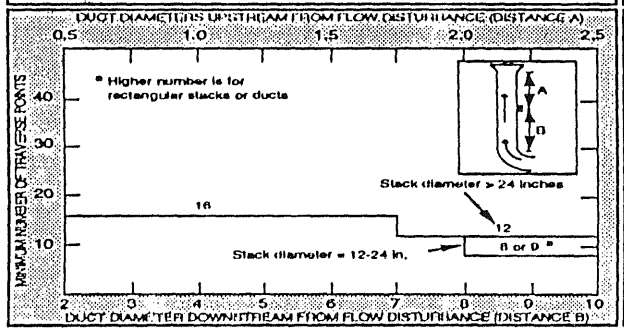


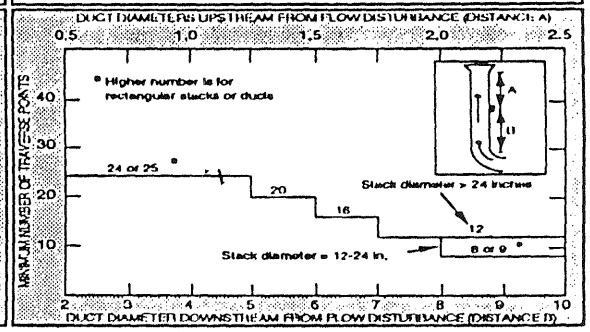
Table 1-2 of EPA Method 1 - Location of Traverse Points in Circular Stacks
(Percent of stack diameter from inside wall to traverse point)

Traverse point number	Number of traverse points on a diameter: 2	4	6	8	10	12
1	14.6	6.7	4.4	3.2	2.6	2.1
2	85.4	25.0	14.6	10.5	8.2	6.7
3		75.0	29.6	19.4	14.6	11.8
4		93.3	70.4	32.3	22.6	17.7
5			85.4	67.7	34.2	25.0
6			95.6	80.6	65.8	35.6
7				89.5	77.4	64.4
8				96.8	85.4	75.0
9					91.8	82.3
10					97.4	88.2
11						93.3
12						97.9

Loaction Schematic
Show cross-section of stack, indicating port placement.

Gas Flow
[in] [out]
of page





DS 001 Sampling Point Determination
EXCEL/WRH.R2-3/7/96

Circle correct bracketed directions on data sheet.

Clean Air Engineering

TEST LOCATION: STACK

UNIT: 1 BAGHOUSE RUN: 1

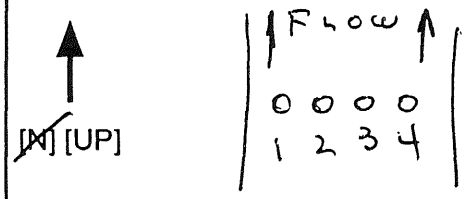
LEAD TESTING FIELD DATA SHEET

METHOD: 12 PAGE 1 OF 2

Client BATTERY BUILDERS, INC	Project No. 8670
Plant NAPERVILLE, IL	Date 4.26.00
Meter Operator G. PAVLOVICS	
Probe Operator B. KOZICZKOWSKI	

Meter Box No. 66.6	Sample Box No. 67.B.1
Meter Yd .9912	Meter ΔH@ 1.8310
K Factor 3.3	Pitot Cp .84
Leak Rate Before .005	[cfm] [~~Lpm~~] @ 17 (in.Hg)
Leak Rate After .004	[cfm] [~~Lpm~~] @ 6 (in.Hg)
Pitot Leak Check Before: ☒	After: Good ☒ Bad ☐

Cross-Section of Test Location



Duct Dimensions (in.)	19.50 x 21.75		
Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]
-.20	0		

Amb. Temp. (°F) 65	Bar. Press. 29.40 [in. Hg] [~~mbar~~]
Probe I.D. No. 67.4.1	
Liner Material GLASS	

Filter No. 203465		
Thimble No. N/A		
Nozzle Diameter .240	Nozzle I.D.	

H_2O 13.0 [ml] [~~gm~~]	Silica Gel (gm) 9.0
Total V_{lc} 22.0	

Start Time: 10:44A	Stop Time: 11:47A

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (In. H_2O)	Orifice Setting ΔH (In. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [~~L~~] 27.30	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
1-1	2.5	.47	1.6	29.12	127	250	244	54	78	79	3	N/A	ΔP ACROSS BAGHOUSE
2	5	.45	1.5	30.89	131	250	247	50	78	79	3	N/A	6.4" wc.
3	7.5	.47	1.6	32.65	131	250	247	48	77	78	4	N/A	
4	10	.43	1.4	34.33	131	250	248	48	77	78	3	N/A	
5	12.5	.43	1.4	36.04	131	250	247	47	76	76	3	N/A	
6	15	.43	1.4	37.73	130	249	246	47	75	74	4	N/A	
2-1	17.5	.48	1.6	39.54	130	250	246	49	73	74	4	N/A	
2	20	.51	1.7	41.38	132	251	247	51	75	73	4	N/A	
3	22.5	.48	1.6	43.17	131	250	246	51	75	72	4	N/A	
4	25	.41	1.4	44.87	132	250	247	52	74	72	3	N/A	
5	27.5	.37	1.2	46.48	132	251	248	54	75	72	3	N/A	
6	30	.41	1.4	48.16	135	251	247	55	74	71	3	N/A	
	Total	*		40.49						1805			
	Average	.6479	1.396		131.8				74.4				

* Sum of square roots.

Circle correct bracketed units on data sheet.

DS 001 General
CNVS/TRG.R3-4/6/94

199787 17.8

1573

Clean Air Engineering

TEST LOCATION: STACK

UNIT: 1 BAGHOUSE RUN: 1

LEAD TESTING FIELD DATA SHEET

METHOD: 12 PAGE 2 OF 2

Client BATTELLE BUILDERS, INC	Project No. 8670
Plant NAPERVILLE, IL	Date 4.26.00
Meter Operator G. PAVLOVICS	
Probe Operator B. KOZICZKOWSKI	

Meter Box No.	Sample Box No.
Meter Yd	Meter ΔH@
K Factor	Pitot Cp
Leak Rate Before	[cfm] [Lpm] @ (in.Hg)
Leak Rate After	[cfm] [Lpm] @ (in.Hg)
Pitot Leak Check Before: ☐	After: Good ☐ Bad ☐

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Probe I.D. No.	
Liner Material	

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

H_2O [ml] [gm]	Silica Gel (gm)
Total V_{lc}	

Start Time:	Stop Time:

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [L]	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
3-1	32.5	.46	1.5	49.90	134	250	247	54	74	71	4	N/A	
2	35	.41	1.4	51.60	134	251	247	55	74	70	4	N/A	
3	37.5	.36	1.2	53.18	133	250	247	56	75	71	3	N/A	
4	40	.34	1.1	54.67	133	251	247	56	76	72	3	N/A	
5	42.5	.36	1.2	56.24	132	251	247	56	75	71	3	N/A	
6	45	.37	1.2	57.77	131	250	246	56	75	71	3	N/A	
4-1	47.5	.42	1.4	59.46	131	251	248	57	75	71	3	N/A	
2	50	.39	1.3	61.11	132	251	247	57	76	72	3	N/A	
3	52.5	.40	1.3	62.76	132	251	247	57	77	73	3	N/A	
4	55	.39	1.3	64.41	132	251	247	58	77	73	3	N/A	
5	57.5	.43	1.4	66.09	133	250	246	57	76	73	4	N/A	
6	60	.43	1.4	67.79	133	250	247	58	76	73	3	N/A	
	Total	*								1767			
	Average				1590								

DS 001 General
CNVS/TRG.R3-4/6/94

* Sum of square roots.

7.5509 15.7

Circle correct bracketed units on data sheet.

Clean Air Engineering

TEST LOCATION: STACK

UNIT: 1 BAGHOUSE **RUN:** 2

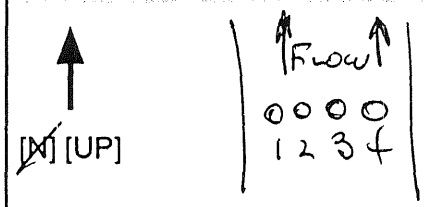
LEAD TESTING FIELD DATA SHEET

METHOD: 12 **PAGE** 1 **OF** 2

Client BATTERY BUILDERS, INC	Project No. 8670
Plant NAPERVILLE, IL	Date 4.26.00
Meter Operator G. PAVLOVICS	
Probe Operator B. KOZICZKOWSKI	

Meter Box No. 66.6	Sample Box No. 67.48
Meter Yd .9912	Meter ΔH@ 1.8310
K Factor 3.1	Pitot Cp .84
Leak Rate Before .006 [cfm] [~~Lpm~~] @ 16 (in.Hg)	
Leak Rate After .003 [cfm] [~~Lpm~~] @ 6 (in.Hg)	
Pitot Leak Check Before: [X]	After: Good [X] Bad [ ]

Cross-Section of Test Location



Duct Dimensions (in.) 19.50 x 21.75

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]
-.20	0		

Amb. Temp. (°F) 65	Bar. Press. 29.40 [in. Hg] [~~mbar~~]
Probe I.D. No. 67.4.1	
Liner Material GLASS	

Filter No. 203578		
Thimble No. N/A		
Nozzle Diameter .240	Nozzle I.D.	

H_2O 14.2 [ml] [~~gm~~]	Silica Gel (gm) 8.6
Total V_{lc} 22.8	

Start Time: 12:39p	Stop Time: 13:42

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [~~L~~] 68.40	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
1-1	2.5	.48	1.5	70.15	133	251	247	58	75	75	4	N/A	AP ACROSS BAGHOUSE
2	5	.48	1.5	71.91	136	251	249	48	76	75	4	N/A	6.5" WC.
3	7.5	.44	1.4	73.59	136	251	248	47	78	76	4	N/A	
4	10	.41	1.3	75.24	137	251	248	47	79	76	3	N/A	
5	12.5	.43	1.3	76.88	135	251	248	46	80	76	3	N/A	OXIDE START 12:47
6	15	.45	1.4	78.54	134	251	248	48	81	76	3	N/A	12:47
2-1	17.5	.56	1.7	80.39	135	252	249	50	81	77	4	N/A	
2	20	.54	1.7	82.25	133	251	247	48	82	77	4	N/A	
3	22.5	.52	1.6	84.05	133	251	248	50	83	77	4	N/A	
4	25	.42	1.3	85.70	133	251	248	51	83	78	3	N/A	
5	27.5	.40	1.2	87.28	132	251	248	51	82	78	3	N/A	
6	30	.38	1.2	88.81	133	251	248	53	83	79	3	N/A	
	Total	*		40.42						1883			
	Average	.6669	1.383		133.8				80.0				

DS 001 General
CNVS/TRG.R3-4/6/94

* Sum of square roots.

Circle correct bracketed units on data sheet.

Clean Air Engineering

TEST LOCATION: STACK

UNIT: 1 BAGHOUSE **RUN:** 2

LEAD TESTING FIELD DATA SHEET

METHOD: 12 **PAGE** 2 **OF** 2

Client BATTERY BUILDERS, INC	Project No. 8670
Plant NAPERVILLE, IL	Date 4.26.00
Meter Operator G. PAVLOVICS	
Probe Operator R. KOZICZKOWSKI	

Meter Box No.	Sample Box No.
Meter Yd	Meter ΔH@
K Factor	Pitot Cp
Leak Rate Before	[cfm] [Lpm] @ (in.Hg)
Leak Rate After	[cfm] [Lpm] @ (in.Hg)
Pitot Leak Check Before: ☐	After: Good ☐ Bad ☐

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)			
Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]	
Probe I.D. No.		
Liner Material		

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

H_2O [ml] [gm]	Silica Gel (gm)
Total V_{lc}	

Start Time:	Stop Time:

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [L]	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
3-1	32.5	.51	1.6	90.65	132	251	247	52	83	78	4	N/A	
2	35	.43	1.3	92.32	135	251	248	54	84	79	3	N/A	
3	37.5	.40	1.2	93.93	133	251	247	53	83	79	4	N/A	
4	40	.36	1.1	95.46	133	250	247	52	82	79	3	N/A	
5	42.5	.36	1.1	96.99	133	250	247	54	82	79	3	N/A	
6	45	.39	1.2	98.55	133	251	247	55	82	79	3	N/A	
4-1	47.5	.46	1.4	100.24	133	251	248	55	83	80	3	N/A	
2	50	.45	1.4	101.92	134	252	248	55	84	80	3	N/A	
3	52.5	.47	1.5	103.66	134	251	248	55	85	80	4	N/A	
4	55	.43	1.3	105.29	134	251	247	55	85	80	3	N/A	
5	57.5	.47	1.5	107.04	134	252	248	55	86	81	4	N/A	
6	60	.47	1.5	108.82	132	251	247	55	85	81	4	N/A	
	Total	*7.8883	16.1							1959			
	Average				1600								

DS 001 General
CNVS/TRG.R3-4/6/94

* Sum of square roots.

Circle correct bracketed units on data sheet.

Clean Air Engineering

TEST LOCATION: STACK

UNIT: 1 BAGHOUSE **RUN:** 3

(LEAD) TESTING FIELD DATA SHEET

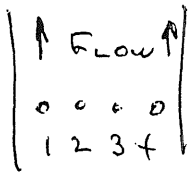
METHOD: 12 **PAGE** 1 **OF** 2

Client BATTERY BUILDERS, INC	Project No. 8670
Plant NAPERVILLE, IL	Date 4.26.00
Meter Operator G. PAVLOVICS	
Probe Operator B. KOZICZKOWSKI	

Meter Box No. 66.6	Sample Box No. 67.B1
Meter Yd .9912	Meter ΔH@ 1.8310
K Factor 3.1	Pitot Cp .84
Leak Rate Before .005 [cfm] [~~Lpm~~] @ 15 (in.Hg)	
Leak Rate After .002 [cfm] [~~Lpm~~] @ 5 (in.Hg)	
Pitot Leak Check Before: ☒	After: Good ☒ Bad ☐

Cross-Section of Test Location

[~~N~~] [UP]



Duct Dimensions (in.)	19.50 x 21.75		
Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way (In) [Out]
-.20	0		

Amb. Temp. (°F) 70	Bar. Press. 29.40 [in. Hg] [~~mbar~~]
Probe I.D. No. 67.4.1	
Liner Material GLASS	

Filter No. 203466		
Thimble No. N/A		
Nozzle Diameter .240	Nozzle I.D.	

H_2O 12.5 [ml] (gm)	Silica Gel (gm) 6.7
Total V_{lc} 19.2	
Start Time: 14:21	Stop Time: 15:24

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [~~L~~] 109.40	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
1-1	2.5	.45	1.4	111.07	138	252	246	63	82	83	3	N/A	ΔP ACROSS BAGHOUSE
2	5	.52	1.6	112.97	141	251	248	58	83	83	4	N/A	6.7" w.c.
3	7.5	.48	1.5	114.66	140	251	248	55	83	82	4	N/A	
4	10	.43	1.3	116.29	141	252	248	56	86	84	3	N/A	
5	12.5	.43	1.3	117.92	141	250	250	55	86	84	3	N/A	
6	15	.39	1.2	119.50	141	250	249	57	87	85	3	N/A	
2-1	17.5	.57	1.8	121.28	141	249	249	59	87	85	4	N/A	ΔP = .57 ΔH = 1.8
2	20	.53	1.6	123.04	141	249	250	59	88	85	4	N/A	
3	22.5	.50	1.6	124.80	141	249	249	59	88	85	4	N/A	
4	25	.42	1.3	126.44	141	249	250	60	89	86	3	N/A	
5	27.5	.42	1.3	128.08	140	249	249	61	87	85	3	N/A	
6	30	.43	1.3	129.70	140	249	249	61	87	85	3	N/A	
	Total	*		39.45						2045			
	Average	.6595	1.346		140.4				87.2				

DS 001 General
CNVS/TRG.R3-4/6/94

* Sum of square roots.
8.1627

Circle correct bracketed units on data sheet.

