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

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

AP42 Section:	11.20
Background Chapter	4
Reference:	10
Title:	Particulate Emission Test Report for a Lightweight Aggregate Kiln at Carolina Stalite, Gold Hill, North Carolina, North Carolina Department of Natural Resources and Community Development, Raleigh, NC, November 29, 1979.

RECEIVED

AP-42 Section 11.20
Reference
Report Sect. 4
Reference 10

North Carolina Department of Natural Resources & Community Development

James B. Hunt, Jr., Governor

Howard N. Lee, Secretary

March 14, 1980

A-82-39
II-D-5

Mr. Bill Terry
Midwest Research Institute
4505 Creedmore Road
Raleigh, North Carolina 27612

Carolina Stalite Gold Hill

Dear Mr. Terry:

Transmitted herewith are the test results you requested pertaining to SO_2 tests conducted at ~~Solite Corporations~~ Aquadale, N. C. facility.

Solite has been notified of your request and has expressed concern over the standard which will be the ultimate result of your research. Their concern centers around their belief that the test results may have reflected the performance of their equipment under the best of conditions and if these figures are used to write a performance standard, the standard may be more stringent than would be achievable on a day-to