Clean Air Engineering

TEST LOCATION: STACK

UNIT: 1 BAGHOUSE RUN: 3

LEAD TESTING FIELD DATA SHEET

METHOD: 12 PAGE 2 OF 5

Client BATTERY BUILDERS INC.	Project No. 8670
Plant NAPERVILLE, IL	Date 4.26.00
Meter Operator G. PAVLOVICS	
Probe Operator B. KOZICZKOWSKI	

Meter Box No.	Sample Box No.
Meter Yd	Meter ΔH@
K Factor	Pitot Cp
Leak Rate Before	[cfm] [Lpm] @ (in.Hg)
Leak Rate After	[cfm] [Lpm] @ (in.Hg)
Pitot Leak Check Before: ☐	After: Good ☐ Bad ☐

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)			
Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Probe I.D. No.	
Liner Material	

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

H_2O [ml] [gm]	Silica Gel (gm)
Total V_{lc}	

Start Time:	Stop Time:

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [L]	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
3-1	32.5	.50	1.6	131.48	141	250	251	63	90	87	4	N/A	
2	35	.38	1.2	133.06	140	248	249	61	89	86	3	N/A	
3	37.5	.35	1.1	134.59	140	249	250	62	90	87	3	N/A	
4	40	.33	1.0	136.07	141	250	250	59	91	88	3	N/A	
5	42.5	.39	1.2	137.63	140	249	249	55	90	88	3	N/A	
6	45	.43	1.3	139.25	140	250	250	54	91	88	3	N/A	
4-1	47.5	.40	1.2	140.83	139	249	249	52	89	88	3	N/A	
2	50	.43	1.3	142.44	141	250	250	52	90	88	3	N/A	
3	52.5	.43	1.3	143.99	142	250	251	52	92	88	3	N/A	
4	55	.41	1.3	145.64	141	249	249	51	91	88	3	N/A	
5	57.5	.43	1.3	147.24	141	250	250	51	92	89	3	N/A	
6	60	.43	1.3	148.85	138	250	250	51	92	89	3	N/A	
	Total	*											
	Average												

DS 001 General
CNVS/TRG B3-4/6/94

* Sum of square roots.

Circle correct bracketed units on data sheet.

1684

Clean Air Engineerin

Impinger Weight Sheet

Client: Battery Builders Unit Name: Baghouse No. 1

Plant: Naperville, IL Job #: 8670 Method: 12

Sample Box #: 67/B1 Date: 4/26/00

Run #: 1

	Contents	Gross Weight	Tare Weight	Net Weight Gain	Total Weight
Impinger 1	100 mL 0.1N HNO_3	587.7	529.1	58.6	
Impinger 2*	100 mL 0.1N HNO_3	634.7	632.1	2.6	
Impinger 3	empty	439.5	437.6	1.9	
Impinger 4	silica gel	719.7	710.7	9.0	
Impinger 5	line rinse			-50.1	72.1
Impinger 6					-50.1 Line Rinse
Impinger 7					13.0
					22.0

*restricted tip,

Sample Box #: 67-48 Date: 4/26/00

Run #: 2

	Contents	Gross Weight	Tare Weight	Net Weight Gain	Total Weight
Impinger 1	100 mL 0.1N HNO_3	597.8	537.8	60.00	
Impinger 2*	100 mL 0.1N HNO_3	530.8	528.9	1.9	
Impinger 3	empty	430.9	~~430.2~~ BK 429.6	2.3	
Impinger 4	silica gel	715.9	707.3	8.6	
Impinger 5	line rinse			-50.0	72.8
Impinger 6					-50.0
Impinger 7					14.2
					22.8

*restricted tip.

Sample Box #: 67/B1 Date: 4/26/00

Run #: 3

	Contents	Gross Weight	Tare Weight	Net Weight Gain	Total Weight
Impinger 1	100 mL 0.1N HNO_3	588.3	529.3	59.0	
Impinger 2*	100 mL 0.1N HNO_3	637.3	BK ~~634.5~~ ~~635.4~~ 635.3	2.0	
Impinger 3	empty	441.2	439.7 ~~442.5~~ ~~440.6~~	1.5	
Impinger 4	silica gel	726.4	719.7 ~~721.5~~ BK	6.7	
Impinger 5	line rinse			-50.0	
Impinger 6					~~12~~ 12.5
					19.7

ORSAT READINGS

TEST LOCATION: Stack

PAGE 1 **OF** 1

Client	Battery Builders, Inc.	Project Number	8670	Fo = $\frac{20.9 - \%O_2}{\%CO_2}$
Plant	Naperville, IL	Unit	Brighouse No. 1	
Orsat ID	#5	Fuel Type		Leak Check Passed ☒

Run Number	Method Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Fo	Analyst	Analysis Date	Analysis Time
1	12	1	.2 BK	21.0	20.8			4/26	16:00
		2	.2	21.0	20.8				
		3	.2	21.0	20.8				
		Avg.	.2 BK	0.2	20.8				
2	12	1	~~0.~~2	21.0	20.8		BJK	4/26	16:15
		2	0.2	21.0	20.8				
		3	0.2	21.0	20.8				
		Avg.	0.2		20.8				
3	12	1	0.2	21.0	20.8		BJK	4/26	16:20
		2	0.2	21.0	20.8				
		3	0.2	21.0	20.8				
		Avg.	0.2		20.8				
		1							
		2							
		3							
		Avg.							
		1							
		2							
		3							
		Avg.							
		1							
		2							
		3							
		Avg.							

Repeat the analysis procedure until the results of any three analyses differ by no more than 0.2 percent by volume. Average the three acceptable values and report the results to the nearest 0.1 percent. Calculate Fo to verify results.

Acceptable ranges for Fo:

Coal:	Anthracite and lignite	1.016-1.130	Gas:	Natural	1.600-1.836
	Bituminous	1.083-1.230		Propane	1.434-1.586
Oil:	Distillate	1.260-1.413		Butane	1.405-1.553
	Residual	1.210-1.370	Wood:		1.000-1.120

Clean Air Engineering

Visible Emissions Observation Form

CLIENT/OWNER: Battery Builders Inc.	OBSERVATION DATE: 4/26/00
START TIME: 1045	END TIME: 1145
PLANT: Naperville, IL	UNIT: Baghouse #1
PROCESS EQUIPMENT: Pot	OPERATING MODE: Full
CONTROL EQUIPMENT: Baghouse	OPERATING MODE: Full
DESCRIBE EMISSION POINT: Round stack	
HEIGHT ABOVE GROUND LEVEL: 25'	DISTANCE FROM OBSERVER: 20'
HEIGHT RELATIVE TO OBSERVER: 10'	DIRECTION FROM OBSERVER: W
DESCRIBE EMISSIONS: None visible	
EMISSION COLOR: —	PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLETS PRESENT: YES ☐ NO ☒	IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐
POINT IN PLUME AT WHICH EMISSION WERE DETERMINED: After leaving stack	
DESCRIBE BACKGROUND: Blue sky	
WIND SPEED: 0-5	WIND DIRECTION: SW
AMBIENT TEMPERATURE: 60°	RELATIVE HUMIDITY: 35%

sec / min	15	30	45	60	sec / min	15	30	45	60
0	0	0	0	0	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	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	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

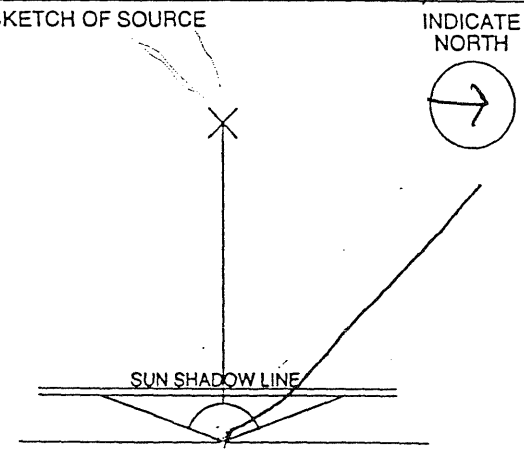
RANGE OF OPACITY READINGS
MINIMUM: 0 MAXIMUM: 0

OBSERVER'S NAME (PRINT): James S. Burton

OBSERVER'S SIGNATURE: James S. Burton DATE: 4/26/00

CERTIFIED BY: WISC. DNR DATE: 4/11/00

LAYOUT SKETCH OF SOURCE



COMMENTS: Was a little close to stack, but no other observation point was available. JB

Visible Emission Form
DS 009.R1/CNVS/TRG-8/1/93

Visible Emissions Observation Form

CLIENT/OWNER	Battery Builders Inc
PLANT	Naperville, IL
UNIT	Baghouse #1
PROCESS EQUIPMENT	
OPERATING MODE	Full
CONTROL EQUIPMENT	Baghouse
OPERATING MODE	Full
DESCRIBE EMISSION POINT	Round Stack
HEIGHT ABOVE GROUND LEVEL	25'
DISTANCE FROM OBSERVER	100'
HEIGHT RELATIVE TO OBSERVER	25'
DIRECTION FROM OBSERVER	NE
DESCRIBE EMISSIONS	None Visible
EMISSION COLOR	—
PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐	
WATER DROPLET'S PRESENT YES ☐ NO ☒	
IF WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐	
POINT IN PLUME AT WHICH EMISSION WERE DETERMINED	After Leaving Stack
DESCRIBE BACKGROUND	Blue Sky
WIND SPEED	0-5
WIND DIRECTION	N
AMBIENT TEMPERATURE	62
RELATIVE HUMIDITY	37%

OBSERVATION DATE	START TIME	END TIME
4/26/00	1240	1340

min \ sec	15	30	45	60	min \ sec	15	30	45	60
0	0	0	0	0	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	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	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

RANGE OF OPACITY READINGS
MINIMUM 0 MAXIMUM 0

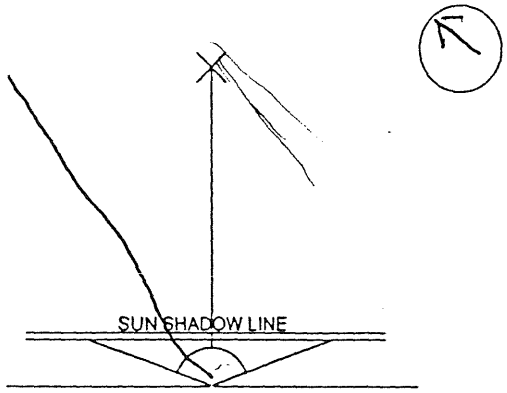
OBSERVER'S NAME (PRINT): James S Burton

OBSERVER'S SIGNATURE: James S Burton — DATE: 4/26/00

CERTIFIED BY: WISC DNR — DATE: 4/11/00

LAYOUT SKETCH OF SOURCE

INDICATE NORTH



COMMENTS

Visible Emission Form
DS 009.R1/CNVS/TRG-8/1/93

Visible Emissions Observation Form

CLIENT/OWNER: Battery Building Inc.	OBSERVATION DATE: 4/26/00
START TIME: 1422	END TIME: 1522
PLANT: Naperville, Il	UNIT: Baghouse #1
PROCESS EQUIPMENT:	OPERATING MODE: Full
CONTROL EQUIPMENT: Bag House	OPERATING MODE: Full
DESCRIBE EMISSION POINT: Round Stack	
HEIGHT ABOVE GROUND LEVEL: 25'	DISTANCE FROM OBSERVER: 100'
HEIGHT RELATIVE TO OBSERVER: 25'	DIRECTION FROM OBSERVER: NR
DESCRIBE EMISSIONS: None visible	
EMISSION COLOR: —	PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐
WATER DROPLET'S PRESENT: YES ☐ NO ☒	IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐
POINT IN PLUME AT WHICH EMISSION WERE DETERMINED: After Leaving Stack	
DESCRIBE BACKGROUND: Blue Sky	
WIND SPEED: 0-5	WIND DIRECTION: N
AMBIENT TEMPERATURE: 62	RELATIVE HUMIDITY: 39%

sec / min	15	30	45	60	sec / min	15	30	45	60
0	0	0	0	0	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	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	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

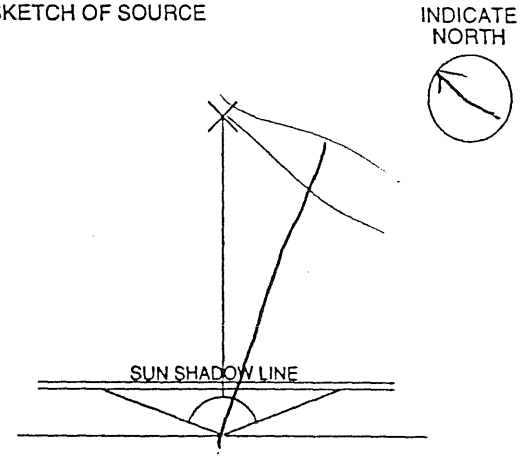
RANGE OF OPACITY READINGS
MINIMUM: 0 MAXIMUM: 0

OBSERVER'S NAME (PRINT): James S Burton

OBSERVER'S SIGNATURE: James S Burton — DATE: 4/26/00

CERTIFIED BY: Wisc. D.N.R. — DATE: 4/11/00

LAYOUT SKETCH OF SOURCE



COMMENTS

Visible Emission Form
DS 009.R1/CNVS/TRG-8/1/93

METHOD 1 FIELD DATA SHEET

TEST LOCATION: STACK

UNIT: Mixing Cooler Exhaust

Client	Battery Build Inc.	Project No.	8670
Plant	Naperville, IL	Date	4/26/00
Duct Dimensions	15 (in.)	Area	1.23 (ft²)
Port Length	0 (in.)	Port Diameter	4 (in.)
Port Height	NA		(ft.)
Duct Diameters Upstream (A)	1.87		(in.)
Duct Diameters Downstream (B)	2.87		(in.)
Number of Points Required	24		
Number of Points / Port Required	12		

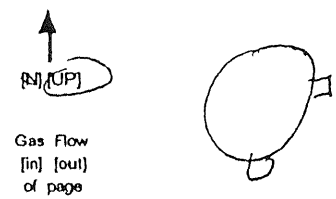
Point	% Diameter (Round Stacks Only)	Point Distance X	Probe Mark X+ Port Depth
1			14.50
2			14.00
3			13.22
4			12.34
5			11.25
6			9.66
7			5.33
8			3.75
9			2.66
10			1.77
11			1.00
12			.50

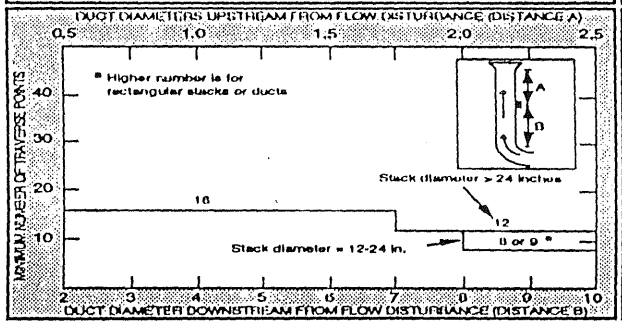
Location Schematic
Show side view of stack, indicating disturbances and port placement.

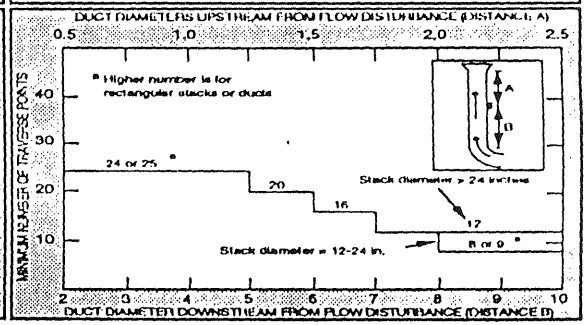
Table 1-2 of EPA Method 1 - Location of Traverse Points in Circular Stacks
(Percent of stack diameter from inside wall to traverse point)

Traverse point number	Number of traverse points on a diameter: 2	4	6	8	10	12
1	14.6	6.7	4.4	3.2	2.6	2.1
2	85.4	25.0	14.6	10.5	8.2	6.7
3		75.0	29.6	19.4	14.6	11.8
4		93.3	70.4	32.3	22.6	17.7
5			85.4	67.7	34.2	25.0
6			95.6	80.6	65.8	35.6
7				89.5	77.4	64.4
8				96.8	85.4	75.0
9					91.8	82.3
10					97.4	88.2
11						93.3
12						97.9

Loaction Schematic
Show cross-section of stack, indicating port placement.







DS 001 Sampling Point Determination
EXCEL/WRH.R2-3/7/96

Circle correct bracketed directions on data sheet.

Clean Air Engineering

TEST LOCATION: Mixer Stack

UNIT: Mixer Cooling **RUN:** 1

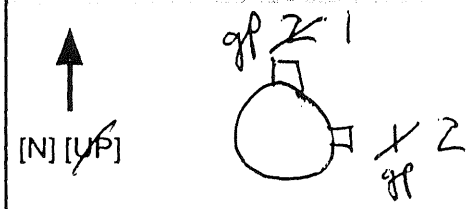
LEAD TESTING FIELD DATA SHEET

METHOD: 12 **PAGE** 1 **OF** 2

Client Battery Builders, Inc	Project No. 8670
Plant Naperville, Inc	Date 4/27/00
Meter Operator G. Pavlovich	
Probe Operator B. Koziczkowski	

Meter Box No. 66.6	Sample Box No. 67.48
Meter Yd .9912	Meter ΔH@ 1.8310
K Factor	Pitot Cp .84
Leak Rate Before .004	[cfm] [~~Lpm~~] @ 15 (in.Hg)
Leak Rate After .002	[cfm] [~~Lpm~~] @ 10 (in.Hg)
Pitot Leak Check Before: ☒	After: Good ☒ Bad ☐

Cross-Section of Test Location



Duct Dimensions (in.) 15.0			
Static Press. (in. H_2O) 0.0	Port Len. (in.) 0	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F) 50	Bar. Press. 29.30 [in. Hg] [~~mbar~~]
Probe I.D. No. 67.4.1	
Liner Material Glass	

Filter No. 203467		
Thimble No. N/A		
Nozzle Diameter .316	Nozzle I.D.	

H_2O 43.9 [ml] [~~gm~~]	Silica Gel (gm) 11.6
Total V_{lc} 55.5	

Start Time: 836 A	Stop Time: 1001 A

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [L] 149.29	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
1-1	2.5	.26	2.6	151.45	80	247	248	58	56	52	6	N/A	
2	5	.23	2.2	153.50	100	247	248	56	56	52	5	N/A	
3	7.5	.22	1.8	155.42	116	247	248	54	57	52	5	N/A	
4	10	.23	2.2	157.54	110	248	248	54	58	53	5	N/A	
5	12.5	.23	2.3	159.67	93	248	249	53	61	53	5	N/A	
6	15	.23	2.3	161.86	86	248	248	54	61	54	5	N/A	
7	17.5	.25	2.6	164.18	79	248	248	54	62	54	6	N/A	
8	20	.27	2.8	166.57	70	248	248	54	62	55	7	N/A	
9	22.5	.27	2.8	168.99	68	247	247	51	59	56	7	N/A	STOPPED 8:56 START 9:08
10	25	.24	2.5	171.27	90	247	249	47	61	56	6	N/A	
11	27.5	.21	2.1	173.32	94	248	249	48	62	57	5	N/A	
12	30	.18	1.8	175.26	94	248	249	49	63	57	5	N/A	
	Total	*		53.72						1369			
	Average	.4963	2.496		87.9				60.1				

DS 001 General
CNVS/TRG.R3-4/6/94

* Sum of square roots.

5.8089 28.0

Circle correct bracketed units on data sheet.

1080

Clean Air Engineering

TEST LOCATION: MIXER STACK

UNIT: MIXER COOLING **RUN:** 1

LEAD TESTING FIELD DATA SHEET

METHOD: 12 **PAGE** 2 **OF** 2

Client BATTERY BUILDERS, INC	Project No. 8670
Plant NAPERVILLE, IL	Date 4/27/00
Meter Operator G. PAVLOVICS	
Probe Operator B. KOZICZKOWSKI	

Meter Box No.	Sample Box No.
Meter Yd	Meter ΔH@
K Factor	Pitot Cp
Leak Rate Before	[cfm] [Lpm] @ (in.Hg)
Leak Rate After	[cfm] [Lpm] @ (in.Hg)
Pitot Leak Check Before: ☐	After: Good ☐ Bad ☐

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Probe I.D. No.	
Liner Material	

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

H_2O [ml] [gm]	Silica Gel (gm)
Total V_{lc}	

Start Time:	Stop Time:

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [L]	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
2-1	32.5	.29	2.9	177.71	88	248	249	50	63	58	7	N/A	
2	35	.30	3.1	180.24	78	247	251	50	65	58	8	N/A	
3	37.5	.33	3.6	182.93	69	248	249	52	67	58	8	N/A	STOPPED 927 START 939
4	40	.30	3.2	185.50	71	247	247	50	63	59	7	N/A	
5	42.5	.29	2.7	187.81	100	247	248	49	63	59	6	N/A	
6	45	.25	2.3	189.96	114	248	249	50	65	60	5	N/A	
7	47.5	.21	2.0	191.97	103	248	248	51	66	60	5	N/A	
8	50	.19	1.9	193.93	94	248	249	52	67	60	5	N/A	
9	52.5	.19	1.9	195.91	89	249	249	53	68	61	5	N/A	
10	55	.26	2.7	198.23	82	248	248	53	70	61	7	N/A	
11	57.5	.31	3.3	200.79	73	248	249	54	71	62	8	N/A	
12	60	.21	2.3	203.01	62 68	248	249	55	71	62	6	N/A	
	Total	*								1515			
	Average	6.1019	31.9		1029								

DS 001 General
CNVS/TRG.R3-4/6/94

* Sum of square roots.

Circle correct bracketed units on data sheet.

Clean Air Engineering

TEST LOCATION: MIXER STACK

UNIT: MIXER COOLING **RUN:** 2

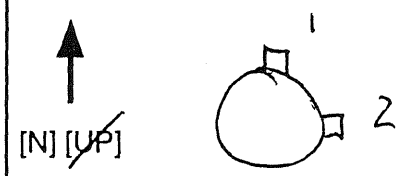
LEAD TESTING FIELD DATA SHEET

METHOD: 12 **PAGE** 1 **OF** 2

Client BATTERY BUILDER INC	Project No. 8670
Plant NAPERVILLE, IL	Date 4/27/00
Meter Operator G. PAVLOVICS	
Probe Operator B. KOZICZKOWSKI	

Meter Box No. 66-6	Sample Box No. 67.B1
Meter Yd .9912	Meter ΔH@ 1.8310
K Factor	Pitot Cp .84
Leak Rate Before .004 [cfm] [~~Lpm~~] @ 16 (in.Hg)	
Leak Rate After .002 [cfm] [~~Lpm~~] @ 10 (in.Hg)	
Pitot Leak Check Before: ☒	After: Good ☒ Bad ☐

Cross-Section of Test Location



Duct Dimensions (in.) 150			
Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]
-0.1	0	Out	In

Amb. Temp. (°F) 59	Bar. Press. 29.3 [in. Hg] [~~mbar~~]
Probe I.D. No. 67.4.1	
Liner Material GLASS	

Filter No. 203468	
Thimble No. N/A	
Nozzle Diameter .316	Nozzle I.D.

H_2O 51.5 [ml] [~~gm~~]	Silica Gel (gm) 12.9
Total V_{lc} 64.4	

Start Time: 10:44 A	Stop Time: 12:09

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [~~L~~] 203.70	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet $T_{m\,in}$ (°F)	DGM Outlet $T_{m\,out}$ (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
1-1	2.5	.25	2.7	206.00	74	248	248	60	64	63	6	N/A	
2	5	.24	2.3	208.14	101	247	249	58	65	63	5	N/A	
3	7.5	.23	1.9	210.10	118	248	249	58	66	63	5	N/A	
4	10	.23	2.0	212.10	108	248	249	58	67	63	5	N/A	
5	12.5	.23	2.2	214.22	96	248	249	60	68	64	5	N/A	
6	15	.23	2.3	216.40	91	248	249	63	69	64	6	N/A	
7	17.5	.24	2.4	218.60	87	248	249	65	70	64	6	N/A	
8	20	.29	3.1	221.09	71	249	249	67	72	65	7	N/A	
9	22.5	.29	3.1	223.64	68	248	249	67	73	65	7	N/A	STOP 11:06 START 11:17
10	25	.29	3.0	226.10	76	248	247	58	69	66	7	N/A	
11	27.5	.25	2.5	228.39	88	247	248	57	70	66	6	N/A	
12	30	.24	2.3	~~230.54~~	102	248	249	56	72	66	5	N/A	
	Total	*		54.34						1597			
	Average	.5068	2.554		91.2				69.5				

DS 001 General
CNVS/TRG R3-4/6/94

* Sum of square roots.

Circle correct bracketed units on data sheet.

Clean Air Engineeri

TEST LOCATION: Mixer Stack

UNIT: Mixer Cooling **RUN:** 2

LEAD TESTING FIELD DATA SHEET

METHOD: 12 **PAGE** 2 **OF** 2

Client Battery Builders, INC	Project No. 8670
Plant Naperville, IL	Date 4/27/00
Meter Operator G. Pavlovics	
Probe Operator B. Koziczkowski	

Meter Box No.	Sample Box No.
Meter Yd	Meter ΔH@
K Factor	Pitot Cp
Leak Rate Before	[cfm] [Lpm] @ (in.Hg)
Leak Rate After	[cfm] [Lpm] @ (in.Hg)
Pitot Leak Check Before: ☐	After: Good ☐ Bad ☐

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Probe I.D. No.	
Liner Material	

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

H_2O [ml] [gm]	Silica Gel (gm)
Total V_{lc}	

Start Time:	Stop Time:

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [L]	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
2-1	32.5	.31	2.9	232.95	99	249	249	56	72	67	7	N/A	
2	35	.31	3.2	235.49	91	248	248	56	74	67	7	N/A	
3	37.5	.31	3.1	237.98	87	248	249	56	76	68	7	N/A	
4	40	.32	3.5	240.62	72	248	249	57	77	68	8	N/A	
5	42.5	.29	3.1	243.16	73	248	248	59	71	69	7	N/A	STOP 11:37 START 11:50
6	45	.24	2.3	245.37	98	247	248	55	73	69	5	N/A	
7	47.5	.23	2.0	247.35	112	248	249	53	74	69	5	N/A	
8	50	.22	1.9	249.33	114	249	250	53	75	70	5	N/A	
9	52.5	.23	2.2	251.44	97	249	249	53	77	70	5	N/A	
10	55	.22	2.2	253.55	93	249	249	54	79	71	5	N/A	
11	57.5	.21	2.1	255.55	90	249	250	55	80	71	5	N/A	
12	60	.29	3.0	258.04	83	249	250	56	81	72	7	N/A	
	Total	*								1740			
	Average												

DS 001 General
CNVS/TRG.R3-4/6/94

* Sum of square roots.
10.1584 215

Circle correct bracketed units on data sheet.
1109

Clean Air Engineering

TEST LOCATION: Mixer Stack

UNIT: Mixer Cooling **RUN:** 3

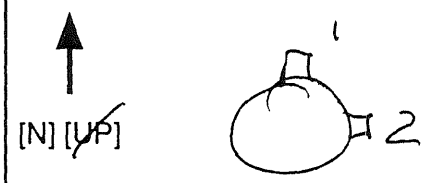
LEAD TESTING FIELD DATA SHEET

METHOD: 12 **PAGE** 1 **OF** 2

Client: Battery Builders, Inc	Project No. 8670
Plant: Naperville, IL	Date: 4.27.00
Meter Operator: G. Pavlovics	
Probe Operator: B. Koziczkowski	

Meter Box No. 66-6	Sample Box No. 6748
Meter Yd .9912	Meter ΔH@ 1.8310
K Factor	Pitot Cp .84
Leak Rate Before .004 [cfm] [~~Lpm~~] @ 16 (in.Hg)	
Leak Rate After .002 [cfm] [~~Lpm~~] @ 9 (in.Hg)	
Pitot Leak Check Before: ☒	After: Good ☒ Bad ☐

Cross-Section of Test Location



Duct Dimensions (in.) 15.0			
Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]
-0.1	0		

Amb. Temp. (°F) 70	Bar. Press. 29.30 [in. Hg] [~~mbar~~]
Probe I.D. No. 67.4.1	
Liner Material Glass	

Filter No. 203469		
Thimble No. N/A		
Nozzle Diameter .316	Nozzle I.D.	

H_2O 53.4 [ml] [~~gm~~]	Silica Gel (gm) 10.6
Total V_{lc} 64.0	

Start Time: 12:37	Stop Time: 14:16

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [~~L~~] 258.60	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
1-1	2.5	.27	2.8	260.93	81	249	249	60	74	73	6	N/A	
2	5	.26	2.4	263.13	102	249	250	50	76	73	5	N/A	
3	7.5	.24	2.0	265.13	119	249	250	49	77	74	5	N/A	
4	10	.24	2.1	267.17	111	250	250	50	78	74	5	N/A	
5	12.5	.25	2.35	269.34	101	249	250	52	79	74	5	N/A	
6	15	.24	2.4	271.54	93	250	250	52	80	75	5	N/A	
7	17.5	.28	2.8	273.91	90	250	250	54	82	76	6	N/A	
8	20	.31	3.2	276.43	81	249	250	54	82	76	7	N/A	
9	22.5	.25	2.6	278.75	82	249	249	~~70~~ 65	81	79	5	N/A	STOP 12:57 START 13:21
10	25	.27	2.5	280.99	97	249	250	53	82	80	5	N/A	
11	27.5	.25	2.2	283.15	109	250	251	51	84	80	5	N/A	
12	30	.25	2.2	285.27	108	250	251	51	85	80	5	N/A	
	Total	*		54.33						1874			
	Average	.5160	2.583		95.2				80.1				

DS 001 General
CNVS/TRG.R3-4/6/94

* Sum of square roots.

Circle correct bracketed units on data sheet.

1174

Clean Air Engineering

TEST LOCATION: Mixer Stack

UNIT: Mixer Cooling **RUN:** 3

LEAD TESTING FIELD DATA SHEET

METHOD: 12 **PAGE** 2 **OF** 2

Client Battery Builders, Inc	Project No. 8670
Plant Naperville, IL	Date 4-27-00
Meter Operator G. Pavlovich	
Probe Operator B. Koziczkowski	

Meter Box No.	Sample Box No.
Meter Yd	Meter ΔH@
K Factor	Pitot Cp
Leak Rate Before	[cfm] [Lpm] @ (in.Hg)
Leak Rate After	[cfm] [Lpm] @ (in.Hg)
Pitot Leak Check Before: ☐	After: Good ☐ Bad ☐

Cross-Section of Test Location

[N] [UP]

Duct Dimensions (in.)

Static Press. (in. H_2O)	Port Len. (in.)	Gas Flow [In] [Out] of page	First point all the way [In] [Out]

Amb. Temp. (°F)	Bar. Press. [in. Hg] [mbar]
Probe I.D. No.	
Liner Material	

Filter No.		
Thimble No.		
Nozzle Diameter	Nozzle I.D.	

H_2O [ml] [gm]	Silica Gel (gm)
Total V_{lc}	

Start Time:	Stop Time:

Traverse Point Number	Min/pt 2.5 Elapsed Time	Velocity Head ΔP's (in. H_2O)	Orifice Setting ΔH (in. H_2O)	Gas Sample Volume - V_m Init. Vol. [ft^3] [L]	Stack Temp. T_s (°F)	Probe T_p (°F) Set Points 250	Filter T_f (°F) Set Points 250	Cond. Temp. T_c (°F)	DGM Inlet T_{min} (°F)	DGM Outlet T_{mout} (°F)	Pump Vacuum (in. Hg)	XAD Trap Temp T_t (°F)	Notes
2-1	32.5	.30	3.0	287.61	93	250	248	55	83	80	7	N/A	
2	35	.31	3.1	290.13	91	249	250	55	85	80	7	N/A	
3	37.5	.31	3.2	292.68	82	249	249	56	86	81	7	N/A	
4	40	.33	3.4	295.39	81	248	249	63	78	79	7	N/A	STOP 1340 START 1355
5	42.5	.27	2.8	297.72	85	248	248	59	80	79	6	N/A	
6	45	.27	2.5	299.89	108	248	249	56	81	80	5	N/A	
7	47.5	.27	2.2	301.95	117	249	250	56	82	79	5	N/A	
8	50	.27	2.5	304.17	99	250	251	60	85	81	5	N/A	
9	52.5	.21	2.0	306.18	97	250	251	59	86	81	5	N/A	
10	55	.21	2.1	308.18	91	250	250	57	86	82	5	N/A	
11	57.5	.28	2.8	310.54	86	250	250	57	87	82	6	N/A	
12	60	.27	2.8	312.93	80	247	248	57	86	82	6	N/A	
	Total	*								1969			
	Average												

DS 001 General
CNVS/TRG R3-4/6/94

* Sum of square roots.

Circle correct bracketed units on data sheet.

1110

Clean Air Engineeri

Impinger Weight Sheet

Client: Battery Builders, Inc. Unit Name: Mixer Cooling Exhaust

Plant: 8670 Job #: 8670 Method: 12

Sample Box #: 67-48 Date: 4/27/00

Run #: 1

	Contents	Gross Weight	Tare Weight	Net Weight Gain	Total Weight
Impinger 1	100mL 0.1N HNO_3	631.2	540.6	90.60	
Impinger 2	100mL 0.1N HNO_3	533.3	531.9	1.40	
Impinger 3	empty	434.5	432.6	1.90	
Impinger 4	silica gel	726.4	714.8	11.6	
Impinger 5			LINE RINSE	-.50	105.5
Impinger 6					-.50 43.9
Impinger 7					55.50

Sample Box #: 67/B1 Date: 4/27/00

Run #: 2

	Contents	Gross Weight	Tare Weight	Net Weight Gain	Total Weight
Impinger 1	100mL 0.1N HNO_3	~~638.5~~ 623.5	529.0	94.50	
Impinger 2	100mL 0.1N HNO_3	638.5	633.2	5.30	
Impinger 3	empty	440.9	439.2	1.70	
Impinger 4	silica gel	739.2	~~729.3~~ 726.3	12.90	114.40
Impinger 5	line rinse			-.50	51.5 BK
Impinger 6					~~64.40~~
Impinger 7					64.4

Sample Box #: 67-78 Date: 4/27/00

Run #: 3

	Contents	Gross Weight	Tare Weight	Net Weight Gain	Total Weight
Impinger 1	100mL 0.1N HNO_3	633.5	537.9	95.6	
Impinger 2	100mL 0.1N HNO_3	537.3	531.0	6.3	
Impinger 3	empty	434.1	432.6	1.5	
Impinger 4	silica gel	737.2	726.6	10.6	
Impinger 5	line rinse			-.50	
Impinger 6					53.4
					64.0

ORSAT READINGS

TEST LOCATION: Stack

PAGE 1 **OF** 1

Client	Battery Builders, Inc.	Project Number	8670	Fo = $\frac{20.9 - \%O_2}{\%CO_2}$	
Plant	Naperville, IL	Unit	Mixer Coating Exhaust		
Orsat ID	#5	Fuel Type		Leak Check Passed	☒

Run Number	Method Number	Trial	Percent CO_2	Percent O_2+CO_2	Percent O_2	Fo	Analyst	Analysis Date	Analysis Time
1	12	1	.2	21.0	20.8		JB	4/27	14:40
		2	.2	21.0	20.8				
		3	.2	21.0	20.8				
		Avg.	.2		20.8				
2	12	1	.2	21.0	20.8		JB	4/27	14:50
		2	.2	21.0	20.8				
		3	.2	21.0	20.8				
		Avg.	.2		20.8				
3	12	1	0	21.0	21.0		JB	4/27	1500
		2	0	21.0	21.0				
		3	0	21.0	21.0				
		Avg.	0	-	21.0				
		1							
		2							
		3							
		Avg.							
		1							
		2							
		3							
		Avg.							
		1							
		2							
		3							
		Avg.							

Repeat the analysis procedure until the results of any three analyses differ by no more than 0.2 percent by volume. Average the three acceptable values and report the results to the nearest 0.1 percent. Calculate Fo to verify results.

Acceptable ranges for Fo:

Coal:	Anthracite and lignite	1.016-1.130	Gas:	Natural	1.600-1.836
	Bituminous	1.083-1.230		Propane	1.434-1.586
Oil:	Distillate	1.260-1.413		Butane	1.405-1.553
	Residual	1.210-1.370	Wood:		1.000-1.120

Clean Air Engineering

Visible Emissions Observation Form

CLIENT/OWNER: Battery Builder Inc	OBSERVATION DATE: 4/27/00
START TIME: 0836	END TIME: 0959
PLANT: Naperville, IL	UNIT: Mixing Cooling Exhaust Filter Stack
PROCESS EQUIPMENT:	OPERATING MODE: Full
CONTROL EQUIPMENT: Filter	OPERATING MODE: Full
DESCRIBE EMISSION POINT: Round Stack	
HEIGHT ABOVE GROUND LEVEL: 25'	DISTANCE FROM OBSERVER: 75'
HEIGHT RELATIVE TO OBSERVER: 25'	DIRECTION FROM OBSERVER: NR
DESCRIBE EMISSIONS: White Steam Plume. The plume appears & disappears at certain times of process.	
EMISSION COLOR: None visible	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☒
WATER DROPLET'S PRESENT: YES ☒ NO ☐	IF WATER DROPLET PLUME: ATTACHED ☒ DETACHED ☐
POINT IN PLUME AT WHICH EMISSION WERE DETERMINED: After steam plume / or out of stack no plume	
DESCRIBE BACKGROUND: Partly cloudy skies. Blue / white overcast	
WIND SPEED: 0-5	WIND DIRECTION: N to NW
AMBIENT TEMPERATURE: 52	RELATIVE HUMIDITY: 45%

sec / min	15	30	45	60	sec / min	15	30	45	60
0	0	0	0	0	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	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	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

START: 0836
STOP: 0846
START: 09
STOP: 09
START 09

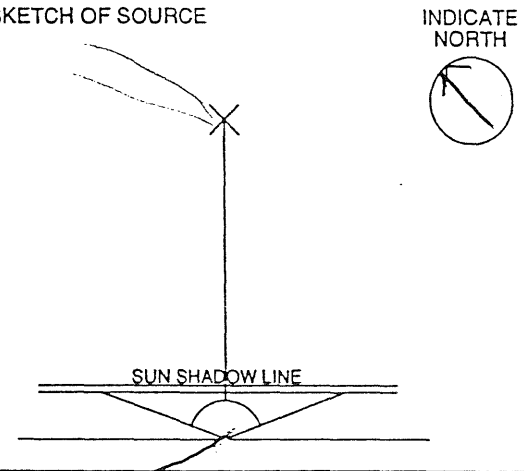
RANGE OF OPACITY READINGS
MINIMUM 0 MAXIMUM 0

OBSERVER'S NAME (PRINT): James S. Burton

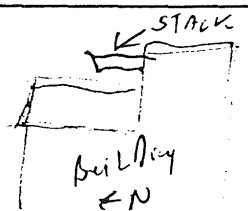
OBSERVER'S SIGNATURE: James S. Burton — DATE: 4/27/00

CERTIFIED BY: WISC. DNR — DATE: 4/11/00

LAYOUT SKETCH OF SOURCE



COMMENTS: Stack comes sideways out of building. No walk on east side to view stack, so my sun shadow line is off. Process. Is



Visible Emission Form

Visible Emissions Observation Form

CLIENT/OWNER: Battery Builders Inc	OBSERVATION DATE: 4/27/00
START TIME: 1044	END TIME: 1208
PLANT: Narrewills, IL	UNIT: Mixing Cooling Exhaust Filter Stack
PROCESS EQUIPMENT:	OPERATING MODE: Full
CONTROL EQUIPMENT: Filter	OPERATING MODE: Full
DESCRIBE EMISSION POINT: Round stack	
HEIGHT ABOVE GROUND LEVEL: 25'	DISTANCE FROM OBSERVER: 75'
HEIGHT RELATIVE TO OBSERVER: 25'	DIRECTION FROM OBSERVER: NR
DESCRIBE EMISSIONS: White steam plume. The plume appears + disappears at certain times of process	
EMISSION COLOR: None visible	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☒
WATER DROPLET'S PRESENT: YES ☒ NO ☐	IF WATER DROPLET PLUME: ATTACHED ☒ DETACHED ☐
POINT IN PLUME AT WHICH EMISSION WERE DETERMINED: After steam plume / out of stack no plume	
DESCRIBE BACKGROUND: Partly cloudy skies Blue/white overcast	
WIND SPEED: 5-10	WIND DIRECTION: NW
AMBIENT TEMPERATURE: 57	RELATIVE HUMIDITY: 45 %

sec / min	15	30	45	60	sec / min	15	30	45	60
0	0	0	0	0	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	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	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

Stop: 11. Start: 11
Stop: 11 Start: 11

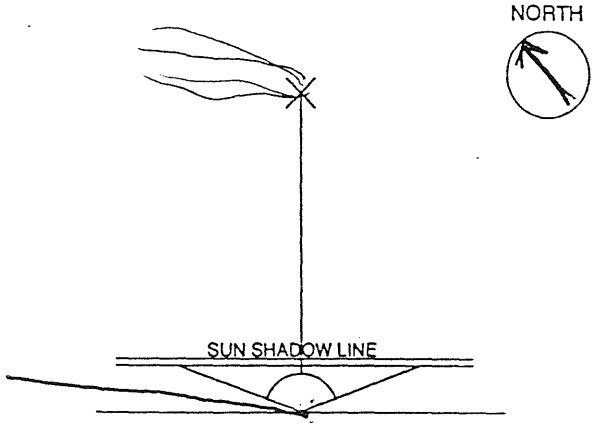
RANGE OF OPACITY READINGS
MINIMUM 0 MAXIMUM 0

OBSERVER'S NAME (PRINT): James S. Burton

OBSERVER'S SIGNATURE: James S. Burton — DATE: 4/27/00

CERTIFIED BY: Wisc. DNR — DATE: 4/11/00

LAYOUT SKETCH OF SOURCE



COMMENTS: Stack comes sideways out of building. No where to read on east side. So my sun shadow line was off. Process is batch process. Listed start/stop times.

Visible Emission Form
DS 009.R1/CNVS/TRG-8/1/93

Visible Emissions Observation Form

CLIENT/OWNER: Battery Builders Inc.	OBSERVATION DATE: 4/27/00
START TIME: 1237	END TIME: 1415
PLANT: Naperville, IL	UNIT: Mixing cooling exhaust filter stack
PROCESS EQUIPMENT	OPERATING MODE: Full
CONTROL EQUIPMENT: Filter	OPERATING MODE: Full
DESCRIBE EMISSION POINT: Round stack	
HEIGHT ABOVE GROUND LEVEL: 25'	DISTANCE FROM OBSERVER: 75'
HEIGHT RELATIVE TO OBSERVER: 25'	DIRECTION FROM OBSERVER: NE
DESCRIBE EMISSIONS: White steam plume. The plume appears & disappears at certain times of process.	
EMISSION COLOR: None visible	PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☒
WATER DROPLET'S PRESENT: YES ☒ NO ☐	IF WATER DROPLET PLUME: ATTACHED ☒ DETACHED ☐
POINT IN PLUME AT WHICH EMISSION WERE DETERMINED: After steam plume / out of stack no plume	
DESCRIBE BACKGROUND: Partly cloudy skies. Blue/white overcast	
WIND SPEED: 10-15	WIND DIRECTION: NW
AMBIENT TEMPERATURE: 68	RELATIVE HUMIDITY: 50%

sec / min	15	30	45	60	sec / min	15	30	45	60
0	0	0	0	0	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	35	0	0	0	0
6	0	0	0	0	36	0	0	0	0
7	0	0	0	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
18	0	0	0	0	48	0	0	0	0
19	0	0	0	0	49	0	0	0	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	0	0	0	0
25	0	0	0	0	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

Stop 1257
Start 1232
Stop: 134
Start 145

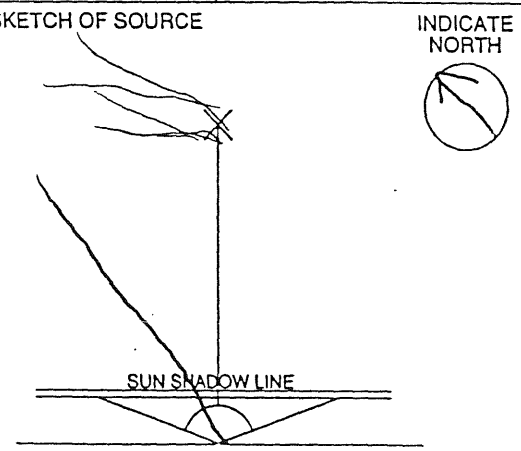
RANGE OF OPACITY READINGS
MINIMUM: 0 MAXIMUM: 0

OBSERVER'S NAME (PRINT): James S. Burton

OBSERVER'S SIGNATURE: James S Burton — DATE: 4/27/00

CERTIFIED BY: WISC DNR — DATE: 4/11/00

LAYOUT SKETCH OF SOURCE



COMMENTS: Stack comes sideway out of building.

Process batch process. Listed start/stop times.

Visible Emission Form
DS 009.R1/CNVS/TRG-8/1/93

FIELD DATA PRINTOUTS

E

Field Data Printout

Location: Baghouse Stack
Test Run: 1
Client: Battery Builders, Inc.
Project No: 8670
Test Date: 4/26/00
Meter ΔH@: 1.8310
Meter Y_d: 0.9912
Pitot C_p: 0.84
Static P: -0.2
Leak Rate Before: 0.005 cfm @ 17 "Hg
Leak Rate After: 0.004 cfm @ 6 "Hg

Method: M12
Testing Type: Lead
Area (ft²): 2.95
Filter No: 203465
Thimble No: NA
Beaker No: NA

Bar. Press. (in. Hg): 29.40
Actual Moisture (%): 2.6
Nozzle Diameter (D_n): 0.24
O_2 (dry volume %): 20.8
CO_2 (dry volume %): 0.2
Start Time (approx.): 10:44
Stop Time (approx.): 11:47
H_2O (condensate, ml): 13.0
H_2O (silica, g): 9.0

Traverse Point	Run Time	Pitot ΔP_s	Sample ΔH	Metered	Stack T_s	Dry Gas Meter $T_{m\,in}$	Dry Gas Meter $T_{m\,out}$	$\sqrt{\Delta P_s}$ (calculated)	Volume (calculated)	Isokinetics (calculated)
	0.0	(in. H_2O)	(in. H_2O)	(ft³) 27.30	(°F)	(°F)	(°F)	(√in. H_2O)	(ft³)	(%)
1-01	2.5	0.47	1.60	29.12	127	78	79	0.69	1.82	104.6
1-02	5.0	0.45	1.50	30.89	131	78	79	0.67	1.77	104.3
1-03	7.5	0.47	1.60	32.65	131	77	78	0.69	1.76	101.7
1-04	10.0	0.43	1.40	34.33	131	77	78	0.66	1.68	101.4
1-05	12.5	0.43	1.40	36.04	131	76	76	0.66	1.71	103.5
1-06	15.0	0.43	1.40	37.73	130	75	74	0.66	1.69	102.5
2-01	17.5	0.48	1.60	39.54	130	73	74	0.69	1.81	104.1
2-02	20.0	0.51	1.70	41.38	132	75	73	0.71	1.84	102.8
2-03	22.5	0.48	1.60	43.17	131	75	72	0.69	1.79	103.1
2-04	25.0	0.41	1.40	44.87	132	74	72	0.64	1.70	106.1
2-05	27.5	0.37	1.20	46.48	132	75	72	0.61	1.61	105.6
2-06	30.0	0.41	1.40	48.16	135	74	71	0.64	1.68	105.2
3-01	32.5	0.46	1.50	49.90	134	74	71	0.68	1.74	102.8
3-02	35.0	0.41	1.40	51.60	134	74	70	0.64	1.70	106.4
3-03	37.5	0.36	1.20	53.18	133	75	71	0.60	1.58	105.2
3-04	40.0	0.34	1.10	54.67	133	76	72	0.58	1.49	101.9
3-05	42.5	0.36	1.20	56.24	132	75	71	0.60	1.57	104.5
3-06	45.0	0.37	1.20	57.77	131	75	71	0.61	1.53	100.3
4-01	47.5	0.42	1.40	59.46	131	75	71	0.65	1.69	104.1
4-02	50.0	0.39	1.30	61.11	132	76	72	0.62	1.65	105.3
4-03	52.5	0.40	1.30	62.76	132	77	73	0.63	1.65	103.8
4-04	55.0	0.39	1.30	64.41	132	77	73	0.62	1.65	105.1
4-05	57.5	0.43	1.40	66.09	133	76	73	0.66	1.68	102.1
4-06	60.0	0.43	1.40	67.79	133	76	73	0.66	1.70	103.4
Final	60.0	0.65	1.40	40.49	132	74				

Field Data Printout

Location:	Baghouse Stack			Bar. Press. (in. Hg):	29.40
Test Run:	2			Actual Moisture (%):	2.7
Client:	Battery Builders, Inc.				
Project No:	8670	Method:	M12	Nozzle Diameter (D_n):	0.24
Test Date:	4/26/00	Testing Type:	Lead	O_2 (dry volume %):	20.8
Meter ΔH@:	1.8310			CO_2 (dry volume %):	0.2
Meter Y_d:	0.9912	Area (ft²):	2.95	Start Time (approx.):	12:39
Pitot C_p:	0.84			Stop Time (approx.):	13:42
Static P:	-0.2	Filter No:	203578	H_2O (condensate, ml):	14.2
Leak Rate Before:	0.006 cfm @ 16 "Hg	Thimble No:	NA	H_2O (silica, g):	8.6
Leak Rate After:	0.003 cfm @ 6 "Hg	Beaker No:	NA		

Traverse Point	Run Time	Pitot ΔP_s	Sample ΔH	Metered	Stack T_s	Dry Gas Meter $T_{m\,in}$	Dry Gas Meter $T_{m\,out}$	$\sqrt{\Delta P_s}$ (calculated)	Volume (calculated)	Isokinetics (calculated)
	0.0	(in. H_2O)	(in. H_2O)	(ft³) 68.40	(°F)	(°F)	(°F)	(√in. H_2O)	(ft³)	(%)
1-01	2.5	0.48	1.50	70.15	133	75	75	0.69	1.75	100.7
1-02	5.0	0.48	1.50	71.91	136	76	75	0.69	1.76	101.5
1-03	7.5	0.44	1.40	73.59	136	78	76	0.66	1.68	100.9
1-04	10.0	0.41	1.30	75.24	137	79	76	0.64	1.65	102.6
1-05	12.5	0.43	1.30	76.88	135	80	76	0.66	1.64	99.3
1-06	15.0	0.45	1.40	78.54	134	81	76	0.67	1.66	98.1
2-01	17.5	0.56	1.70	80.39	135	81	77	0.75	1.85	98.1
2-02	20.0	0.54	1.70	82.25	133	82	77	0.73	1.86	100.1
2-03	22.5	0.52	1.60	84.05	133	83	77	0.72	1.80	98.6
2-04	25.0	0.42	1.30	85.70	133	83	78	0.65	1.65	100.5
2-05	27.5	0.40	1.20	87.28	132	82	78	0.63	1.58	98.5
2-06	30.0	0.38	1.20	88.81	133	83	79	0.62	1.53	97.8
3-01	32.5	0.51	1.60	90.65	132	83	78	0.71	1.84	101.6
3-02	35.0	0.43	1.30	92.32	135	84	79	0.66	1.67	100.5
3-03	37.5	0.40	1.20	93.93	133	83	79	0.63	1.61	100.3
3-04	40.0	0.36	1.10	95.46	133	82	79	0.60	1.53	100.6
3-05	42.5	0.36	1.10	96.99	133	82	79	0.60	1.53	100.6
3-06	45.0	0.39	1.20	98.55	133	82	79	0.62	1.56	98.5
4-01	47.5	0.46	1.40	100.24	133	83	80	0.68	1.69	98.2
4-02	50.0	0.45	1.40	101.92	134	84	80	0.67	1.68	98.6
4-03	52.5	0.47	1.50	103.66	134	85	80	0.69	1.74	99.9
4-04	55.0	0.43	1.30	105.29	134	85	80	0.66	1.63	97.8
4-05	57.5	0.47	1.50	107.04	134	86	81	0.69	1.75	100.3
4-06	60.0	0.47	1.50	108.82	132	85	81	0.69	1.78	101.9
Final	60.0	0.67	1.38	40.42	134	80				

Field Data Printout

Location:	Baghouse Stack			Bar. Press. (in. Hg):	29.40
Test Run:	3			Actual Moisture (%):	2.4
Client:	Battery Builders, Inc.				
Project No:	8670	Method:	M12	Nozzle Diameter (D_n):	0.24
Test Date:	4/26/00	Testing Type:	Lead	O_2 (dry volume %):	20.8
Meter ΔH@:	1.8310			CO_2 (dry volume %):	0.2
Meter Y_d:	0.9912	Area (ft²):	2.95	Start Time (approx.):	14:21
Pitot C_p:	0.84			Stop Time (approx.):	15:24
Static P:	-0.2	Filter No:	203466	H_2O (condensate, ml):	12.5
Leak Rate Before:	0.005 cfm @ 15 "Hg	Thimble No:	NA	H_2O (silica, g):	6.7
Leak Rate After:	0.002 cfm @ 5 "Hg	Beaker No:	NA		

Traverse Point	Run Time	Pitot ΔP_s	Sample ΔH	Metered (ft³)	Stack T_s	Dry Gas Meter $T_{m\,in}$	Dry Gas Meter $T_{m\,out}$	$\sqrt{\Delta P_s}$ (calculated)	Volume (calculated)	Isokinetics (calculated)
	0.0	(in. H_2O)	(in. H_2O)	109.40	(°F)	(°F)	(°F)	(√in. H_2O)	(ft³)	(%)
1-01	2.5	0.45	1.40	111.07	138	82	83	0.67	1.67	98.0
1-02	5.0	0.52	1.60	112.97	141	83	83	0.72	1.90	104.0
1-03	7.5	0.48	1.50	114.66	140	83	82	0.69	1.69	96.2
1-04	10.0	0.43	1.30	116.29	141	86	84	0.66	1.63	97.6
1-05	12.5	0.43	1.30	117.92	141	86	84	0.66	1.63	97.6
1-06	15.0	0.39	1.20	119.50	141	87	85	0.62	1.58	99.2
2-01	17.5	0.57	1.80	121.28	141	87	85	0.75	1.78	92.6
2-02	20.0	0.53	1.60	123.04	141	88	85	0.73	1.76	94.8
2-03	22.5	0.50	1.60	124.80	141	88	85	0.71	1.76	97.6
2-04	25.0	0.42	1.30	126.44	141	89	86	0.65	1.64	99.0
2-05	27.5	0.42	1.30	128.08	140	87	85	0.65	1.64	99.1
2-06	30.0	0.43	1.30	129.70	140	87	85	0.66	1.62	96.8
3-01	32.5	0.50	1.60	131.48	141	90	87	0.71	1.78	98.3
3-02	35.0	0.38	1.20	133.06	140	89	86	0.62	1.58	100.1
3-03	37.5	0.35	1.10	134.59	140	90	87	0.59	1.53	100.8
3-04	40.0	0.33	1.00	136.07	141	91	88	0.57	1.48	100.3
3-05	42.5	0.39	1.20	137.63	140	90	88	0.62	1.56	97.3
3-06	45.0	0.43	1.30	139.25	140	91	88	0.66	1.62	96.2
4-01	47.5	0.40	1.20	140.83	139	89	88	0.63	1.58	97.3
4-02	50.0	0.43	1.30	142.44	141	90	88	0.66	1.61	95.7
4-03	52.5	0.43	1.30	143.99	142	92	88	0.66	1.55	92.1
4-04	55.0	0.41	1.30	145.64	141	91	88	0.64	1.65	100.4
4-05	57.5	0.43	1.30	147.24	141	92	89	0.66	1.60	94.9
4-06	60.0	0.43	1.30	148.85	138	92	89	0.66	1.61	95.2
Final	60.0	0.66	1.35	39.45	140	87				

Field Data Printout

Location: Mixer Stack
Test Run: 1
Client: Battery Builders, Inc.
Project No: 8670
Test Date: 4/27/00
Meter ΔH@: 1.8310
Meter Y_d: 0.9912
Pitot C_p: 0.84
Static P: 0.0
Leak Rate Before: 0.004 cfm @ 15 "Hg
Leak Rate After: 0.002 cfm @ 10 "Hg

Method: M12
Testing Type: Lead
Area (ft²): 1.23
Filter No: 203467
Thimble No: NA
Beaker No: NA

Bar. Press. (in. Hg): 29.30
Actual Moisture (%): 4.5
Nozzle Diameter (D_n): 0.316
O_2 (dry volume %): 20.8
CO_2 (dry volume %): 0.2
Start Time (approx.): 08:36
Stop Time (approx.): 10:01
H_2O (condensate, ml): 43.9
H_2O (silica, g): 11.6

Traverse Point	Run Time	Pitot ΔP_s	Sample ΔH	Metered	Stack T_s	Dry Gas Meter $T_{m\,in}$	Dry Gas Meter $T_{m\,out}$	$\sqrt{\Delta P_s}$ (calculated)	Volume (calculated)	Isokinetics (calculated)
	0.0	(in. H_2O)	(in. H_2O)	(ft³) 149.29	(°F)	(°F)	(°F)	(√in. H_2O)	(ft³)	(%)
1-01	2.5	0.26	2.60	151.45	80	56	52	0.51	2.16	98.4
1-02	5.0	0.23	2.20	153.50	100	56	52	0.48	2.05	101.0
1-03	7.5	0.22	1.80	155.42	116	57	52	0.47	1.92	97.9
1-04	10.0	0.23	2.20	157.54	110	58	53	0.48	2.12	105.0
1-05	12.5	0.23	2.30	159.67	93	61	53	0.48	2.13	103.7
1-06	15.0	0.23	2.30	161.86	86	61	54	0.48	2.19	105.8
1-07	17.5	0.25	2.60	164.18	79	62	54	0.50	2.32	106.8
1-08	20.0	0.27	2.80	166.57	70	62	55	0.52	2.39	104.9
1-09	22.5	0.27	2.80	168.99	68	59	56	0.52	2.42	106.3
1-10	25.0	0.24	2.50	171.27	90	61	56	0.49	2.28	108.1
1-11	27.5	0.21	2.10	173.32	94	62	57	0.46	2.05	104.0
1-12	30.0	0.18	1.80	175.26	94	63	57	0.42	1.94	106.1
2-01	32.5	0.29	2.90	177.71	88	63	58	0.54	2.45	105.2
2-02	35.0	0.30	3.10	180.24	78	65	58	0.55	2.53	105.7
2-03	37.5	0.33	3.60	182.93	69	67	58	0.57	2.69	106.1
2-04	40.0	0.30	3.20	185.50	71	63	59	0.55	2.57	106.8
2-05	42.5	0.29	2.70	187.81	100	63	59	0.54	2.31	100.1
2-06	45.0	0.25	2.30	189.96	114	65	60	0.50	2.15	101.2
2-07	47.5	0.21	2.00	191.97	103	66	60	0.46	2.01	102.1
2-08	50.0	0.19	1.90	193.93	94	67	60	0.44	1.96	103.7
2-09	52.5	0.19	1.90	195.91	89	68	61	0.44	1.98	104.0
2-10	55.0	0.26	2.70	198.23	82	70	61	0.51	2.32	103.6
2-11	57.5	0.31	3.30	200.79	73	71	62	0.56	2.56	103.7
2-12	60.0	0.21	2.30	203.01	68	71	62	0.46	2.22	108.5
Final	60.0	0.50	2.50	53.72	88	60				

Field Data Printout

Location: Mixer Stack
Test Run: 2
Client: Battery Builders, Inc.
Project No: 8670
Test Date: 4/27/00
Meter ΔH@: 1.8310
Meter Y_d: 0.9912
Pitot C_p: 0.84
Static P: -0.1
Leak Rate Before: 0.004 cfm @ 16 "Hg
Leak Rate After: 0.002 cfm @ 10 "Hg

Method: M12
Testing Type: Lead
Area (ft²): 1.23
Filter No: 203468
Thimble No: NA
Beaker No: NA

Bar. Press. (in. Hg): 29.30
Actual Moisture (%): 5.0
Nozzle Diameter (D_n): 0.316
O_2 (dry volume %): 20.8
CO_2 (dry volume %): 0.2
Start Time (approx.): 10:44
Stop Time (approx.): 12:09
H_2O (condensate, ml): 51.5
H_2O (silica, g): 12.9

Traverse Point	Run Time	Pitot ΔP_s	Sample ΔH	Metered	Stack T_s	Dry Gas Meter		$\sqrt{\Delta P_s}$ (calculated)	Volume (calculated)	Isokinetics (calculated)
						$T_{m\,in}$	$T_{m\,out}$			
	0.0	(in. H_2O)	(in. H_2O)	(ft³) 203.70	(°F)	(°F)	(°F)	($\sqrt{in.\ H_2O}$)	(ft³)	(%)
1-01	2.5	0.25	2.70	206.00	74	64	63	0.50	2.30	104.8
1-02	5.0	0.24	2.30	208.14	101	65	63	0.49	2.14	101.8
1-03	7.5	0.23	1.90	210.10	118	66	63	0.48	1.96	96.5
1-04	10.0	0.23	2.00	212.10	108	67	63	0.48	2.00	97.5
1-05	12.5	0.23	2.20	214.22	96	68	64	0.48	2.12	102.1
1-06	15.0	0.23	2.30	216.40	91	69	64	0.48	2.18	104.5
1-07	17.5	0.24	2.40	218.60	87	70	64	0.49	2.20	102.8
1-08	20.0	0.29	3.10	221.09	71	72	65	0.54	2.49	104.1
1-09	22.5	0.29	3.10	223.64	68	73	65	0.54	2.55	106.2
1-10	25.0	0.29	3.00	226.10	76	69	66	0.54	2.46	103.5
1-11	27.5	0.25	2.50	228.39	88	70	66	0.50	2.29	104.7
1-12	30.0	0.24	2.30	230.54	102	72	66	0.49	2.15	101.4
2-01	32.5	0.31	2.90	232.95	99	72	67	0.56	2.41	99.8
2-02	35.0	0.31	3.20	235.49	91	74	67	0.56	2.54	104.3
2-03	37.5	0.31	3.10	237.98	87	76	68	0.56	2.49	101.6
2-04	40.0	0.32	3.50	240.62	72	77	68	0.57	2.64	104.5
2-05	42.5	0.29	3.10	243.16	73	71	69	0.54	2.54	106.1
2-06	45.0	0.24	2.30	245.37	98	73	69	0.49	2.21	103.5
2-07	47.5	0.23	2.00	247.35	112	74	69	0.48	1.98	95.7
2-08	50.0	0.23	1.90	249.33	114	75	70	0.47	1.98	96.7
2-09	52.5	0.23	2.20	251.44	97	77	70	0.48	2.11	100.3
2-10	55.0	0.22	2.20	253.55	93	79	71	0.47	2.11	101.9
2-11	57.5	0.21	2.10	255.55	90	80	71	0.46	2.00	98.5
2-12	60.0	0.29	3.00	258.04	83	81	72	0.54	2.49	103.7
Final	60.0	0.51	2.55	54.34	91	70				

Field Data Printout

Location: Mixer Stack
Test Run: 3
Client: Battery Builders, Inc.
Project No: 8670
Test Date: 4/27/00
Meter ΔH@: 1.8310
Meter Y_d: 0.9912
Pitot C_p: 0.84
Static P: -0.1
Leak Rate Before: 0.004 cfm @ 16 "Hg
Leak Rate After: 0.002 cfm @ 9 "Hg

Method: M12
Testing Type: Lead
Area (ft²): 1.23
Filter No: 203469
Thimble No: NA
Beaker No: NA

Bar. Press. (in. Hg): 29.30
Actual Moisture (%): 5.5
Nozzle Diameter (D_n): 0.316
O_2 (dry volume %): 21.0
CO_2 (dry volume %): 0.0
Start Time (approx.): 12:37
Stop Time (approx.): 14:16
H_2O (condensate, ml): 53.4
H_2O (silica, g): 10.6

Traverse Point	Run Time	Pitot ΔP_s (in. H_2O)	Sample ΔH (in. H_2O)	Metered (ft³)	Stack T_s (°F)	Dry Gas Meter $T_{m\,in}$ (°F)	Dry Gas Meter $T_{m\,out}$ (°F)	$\sqrt{\Delta P_s}$ (calculated) ($\sqrt{\text{in. } H_2O}$)	Volume (calculated) (ft³)	Isokinetics (calculated) (%)
	0.0			258.60						
1-01	2.5	0.27	2.80	260.93	81	74	73	0.52	2.33	101.3
1-02	5.0	0.26	2.40	263.13	102	76	73	0.51	2.20	99.0
1-03	7.5	0.24	2.00	265.13	119	77	74	0.49	2.00	94.8
1-04	10.0	0.24	2.10	267.17	111	78	74	0.49	2.04	96.0
1-05	12.5	0.25	2.35	269.34	101	79	74	0.50	2.17	99.1
1-06	15.0	0.24	2.40	271.54	93	80	75	0.49	2.20	101.7
1-07	17.5	0.28	2.80	273.91	90	82	76	0.53	2.37	101.0
1-08	20.0	0.31	3.20	276.43	81	82	76	0.56	2.52	101.3
1-09	22.5	0.25	2.60	278.75	82	81	79	0.50	2.32	103.6
1-10	25.0	0.27	2.50	280.99	97	82	80	0.52	2.24	97.4
1-11	27.5	0.25	2.20	283.15	109	84	80	0.50	2.16	98.3
1-12	30.0	0.25	2.20	285.27	108	85	80	0.50	2.12	96.4
2-01	32.5	0.30	3.00	287.61	93	83	80	0.55	2.34	96.2
2-02	35.0	0.31	3.10	290.13	91	85	80	0.56	2.52	101.5
2-03	37.5	0.31	3.20	292.68	82	86	81	0.56	2.55	101.7
2-04	40.0	0.33	3.40	295.39	81	78	79	0.57	2.71	105.7
2-05	42.5	0.27	2.80	297.72	85	80	79	0.52	2.33	100.5
2-06	45.0	0.27	2.50	299.89	108	81	80	0.52	2.17	95.3
2-07	47.5	0.27	2.20	301.95	117	82	79	0.52	2.06	91.1
2-08	50.0	0.27	2.50	304.17	99	85	81	0.52	2.22	96.3
2-09	52.5	0.21	2.00	306.18	97	86	81	0.46	2.01	98.5
2-10	55.0	0.21	2.10	308.18	91	86	82	0.46	2.00	97.4
2-11	57.5	0.28	2.80	310.54	86	87	82	0.53	2.36	99.2
2-12	60.0	0.27	2.80	312.93	80	86	82	0.52	2.39	101.8
Final	60.0	0.52	2.58	54.33	95	80				

LABORATORY DATA

F

PHILIP SERVICES

INORGANIC DATA PACKAGE
FOR
CLEAN AIR ENGINEERING

Project # 8670

Philip Analytical Services Corporation
5555 North Service Road
Burlington, ON L7L 5H7

Submission #: 0E0074

Prepared by : Shari Typer- CSR Initial :
Approved by : Dr. Ron McLeod - Principal Scientist Initial :

1. CASE NARRATIVE

PROJECT NARRATIVE

PHILIP Analytical Services (Burlington ON)
Philip Project: AN000466
Philip Submission #:0E0074

Client: Clean Air Engineering
Client Project: 8670

I. SAMPLE RECEIPT/ANALYSIS

a) Sample Listing

Philip ID	Client Sample ID	Date Sampled	Date Received	Date Prepped	Run Date
Lead via Modified EPA Method 12-GFAA					
019609 00	Method Blank	00/04/27	00/05/01	00/05/09	00/05/11
019610 00	M12-Reagent Blank	00/04/27	00/05/01	00/05/09	00/05/11
019611 00	Baghouse #1 R1	00/04/26	00/05/01	00/05/09	00/05/11
019612 00	Baghouse #1 R2	00/04/26	00/05/01	00/05/09	00/05/11
019613 00	Baghouse #1 R3	00/04/26	00/05/01	00/05/09	00/05/11
019614 00	Mixer Cooling Ex-R1	00/04/27	00/05/01	00/05/09	00/05/11
019615 00	Mixer Cooling Ex-R2	00/04/27	00/05/01	00/05/09	00/05/11
019616 00	Mixer Cooling Ex-R3	00/04/27	00/05/01	00/05/09	00/05/11

Run Date is defined as the date of injection of the last calibration standard (12 hour or less) prior to the samples analyzed within that run sequence. Therefore the time of calibration injection that defines the run date is always within 12 hours of the time of sample injection.

b) Shipping Problems: none encountered

c) Documentation Problems: none encountered

II. SAMPLE PREP:

No problems encountered

III. SAMPLE ANALYSIS:

See also comments within the appropriate Certificate of Analysis.

a) Hold Times: all within recommended hold times

b) Instrument Calibration: all within control limits

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above.
In addition, I certify, that to the best of my knowledge and belief, the data as reported are true and accurate.
Release of the data contained in this data package has been authorized by the cognizant laboratory official or his/her designee, as verified by this signature.

Ronald A. McLeod, Principal Sci., Ph.D.,C.Chem.

May 15th 2000
Date

2. ANALYTICAL DATA REPORT

PHILIP SERVICES

Certificate of Analysis

CLIENT INFORMATION		LABORATORY INFORMATION	
Attention:	Brian Koziczkowski	**Contact:**	Ron McLeod
Client Name:	Clean Air Engineering	**Project:**	AN000466
Project:	8670	**Date Received:**	00/05/01
Project Desc:	Battery Builders Inc.	**Date Reported:**	00/05/11
Address:	500 W. Wood Street Palatine, IL IL 60067	**Submission No.:**	0E0074
		Sample No.:	019609-019616
Fax Number:	847-991-3385		
Phone Number:	847-991-3300		

NOTES: *"-' = not analysed '<' = less than Method Detection Limit (MDL) 'NA' = no data available*
LOQ can by determined for all analytes by multiplying the appropriate MDL X 3.33
Solids data is based on dry weight except for biota analyses.
Organic analyses are not corrected for extraction recovery standards except for isotope dilution methods, (i.e. CARB 429 PAH, all PCDD/F and DBD/DBF analyses)

Methods used by PASC are based upon those found in 'Standard Methods for the Examination of Water and Wastewater', Nineteenth Edition. Other methods are based on the principles of MISA or EPA methodologies. New York State: ELAP Identification Number 10756.

All work recorded herein has been done in accordance with normal professional standards using accepted testing methodologies, quality assurance and quality control procedures except where otherwise agreed to by the client and testing company in writing. Any and all use of these test results shall be limited to the actual cost of the pertinent analysis done. There is no other warranty expressed or implied. Your samples will be retained at PASC for a period of three weeks from receipt of data or as per contract.

COMMENTS:

Certified by: K. A. McLeod

PASC - Certificate of Analysis

	Client ID:		Method Blank	Blank Spike #1	Blank Spike #1	Blank Spike #2	Blank Spike #2	M12-Reagent Blank	Baghouse #1 R1	Baghouse #1 R2	Baghouse #1 R3
	Lab No.:		019609 00	019609 00	019609 00	019609 00	019609 00	019610 00	019611 00	019612 00	019613 00
	Date Sampled:		00/04/27	00/04/27	00/04/27	00/04/27	00/04/27	00/04/27	00/04/26	00/04/26	00/04/26
Component	**MDL**	**Units**			% Recoveries		% Recoveries				
Lead (gfaa)	0.25	ug	<	1.9	94	1.9	94	3.4	680	910	750

000006

PASC - Certificate of Analysis

	Client ID:		Mixer Cooling Ex-R1	Mixer Cooling Ex-R2	Mixer Cooling Ex-R3	Mixer Cooling Ex-R3	Mixer Cooling Ex-R3	Mixer Cooling Ex-R3	Mixer Cooling Ex-R3	Mixer Cooling Ex-R3
	Lab No.:		019614 00	019615 00	019616 00	019616 00	019616 00	019616 00	019616 00	019616 00
	Date Sampled:		00/04/27	00/04/27	00/04/27	00/04/27	00/04/27	00/04/27	00/04/27	00/04/27
Component	**MDL**	**Units**				Duplicate	M. Spike	MS % Rec.	MS Dup	MSD % Rec.
Lead (gfaa)	0.25	ug	130	160	190	180	560	95	550	92

000007

PASC - Summary of Analysis Pre. Dates

Batch Code:	**0509MNG1**
Lead (gfaa)	019609 00
	019610 00
	019611 00
	019612 00
	019613 00
	019614 00
	019615 00
	019616 00
Run Date:	00/05/11
Date of Sample Prep:	00/05/09

3. RAW DATA

EPA Method 7421
Metals by GFAA

Level 3 Data Package

Calibration: 0 µg/L, 5 µg/L, 10 µg/ L, 25 µg/L, 50 µg/L for PB
Method Detection Limit(s): as listed on the certificate of analysis and/or the validation record(s)
Testcode(s): 12PB-FGF
Matrix: IMPINGERS
Calculation: Final Result (TOT µg) = Conc. (µg/L) x $\frac{\text{final vol.}}{1000}$ x dilution factor

Procedural Legend

ICB - Initial Calibration Blank	
ICV - Initial Calibration Verification	Conc. -25 µg/L For Pb
BL - Process Blank	
L - Process Spike	Conc. - 20 µg/L For Pb
D - Duplicate Sample	
DL - Duplicate Process Spike	Conc. - 20 µg/L For Pb
CCB - Continuing Calibration Blankµg/L	
CCV- Continuing Calibration Verification	Conc. - 20 µg/L For Pb
Ext. Ref. – External Reference	Conc. - 20 µg/L For Pb

MISCELLANEOUS PREPARATION LOG 1

DG12GFF

- [x] Digest Code done/Tubes labeled
- [x] Samples ~~poured out~~ BLOWN DOWN
- [x] Spikes added
- [x] Acid/s added
- [x] Samples digested
- [x] Samples bulked FINALVOL 100mls
- [x] Rack order checked

	#	Sample I.D.	B.Code	Init. Vol.	F. Vol.	Dil	Comments
	1	BL 0509	MNG1		100 ml	100X	19609 MB
	2	BL 0509 DL					200 µl GF SPIKE
	3	BL 0509 L					200 µl GF SPIKE
1	4	19610					
1	5	D					
1	6	S					
1	7	L					
2	8	19611					
3	9	12					
4	10	13					
5	11	14					
6	12	15					
7	13	16					
8	14						
9	15						
10	16						
	17	BL					
	18	BL S					
	19	BL L					
11	20						
11	21	D					
11	22	S					
11	23	L					
12	24						
13	25						
14	26						
15	27						
16	28						
17	29						
18	30						
19	31						
20	32						

Notes:

0509 MN ~~HCL Lot No.~~ H_2O_2 LOT # 992256	HNO3 Lot No. 100010	Bath Temps: / / °C

Prepared By: M. Alvarado Date: 090509 Checked by: M. Alvarado

on ber	Client	Client ID	Parameter	TS	Result	Dup.	Spike	% Rec.	Dup. Spk	% Rec.	Batch Date	Batch Code	Run Date	Run Code	Day Old	Day In	Analyst's Comments
509	CLEANAIR	MB R456	Lead (gfaa	P	-0.25	-99999.0	1.90	94.	1.90	94.	00/05/09	MNG1	00/05/11	HR01	12.	8.	
510	CLEANAIR	M12-Reagent Blank	Lead (gfaa	P	3.39						00/05/09	MNG1	00/05/11	HR01	12.	8.	*INT FOR SERIAL DIL.SA
511	CLEANAIR	Baghouse #1 R1	Lead (gfaa	P	681.20						00/05/09	MNG1	00/05/11	HR01	13.	8.	
512	CLEANAIR	Baghouse #1 R2	Lead (gfaa	P	910.50						00/05/09	MNG1	00/05/11	HR01	13.	8.	
513	CLEANAIR	Baghouse #1 R3	Lead (gfaa	P	749.80						00/05/09	MNG1	00/05/11	HR01	13.	8.	
514	CLEANAIR	Mixer Cooling Ex-R1	Lead (gfaa	P	125.30						00/05/09	MNG1	00/05/11	HR01	12.	8.	
515	CLEANAIR	Mixer Cooling Ex-R2	Lead (gfaa	P	155.30						00/05/09	MNG1	00/05/11	HR01	12.	8.	
516	CLEANAIR	Mixer Cooling Ex-R3	Lead (gfaa	P	185.20	180.60	563.40	95.	551.40	92.	00/05/09	MNG1	00/05/11	HR01	12.	8.	*PDS*
509	INTERNAL		Lead (gfaa	P	-0.25	-99999.0	1.90	94.	1.90	94.	00/05/09	MNG1	00/05/11	HR01	$$$	$$$	

9 Tests for 12PB-FGF with an MDL of 0.25 ug Validated By _____ Control Chart Updated N/A IO Requirements met N/A

00012

00013

Element: PB **AUTOSAMPLER RUN LOG (PE - 3030)** **Test Code:** 12PB-FGF

Date: 00/05/11 **Start Time:** 8:00 **End Time:** 12:00 **Modifier ID:** B

Analyst: HUA **Run Code:** HR01 **Matrix:** IMPINGER **Units:** ug **MDL:** 0.25 ug

Cup #	Samp. Dil. F.	Dig. Dil. F.	Samp. ID	Init. Conc.	F. Conc.	% R
0			Cal. Blk (CB)	0.0		
1			Standard 1	5.0		
1			Standard 2	10.0		
2			Standard 3	20.0		
2			Standard 4	50.0		
3			ICV	24.65		99
4			ICB	0.44		
5			Ext Ref. (20.0)	18.64		93
6	1	0.1	BL0509MNG1	0.17	0.02	
7	1	0.1	BL0509MNG1L	19.01	1.90	94
8	1	0.1	BL0509MNG1DL	18.99	1.90	94
9	200	0.1	019616	9.26	185.20	
10	200	0.1	019616D	9.03	180.60	
11	200	0.1	019616L PDS			
12	200	0.1	019616DL PDS			
13			CCV	18.87		94
14			CCB	-0.08		
15	200	0.1	019616L PDS	28.17	563.40	95
16	5	0.1	019610	9.05	4.53	
17	200	0.1	BL0509MNG1DL	27.57	551.40	92
18	1	0.1	019610	33.91	3.39	
19	200	0.1	019611	34.06	681.20	
20	500	0.1	019612	18.21	910.50	
21	200	0.1	019613	37.49	749.80	
22	100	0.1	019614	12.53	125.30	
23	100	0.1	019615	15.53	155.30	
24	10	0.1	019610	4.58	4.58	
25			CCV	18.38		92
26			CCB	0.16		
27						
28						
29						
30						
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						

Cup #	Samp. Dil. F.	Dig. Dil. F.	Samp. ID	Init. Conc.	F. Conc.	% R
0			Cal. Blk (CB)	0.0		
1			Standard 1	0.5		
1			Standard 2	1.0		
2			Standard 3	2.0		
2			Standard 4	5.0		
3			ICV			
4			ICB			
5			Ext Ref. ( )			
6			BL			
7			BL L			
8						
9			D			
10			L			
11						
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32						
33						
34						
35						
36						-
37						
38						
39						
40						

Comments: *Check protocol, duplicate analyses or duplicate blank spikes and sample spikes may be required*

	Std 1	Std 2	Std 3	Std 4	Std 5	ICV	CCV	Ext. Ref.	Matrix Mod.	Wave length	Slit nm	Lamp	Platform
Sb	0	10	20	50	100	62.5	50	20	A	217.6	0.7	EDL	Yes
As	0	10	20	50	100	62.5	50	60	A	193.7	0.7	EDL	Yes
Ba	0	10	20	50	100	62.5	50	60	E	553.7	0.7	EDL	Yes
Cd	0	0.5	0	2.5	5	2.5	2	2	B	228.8	0.7	HCl	Yes
Co	0	5	0.5	25	50	25	20	20	C	242.5	0.2	HCl	Yes
Cu	0	5	1	25	50	25	20	20	E	327.8	0.7	HCl	Yes
Cr	0	5	2.5	25	50	25	20	20	C	357.9	0.7	HCl	Yes
Pb	0	5	5	25	50	25	20	20	B	283.3	0.7	EDL	Yes
Mo	0	2.5	5	12.5	25	12.5	10	20	E	313.3	0.7	HCl	No
Ni	0	5	10	25	50	25	20	20	E	232.1	0.2	HCl	Yes
Se	0	10	20	50	100	62.5	50	60	A	196.0	0.7	EDL	Yes
Ag	0	0.5	1	2.5	5	2.5	2	3.2	D	327.1	0.7	HCl	Yes
Tl	0	10	20	50	100	62.5	50	60	A	276.8	0.7	EDL	Yes
Te	0	10	20	50	100	62.5	50	-	A	214.3	0.2	EDL	Yes

Matrix Modifiers:

A $Pd(NO_3)/Mg(NO_3)_2$

B 0.31% w/v $Mg(NO_3)_2$ and 4.6% w/v $(NH_4)H_2PO_4$

C 0.5% w/v $Mg(NO_3)_2$

D 2% w/v $(NH_4)H_2PO_4$ in 2% Nitric Acid

E None

Zero solution: 10% Nitric acid

Rinse Solution: 0.2% Nitric acid

EPA SW846 QC CRITERIA:

Initial Calibration: Blank and 3 standards, r>=0.995
ICV: **90-110%** recovery
CCV: **80-120%** recovery, run every 10 samples
Ext. Ref.: Must be run once per run - EPA source
Blank Spike (LCS): 1/batch of samples, minimum 1/20 samples, no criteria specified, (in house waters = **90-110%**)
Matrix Spike: 1 MS and 1 MSD per batch of samples, minimum 1 per 20 samples, no criteria specified
Serial dilution: only if sample concentration is >25 times the MDL, must be **90-110%** of original
Post Digest Spike: only if sample concentration is <25 times the MDL, **85-115%** recovery

Tracking I.D.	Tracking #	Tracking I.D.	Tracking #
Dil. Soln. & Zero Soln.	6	Post Spiking Solution	1
STD 1	7	Matrix Modifier A	908334
STD 2	7	Matrix Modifier B	2
ICB/CCB	1	Matrix Modifier C	1
ICV	3	Matrix Modifier D	n/a
CCV	2	Rinse Solution	3
External Reference	4		

00/07/11 HK01

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.041	0.026	0.033
PEAK AREA (ABS-SECONDS)	0.084	0.020	0.064

READ: 0.020

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.407	-3.168	4.166
PEAK AREA (ABS-SECONDS)	0.207	-9.889	5.195

READ: -.---

E-81: RESULT GREATER THAN 9999

MEAN= -.--- STD.DEV.= 1.469 COEF.VAR.= %

0.000 AUTOZERO

PB

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.052	0.022	0.051
PEAK AREA (ABS-SECONDS)	0.102	0.016	0.086

READ: 8.106

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.046	0.023	0.046
PEAK AREA (ABS-SECONDS)	0.087	0.016	0.072

READ: 8.106

MEAN= 8.106 STD.DEV.= 0.000 COEF.VAR.= %

0.000 AUTOZERO

PB

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.052	0.022	0.052
PEAK AREA (ABS-SECONDS)	0.095	0.016	0.077

READ: 0.000

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.049	0.020	0.046
PEAK AREA (ABS-SECONDS)	0.088	0.014	0.075

READ: -0.002

MEAN= -0.001 STD.DEV.= 0.002 COEF.VAR.= %

0.000 AUTOZERO

PB

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.119	0.069	0.047
PEAK AREA (ABS-SECONDS)	0.123	0.042	0.081

READ: 0.027

(CONTINUED) 00016

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.125	0.096	0.044
PEAK AREA (ABS-SECONDS)	0.117	0.041	0.075

READ: 0.026

MEAN= 0.027 STD.DEV.= 0.000 COEF.VAR.= %

****

5.00 STANDARD 1

****

PB

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.173	0.130	0.050
PEAK AREA (ABS-SECONDS)	0.155	0.066	0.090

READ: 9.48

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.180	0.136	0.049
PEAK AREA (ABS-SECONDS)	0.161	0.067	0.094

READ: 9.81

MEAN= 9.65 STD.DEV.= 0.24 COEF.VAR.= %

****

9.65

E-50: READING GREATER THAN HIGHEST STANDARD

****

10.00 STANDARD 2

****

PB

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.378	0.291	0.087
PEAK AREA (ABS-SECONDS)	0.255	0.147	0.108

READ: 28.95

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.451	0.351	0.100
PEAK AREA (ABS-SECONDS)	0.247	0.146	0.101

READ: 28.74

MEAN= 28.85 STD.DEV.= 0.17 COEF.VAR.= %

****

28.85

E-50: READING GREATER THAN HIGHEST STANDARD

****

25.01 STANDARD 3

****

PB

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.663	0.516	0.148
PEAK AREA (ABS-SECONDS)	0.393	0.255	0.138

READ: 45.18

```
                                           AA            ZAA            BG
PEAK HEIGHT (ABSORBANCE)                 0.674          0.524          0.149
PEAK AREA (ABS-SECONDS)                  0.394          0.258          0.135

READ:       45.88
--------------------------------------------------------------------------------
MEAN=      45.53     STD.DEV.=       0.48     COEF.VAR.=         %
********************************************************************************
   45.53
          E-50: READING GREATER THAN HIGHEST STANDARD
********************************************************************************
   49.92          STANDARD    4
********************************************************************************
PB    0103
                                           AA            ZAA            BG
PEAK HEIGHT (ABSORBANCE)                 0.405          0.316          0.090
PEAK AREA (ABS-SECONDS)                  0.250          0.144          0.107

READ:       24.85
--------------------------------------------------------------------------------
                                           AA            ZAA            BG
PEAK HEIGHT (ABSORBANCE)                 0.368          0.284          0.084
PEAK AREA (ABS-SECONDS)                  0.254          0.142          0.112

READ:       24.46
--------------------------------------------------------------------------------
MEAN=      24.65     STD.DEV.=       0.29     COEF.VAR.=         %
********************************************************************************
PB    0104
                                           AA            ZAA            BG
PEAK HEIGHT (ABSORBANCE)                 0.053          0.026          0.050
PEAK AREA (ABS-SECONDS)                  0.096          0.019          0.076

READ:        0.82
--------------------------------------------------------------------------------
                                           AA            ZAA            BG
PEAK HEIGHT (ABSORBANCE)                 0.045          0.023          0.045
PEAK AREA (ABS-SECONDS)                  0.082          0.015          0.067

READ:        0.06
--------------------------------------------------------------------------------
MEAN=       0.44     STD.DEV.=       0.54     COEF.VAR.=         %
********************************************************************************
PB    0105
                                           AA            ZAA            BG
PEAK HEIGHT (ABSORBANCE)                 0.296          0.228          0.069
PEAK AREA (ABS-SECONDS)                  0.225          0.113          0.112

READ:       18.68
--------------------------------------------------------------------------------
                                           AA            ZAA            BG
PEAK HEIGHT (ABSORBANCE)                 0.294          0.220          0.074
PEAK AREA (ABS-SECONDS)                  0.250          0.113          0.137

READ:       18.60
--------------------------------------------------------------------------------
MEAN=      18.64     STD.DEV.=       0.06     COEF.VAR.=         %
********************************************************************************
```

PB 0106

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.059	0.038	0.055
PEAK AREA (ABS-SECONDS)	0.104	0.022	0.083

READ: 1.23

AAL 06/10/11

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.056	0.032	0.055
PEAK AREA (ABS-SECONDS)	0.107	0.019	0.088

READ: 0.84

MEAN= 1.04 STD.DEV.= 0.28 COEF.VAR.= %

PB 0107

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.346	0.271	0.110
PEAK AREA (ABS-SECONDS)	0.223	0.112	0.111

READ: 18.36

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.322	0.248	0.074
PEAK AREA (ABS-SECONDS)	0.234	0.118	0.116

READ: 19.66

MEAN= 19.01 STD.DEV.= 0.97 COEF.VAR.= %

PB 0108

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.330	0.252	0.079
PEAK AREA (ABS-SECONDS)	0.232	0.116	0.116

READ: 19.20

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.396	0.309	0.088
PEAK AREA (ABS-SECONDS)	0.207	0.114	0.093

READ: 18.78

MEAN= 18.99 STD.DEV.= 0.32 COEF.VAR.= %

PB 0106

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.062	0.022	0.060
PEAK AREA (ABS-SECONDS)	0.109	0.016	0.093

READ: 0.30

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.171	0.014	0.162
PEAK AREA (ABS-SECONDS)	0.153	0.015	0.138

READ: 0.04

MEAN= 0.17 STD.DEV.= 0.18 COEF.VAR.= %

PB

AAL 06/10/11

	AA	ZAA	BG

PB 0109

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.173	0.127	0.064
PEAK AREA (ABS-SECONDS)	0.181	0.066	0.115

READ: 9.39

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.176	0.126	0.094
PEAK AREA (ABS-SECONDS)	0.228	0.064	0.164

READ: 9.14

MEAN= 9.26 STD.DEV.= 0.18 COEF.VAR.= %

PB 0110

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.166	0.115	0.110
PEAK AREA (ABS-SECONDS)	0.261	0.064	0.197

READ: 9.00

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.199	0.146	0.064
PEAK AREA (ABS-SECONDS)	0.203	0.064	0.139

READ: 9.06

MEAN= 9.03 STD.DEV.= 0.04 COEF.VAR.= %

PB 0111

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.438	0.338	0.100
PEAK AREA (ABS-SECONDS)	0.299	0.154	0.146

READ: 26.89

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.410	0.311	0.099
PEAK AREA (ABS-SECONDS)	0.324	0.154	0.170

READ: 27.09

MEAN= 26.99 STD.DEV.= 0.16 COEF.VAR.= %

PB 0112

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.388	0.294	0.093
PEAK AREA (ABS-SECONDS)	0.297	0.142	0.156

READ: 24.46

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.403	0.300	0.109
PEAK AREA (ABS-SECONDS)	0.391	0.153	0.238

READ: 26.76

MEAN= 25.60 STD.DEV.= 1.74 COEF.VAR.= %

NL 04/07/11

PB 0113

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.314	0.226	0.118
PEAK AREA (ABS-SECONDS)	0.370	0.115	0.255

READ: 19.06

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.318	0.233	0.114
PEAK AREA (ABS-SECONDS)	0.357	0.113	0.244

READ: 18.68

MEAN= 18.87 STD.DEV.= 0.29 COEF.VAR.= %

PB 0114

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.073	0.024	0.071
PEAK AREA (ABS-SECONDS)	0.143	0.018	0.125

READ: 0.56

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.099	0.021	0.099
PEAK AREA (ABS-SECONDS)	0.177	0.011	0.166

READ: -0.73

MEAN= -0.08 STD.DEV.= 0.91 COEF.VAR.= %

PB 0115

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.406	0.299	0.129
PEAK AREA (ABS-SECONDS)	0.403	0.157	0.246

READ: 27.60

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.401	0.255	0.141
PEAK AREA (ABS-SECONDS)	0.437	0.162	0.275

READ: 28.73

MEAN= 28.17 STD.DEV.= 0.86 COEF.VAR.= %

PB 0116

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.461	0.106	0.461
PEAK AREA (ABS-SECONDS)	0.765	0.066	0.700

READ: 9.35

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.458	0.106	0.455
PEAK AREA (ABS-SECONDS)	0.775	0.063	0.712

READ: 9.83

MEAN= 9.09 STD.DEV.= 0.38 COEF.VAR.= %

PB 0117

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.417	0.305	0.175
PEAK AREA (ABS-SECONDS)	0.493	0.156	0.337

READ: 27.46

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.449	0.331	0.174
PEAK AREA (ABS-SECONDS)	0.505	0.157	0.348

READ: 27.71

MEAN= 27.57 STD.DEV.= 0.21 COEF.VAR.= %

##

PB 0118

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.595	0.318	0.588
PEAK AREA (ABS-SECONDS)	1.286	0.196	1.090

READ: 36.40

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.546	0.288	0.542
PEAK AREA (ABS-SECONDS)	1.192	0.175	1.017

READ: 31.46

MEAN= 33.91 STD.DEV.= 3.81 COEF.VAR.= %

##

PB 0119

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.464	0.350	0.269
PEAK AREA (ABS-SECONDS)	0.571	0.186	0.385

READ: 33.90

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.475	0.372	0.272
PEAK AREA (ABS-SECONDS)	0.578	0.188	0.390

READ: 34.22

MEAN= 34.06 STD.DEV.= 0.25 COEF.VAR.= %

##

PB 0120

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.282	0.206	0.283
PEAK AREA (ABS-SECONDS)	0.489	0.114	0.375

READ: 18.77

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.274	0.207	0.272
PEAK AREA (ABS-SECONDS)	0.444	0.109	0.336

READ: 17.65

MEAN= 18.21 STD.DEV.= 0.84 COEF.VAR.= %

##

PB 0121

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.460	0.360	0.276
PEAK AREA (ABS-SECONDS)	0.565	0.202	0.364

READ: 37.27

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.465	0.390	0.252
PEAK AREA (ABS-SECONDS)	0.553	0.204	0.349

READ: 37.70

MEAN= 37.49 STD.DEV.= 0.33 COEF.VAR.= %

****

PB 0122

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.260	0.156	0.256
PEAK AREA (ABS-SECONDS)	0.353	0.083	0.270

READ: 12.66

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.304	0.156	0.304
PEAK AREA (ABS-SECONDS)	0.485	0.082	0.406

READ: 12.40

MEAN= 12.53 STD.DEV.= 0.19 COEF.VAR.= %

****

PB 0123

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.304	0.157	0.306
PEAK AREA (ABS-SECONDS)	0.490	0.083	0.407

READ: 12.66

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.332	0.160	0.332
PEAK AREA (ABS-SECONDS)	0.539	0.081	0.458

READ: 12.39

MEAN= 12.53 STD.DEV.= 0.20 COEF.VAR.= %

****

PB 0124

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.451	0.067	0.446
PEAK AREA (ABS-SECONDS)	0.664	0.042	0.621

READ: 4.99

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.437	0.064	0.440
PEAK AREA (ABS-SECONDS)	0.635	0.035	0.597

READ: 4.17

MEAN= 4.56 STD.DEV.= 0.59 COEF.VAR.= %

****

PB 0125

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.362	0.216	0.391
PEAK AREA (ABS-SECONDS)	0.656	0.114	0.542

READ: 18.82

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.396	0.212	0.395
PEAK AREA (ABS-SECONDS)	0.564	0.110	0.554

READ: 17.99

MEAN= 18.36 STD.DEV.= 0.65 COEF.VAR.= %

****

PB 0126

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.395	0.028	0.395
PEAK AREA (ABS-SECONDS)	0.581	0.017	0.564

READ: 0.40

	AA	ZAA	BG
PEAK HEIGHT (ABSORBANCE)	0.360	0.023	0.357
PEAK AREA (ABS-SECONDS)	0.468	0.014	0.473

READ: -0.03

MEAN= 0.16 STD.DEV.= 0.35 COEF.VAR.= %

****

4. SHIPPING/RECEIVING DOCUMENTS

Airbills (No. of shipments)
Chain-of-Custody Records
Sample Log-In Sheets
Miscellaneous Shipping/Receiving Records (describe or list)
NOTICE OF SAMPLE RECEIPT

14954

CHAIN OF CUSTODY FORM

LIENT Battery Builders, Inc.
LANT Naperville, IL
ROJECT MANAGER Brian Koziczkowski
OB LEADER Brian Koziczkowski

PROJECT NO. 8670
DEPT. 66
RECOVERY PERSON: Brian Koziczkowski

PAGE 1 OF 2
REVISION NO. ____

CAE LAB NO.	RUN NO.	TEST LOCATION	DATE	SAMPLE MATRIX	NO. OF CONTAINERS	ORIGINAL VOLUME	EPA MIR w/ GFAAS	ANALYSIS REQUESTED			ADDITIONAL INFORMATION
1611	1	Baghouse No. 1	4/26/00	filter #203465 ✓	1		X				ppd.
	↓			front-half HNO_3 rinse ✓							100cc
				impinger contents ✓		482.8					1LAr
612	2			filter #203578 ✓							ppd
	↓			front-half HNO_3 rinse ✓							100cc.
				impinger contents ✓		449.9					1LAr.
613	3			filter #203466 ✓							ppd
	↓			front-half HNO_3 rinse ✓							100cc
				impinger contents ✓		426.8					1LAr.
614	1	Mixer Cooling Exhaust	4/27/00	filter #203467 ✓							ppd.
	↓			front-half HNO_3 rinse ✓							100cc.
				impinger contents ✓		348.3					1LAr.
	2			filter #203468 ✓							ppd.
615	↓			front-half HNO_3 rinse ✓							100cc.
				impinger contents ✓		~~472.9~~ 434.3					1LAr.

Relinquished by:(Signature)	Date/Time	Received by:(Signature)	Date/Time	Relinquished by:(Signature)	Date/Time
Brian J. Koziczkowski	4/28/00				
Courier: Fed Ex	Date/Time	Relinquished by:(Signature)	Date/Time	Rec'd for Analysis by: PASL	Date/Time 000504 12:10

Special Handling Instructions

Forwarding Lab: Philip Analytical Services, 299 Cayuga Road (Fed Ex Depot), Cheektowaga, NY 14225

PO Number:

This form was completed by: Brian Koziczkowski

Signature: Brian J. Koziczkowski Date: 4/27/00

Clean Air Engineering
500 West Wood Street
Palatine, IL 60067
(847) 991-3300 phone
(847) 991-3385 fax

DS COC Palatine
EXCL.R0-6/7/96

000027

14955

CHAIN OF CUSTODY FORM

CLIENT: Battery Builders, Inc.
PLANT: Naperville, IL
PROJECT MANAGER: Brian Koziczkowski
JOB LEADER: Brian Koziczkowski

PROJECT NO. 8670
DEPT. 66
RECOVERY PERSON: Brian Koziczkowski

PAGE 2 OF 2
REVISION NO. ____

CAE LAB NO.	RUN NO.	TEST LOCATION	DATE	SAMPLE MATRIX	NO. OF CONTAINERS	ORIGINAL VOLUME	EPA M12 w/ GFAAS				ADDITIONAL INFORMATION
016.5	3	Mixer Cooling Exhaust	4/27/00	filter # 203469 ✓	1		X				MB- 19604
	↓	↓	↓	front-half HNO3 rinse ✓	↓		↓				ppd.
				impinger contents ✓		443.9					100cc.
		Reagent Blank	4/27/00	200mL 0.1N HNO3 ✓		2000					1LAr.
410.5		Reagent Blank	↓	filter #203609 ✓							1LAr.
		Reagent Blank		filter #203608 ✓							ppd
											ppd.

Relinquished by:(Signature)	Date/Time	Received by:(Signature)	Date/Time	Relinquished by:(Signature)	Date/Time
Brian J. Koziczkowski	4/28/00				
Courier:	**Date/Time**	**Relinquished by:(Signature)**	**Date/Time**	**Rec'd for Analysis by:**	**Date/Time**
Fed Ex				[signature]	000501 10:00

Special Handling Instructions

Forwarding Lab: Philip Analytical Services
299 Cayuga Road (Fed Ex Depot)
Cheektowaga, NY 14225

This form was completed by: Brian Koziczkowski

Signature: Brian J. Koziczkowski Date: 4/27/00

Clean Air Engineering
500 West Wood Street
Palatine, IL 60067
(847) 991-3300 phone
(847) 991-3385 fax

DS COC Palatine
EXCL.R0-6/7/96

000226

00027

Page ___ of ___

US SAMPLE LOG IN SHEET

CLEAN AIR

Lab Name: Philip Analytical Services Corporation, Burlington Laboratory

Received By (Print Name): K Cavaro PALATINE

Received By (Signature):

Client Project ID:

REMARKS:		Condition of Samples/Sample Shipment:
Custody Seal(s)	Present ___ Absent ✓	rec'd intact
Chain of Custody Records	Present ✓ Absent ___	
Airbill	Present ✓ Absent ___	
Airbill No.	4112 2546 7960 7950	
Does Information on Custody Records and Samples Agree?	Yes ✓ No ___	
Date Received at Lab	000501	
Time Received	12:10	

Temperature of Coolers

Cooler ID:	Temperature
2 Boxes	not taken

Relinquished By: E Jones

Logbook No: ___

Date: 000501

Logbook Page No. ___

** TX STATUS REPORT ** AS OF MAY 03 2000 10:01 PAGE.01

PHILIP ANALYTICAL

	DATE	TIME	TO/FROM	MODE	MIN/SEC	PGS	JOB#	STATUS
29	05/03	10:01	18479913385	EC--S	00'19"	001	063	OK

NOTICE OF SAMPLE RECEIPT-PHILIP ANALYTICAL SERVICES

Attention: Brian Koziczkowski
Client: Clean Air Engineering
Re Client Project: 8670
FAX #: 847-991-3385
Phone #: 847-991-3300

Samples for: Pb via EPA M12 - GFAAS.
were received in good condition unless
indicated below.

SAMPLE LISTING

Philip ID #	Sample ID	Date Sampled	Date Received
019610	M12-Reagent Blank	00/04/27	00/05/01
019611	Baghouse #1 R1	00/04/26	00/05/01
019612	Baghouse #1 R2	00/04/26	00/05/01
019613	Baghouse #1 R3	00/04/26	00/05/01
019614	Mixer Cooling Ex-R1	00/04/27	00/05/01
019615	Mixer Cooling Ex-R2	00/04/27	00/05/01
019616	Mixer Cooling Ex-R3	00/04/27	00/05/01

Comments: _____

Date 00/05/03

00029

NOTICE OF SAMPLE RECEIPT-PHILIP ANALYTICAL SERVICES

Attention: Brian Koziczkowski
Client: Clean Air Engineering
Re Client Project: 8670
FAX #: 847-991-3385
Phone #: 847-991-3300

Samples for: Pb via EPA M12 - GFAAS.
were received in good condition unless
indicated below.

SAMPLE LISTING

Philip ID #	Sample ID	Date Sampled	Date Received
019610	M12-Reagent Blank	00/04/27	00/05/01
019611	Baghouse #1 R1	00/04/26	00/05/01
019612	Baghouse #1 R2	00/04/26	00/05/01
019613	Baghouse #1 R3	00/04/26	00/05/01
019614	Mixer Cooling Ex-R1	00/04/27	00/05/01
019615	Mixer Cooling Ex-R2	00/04/27	00/05/01
019616	Mixer Cooling Ex-R3	00/04/27	00/05/01

Comments: _____

Date 00/05/03

CHAIN OF CUSTODY

G

CHAIN OF CUSTODY FORM

IT Battery Builders, Inc.
T Naperville, IL
ECT MANAGER Brian Koziczkowski
EADER Brian Koziczkowski

PROJECT NO. 8670
DEPT. 66
RECOVERY PERSON: Brian Koziczkowski

PAGE 2 OF 2
REVISION NO. ____

E NO.	RUN NO.	TEST LOCATION	DATE	SAMPLE MATRIX	NO. OF CONTAINERS	ORIGINAL VOLUME	ANALYSIS REQUESTED: CPA MI 24 GFAAS				ADDITIONAL INFORMATION
	3	Mixer Cooling Exhaust	4/27/00	Filter # 203469	1		X				
	↓	↓	↓	Front half HNO3 rinse	↓		↓				
				Impinger contents		1439					
		Reagent Blank	4/27/00	200mL 5% HNO3		2000					
		Reagent Blank	↓	Filter #203469							
		Reagent Blank	↓	Filter #203468	↓		↓				

Relinquished by:(Signature)	Date/Time	Received by:(Signature)	Date/Time	Relinquished by:(Signature)	Date/Time
Brian J. Koziczkowski	4/28/00				
Carrier:	**Date/Time**	**Relinquished by:(Signature)**	**Date/Time**	**Rec'd for Analysis by:**	**Date/Time**
Fed Ex					

Special Handling Instructions

Forwarding Lab: Philip Analytical Services
249 Cayuga Road (Fed Ex Depot)
Cheektowaga, NY 14225

PO Number: 19439-00-8670

This form was completed by:
Brian Koziczkowski

Signature	Date
Brian J. Koziczkowski	4/28/00

Clean Air Engineering
500 West Wood Street
Palatine, IL 60067
(847) 991-3300 phone
(847) 991-3385 fax

DS COC Palatine
EXCL.R0-6/7/96

CHAIN OF CUSTODY FORM

T Battery Builders, Inc.
T Naperville, IL
ECT MANAGER Brian Koziczkowski
EADER Brian Koziczkowski

PROJECT NO. 8670
DEPT. 66
RECOVERY PERSON: Brian Koziczkowski

PAGE 1 OF 2
REVISION NO. ____

NO.	RUN NO.	TEST LOCATION	DATE	SAMPLE MATRIX	NO. OF CONTAINERS	ORIGINAL VOLUME	CPA MIR w/ GFAAS				ADDITIONAL INFORMATION
	1	Baghouse No. 1	4/26/00	Filter #203465	1		X				
	↓			front-half HNO_3 rinse							
	↓			impinger contents		442.8					
	2			Filter #203578							
	↓			front-half HNO_3 rinse							
	↓			impinger contents		449.9					
	3			Filter #203466							
	↓			front-half HNO_3 rinse							
	↓	↓	↓	impinger contents		426.8					
	1	Mixer Cooling Exhaust	4/27/00	filter #203467							
	↓			front-half HNO_3 rinse							
	↓			impinger contents		398.3					
	2			Filter #203468							
	↓			front-half HNO_3 rinse							
	↓	↓	↓	impinger contents	↓	~~412.4~~ 398.3	↓				

nquished by:(Signature)	Date/Time	Received by:(Signature)	Date/Time	Relinquished by:(Signature)	Date/Time
Brian J. [illegible]	4/28/00				
rier:	**Date/Time**	**Relinquished by:(Signature)**	**Date/Time**	**Rec'd for Analysis by:**	**Date/Time**
ed Ex					

cial Handling Instructions

orwarding Lab: Philip Analytical Services
299 Fayega Road (Rt 6 Dead [illegible]

This form was completed by:
Brian Koziczkowski

Signature [illegible] Date [illegible]

CAE
Clean Air Engineering
500 West Wood Street
Palatine, IL 60067
(847) 991-3300 phone
(847) 991-3385 fax

DS COC Palatine

OPERATING DATA

H

Paste-BH-S
IL APC ID #: 197820AA0

Battery Builders, Inc.
Stack Test Process Rates
Test Date: 4/26/00

05/18/00
10:54
STACDATA.XLS

Pasting Baghouse Exhaust								
					Date:	04/26/00		
Pasting Stack Test Data								
Stack Sample # 1:				10:44 to 11:44				
				Mix 21 & 22				
Mix:		**Negative**		Mix # 22 finished cooling cycle @ 11:46				
Plate:		125N						
	Lead Oxide Charge Weight:			4,800	Lbs.	Filter Press. Drop Start:	3.5	" W.C.
						Filter Press. Drop End:	3.5	" W.C.
Stack Sample # 2:				12:35 to 13:42		67	minutes	
				Mix: 24, 25, 26				
Mix:		Negative		Mix 26 was completed @ 13:42				
Plate:		85N						
	Lead Oxide Charge Weight:			7,200	Lbs.	Filter Press. Drop Start:	3.5	" W.C.
						Filter Press. Drop End:	3.5	" W.C.
	Oxide Delivery:		44,870	Lbs.		**Started:**	**12:44**	
			285.8	Lbs/Min		**Ended:**	**14:21**	157 Minutes
Oxide Delivered during test:			16,576	Lbs				
Stack Sample # 3:				14:41 to 15:24				
				Mix #'s: 27, 28,				
Mix:		Negative		Mix 28 was finished				
Plate:		85N						
	Lead Oxide Charge Weight:			4,800	Lbs.	Filter Press. Drop Start:	3.5	" W.C.
						Filter Press. Drop End:	3.5	" W.C.

Cool-S
IL APC ID #: 197820AA0

Battery Builders, Inc.
Stack Test Process Rates
Test Date: 4/27/00

05/18/00
10:55
STACDATA.XLS

Mixer Cooling Exhaust								
				Date:	04/27/00			
Pasting Stack Test Data								
Stack Sample # 1:								
Mix:	**Negative**							
Plate:	**see below**							
Batch # 1:	Lead Oxide Charge Weight:			2,400	Lbs.	Filter Press. Drop Start:	0.5	" W.C.
85N	Mix start Time			08:25				
	Cool Exhaust Start Time			08:31				
	Cool Exhaust End Time:			08:51		Filter Press. Drop End:	0.56	" W.C.
Batch # 2:	Lead Oxide Charge Weight:			2,400	Lbs.	Filter Press. Drop Start:	0.51	" W.C.
85N	Mix start Time			08:55				
	Cool Exhaust Start Time			09:04				
	Cool Exhaust End Time:			09:20		Filter Press. Drop End:	0.55	" W.C.
Batch # 3:	Lead Oxide Charge Weight:			2,400	Lbs.	Filter Press. Drop Start:	0.5	" W.C.
90N	Mix start Time			09:22				
	Cool Exhaust Start Time			09:34				
	Cool Exhaust End Time:			09:57		Filter Press. Drop End:	0.53	" W.C.

Cool-S
IL APC ID #: 197820AA0

Battery Builders, Inc.
Stack Test Process Rates
Test Date: 4/27/00

05/18/00
10:55
STACDATA.XLS

Mixer Cooling Exhaust

Date: 04/27/00

Pasting Stack Test Data

Stack Sample # 2:

Mix:	Negative						
Plate:	see below						
Batch # 1:	Lead Oxide Charge Weight:	2,400	Lbs.	Filter Press. Drop Start:	0.51	" W.C.
90N	Mix start Time	10:30				
	Cool Exhaust Start Time	10:40				
	Cool Exhaust End Time:	11:00		Filter Press. Drop End:	0.55	" W.C.
Batch # 2:	Lead Oxide Charge Weight:	2,400	Lbs.	Filter Press. Drop Start:	0.5	" W.C.
75N	Mix start Time	11:02				
	Cool Exhaust Start Time	11:12				
	Cool Exhaust End Time:	11:32		Filter Press. Drop End:	0.54	" W.C.
Batch # 3:	Lead Oxide Charge Weight:	2,400	Lbs.	Filter Press. Drop Start:	0.51	" W.C.
45N	Mix start Time	11:34				
	Cool Exhaust Start Time	11:46				
	Cool Exhaust End Time:	12:06		Filter Press. Drop End:	0.54	" W.C.

Cool-S
IL APC ID #: 197820AA0

Battery Builders, Inc.
Stack Test Process Rates
Test Date: 4/27/00

05/18/00
10:55
STACDATA.XLS

Mixer Cooling Exhaust									
				Date:	04/27/00				
Pasting Stack Test Data									
Stack Sample # 3:									
Mix:		Negative							
Plate:		see below							
Batch # 1:	Lead Oxide Charge Weight:			2,400	Lbs.	Filter Press. Drop Start:		0.52	" W.C.
45N	Mix start Time			12:26					
	Cool Exhaust Start Time			12:33					
	Cool Exhaust End Time:			12:53		Filter Press. Drop End:		0.56	" W.C.
Batch # 2:	Lead Oxide Charge Weight:			2,400	Lbs.	Filter Press. Drop Start:		0.51	" W.C.
45N	Mix start Time			13:09					
	Cool Exhaust Start Time			13:15					
	Cool Exhaust End Time:			13:36		Filter Press. Drop End:		0.55	" W.C.
Batch # 3:	Lead Oxide Charge Weight:			2,400	Lbs.	Filter Press. Drop Start:		0.5	" W.C.
125N	Mix start Time			13:40					
	Cool Exhaust Start Time			13:50					
	Cool Exhaust End Time:			14:11		Filter Press. Drop End:		0.55	" W.C.

PERTINENT CERTIFICATIONS

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Tommy G. Thompson, Governor
George E. Meyer, Secretary

PO Box 7921
101 South Webster Street
Madison, Wisconsin 53707-7921
TELEPHONE 608-266-2621
FAX 608-267-3579
TDD 608-267-6897

C. A.
MAY 15 2000

May 10, 2000

Mr. James Burton
Clean Air Eng.
500 W Wood St
Palatine IL 60067

Dear Mr. Burton:

Please be advised that you have successfully completed our recent Visible Emissions Evaluation course.

Having participated in the smoke evaluation sessions, you met the following certification criteria:

1. The average deviation for the sets of 25 black and 25 white smoke emissions was less than 7.5%.

2. The deviation of each reading was 15% or less.

This certification is valid until 10/11/2000.

Sincerely,

Andy Seeber

Andy Seeber, Environmental Engineering Specialist
Bureau of Air Management

Enclosure

Department of Natural Resources

SMOKE SCHOOL OPACITY TRAINING FORM

Form 4500-97 Rev. 5-97

0875

Name of Observer: JAMES BURTON	Run Number: 2	Qualified? Yes ☒ No ☐
Company Name: CLEAN AIR ENG.	Course Location: MILWAUKEE, WI.	Date: 4/11/00
Wind Speed and Direction: SW 5-10	Sky Condition: OVERCAST	Glasses? Yes ☒ No ☐ Type: CLEAR
Distance and Direction of Observer from Stack: 501 NW	Graded By (Initial): BS 4/20	Checked By (Name): EG

Reading No. Black (White) Value

Reading No.	Black			(White)																		Value
1	0	5	10	(15)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	1
2	0	5	(10)	(15)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	2
3	0	5	10	(15)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	3
4	0	5	(10)	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	4
5	0	5	(10)	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	5
6	0	5	(10)	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	6
7	0	(5)	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	7
8	0	(5)	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	8
9	(0)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	9
10	0	(5)	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	10
11	0	5	10	(15)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	11
12	0	5	10	15	(20)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	12
13	0	5	10	15	20	(25)	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	13
14	0	5	10	15	20	(25)	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	14
15	0	5	10	15	20	25	(30)	35	40	45	50	55	60	65	70	75	80	85	90	95	100	15
16	0	5	10	15	20	25	30	(35)	40	45	50	55	60	65	70	75	80	85	90	95	100	16
17	0	5	10	15	20	25	30	(35)	40	45	50	55	60	65	70	75	80	85	90	95	100	17
18	0	5	10	15	20	25	30	(35)	40	45	50	55	60	65	70	75	80	85	90	95	100	18
19	0	5	10	15	20	25	30	35	(40)	45	50	55	60	65	70	75	80	85	90	95	100	19
20	0	5	10	15	20	25	30	35	40	(45)	50	55	60	65	70	75	80	85	90	95	100	20
21	0	5	10	15	20	25	30	35	40	45	(50)	55	60	65	70	75	80	85	90	95	100	21
22	0	5	10	15	20	25	30	35	40	45	50	55	(60)	65	70	75	80	85	90	95	100	22
23	0	5	10	15	20	25	30	35	40	45	50	55	60	(65)	70	75	80	85	90	95	100	23
24	0	5	10	15	20	25	30	35	40	45	50	55	60	65	(70)	75	80	85	90	95	100	24
25	(0)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	25

Deviation 4.6 %

(Black) White

26	0	5	10	(15)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	26
27	0	5	(10)	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	27
28	0	5	(10)	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	28
29	0	5	(10)	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	29
30	0	(5)	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	30
31	(0)	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	31
32	0	(5)	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	32
33	0	5	(10)	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	33
34	0	5	10	(15)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	34
35	0	5	10	15	(20)	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	35
36	0	5	10	15	20	(25)	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	36
37	0	5	10	15	20	25	(30)	35	40	45	50	55	60	65	70	75	80	85	90	95	100	37
38	0	5	10	15	20	25	30	35	(40)	45	50	55	60	65	70	75	80	85	90	95	100	38
39		5	10	15	20	25	30	35	(40)	45	50	55	60	65	70	75	80	85	90	95	100	39
40		5	10	15	20	25	30	35	40	(45)	50	55	60	65	70	75	80	85	90	95	100	40
41		5	10	15	20	25	30	35	40	45	(50)	55	60	65	70	75	80	85	90	95	100	41
42			10	15	20	25	30	35	40	45	50	(55)	60	65	70	75	80	85	90	95	100	42
43			10	15	20	25	30	35	40	45	50	55	(60)	65	70	75	80	85	90	95	100	43
44			10	15	20	25	30	35	40	45	50	55	(60)	65	70	75	80	85	90	95	100	44
45			10	15	20	25	30	35	40	45	50	55	60	(65)	70	75	80	85	90	95	100	45
46				15	20	25	30	35	40	45	50	55	60	65	(70)	75	80	85	90	95	100	46
47				15	20	25	30	35	40	45	50	55	60	65	70	(75)	80	85	90	95	100	47
48				15	20	25	30	35	40	45	50	55	60	65	70	75	(80)	85	90	95	100	48
49				15	20	25	30	35	40	45	50	55	60	65	(70)	75	80	85	90	95	100	49
50				5	20	25	30	35	40	45	50	55	(60)	65	70	75	80	85	90	95	100	50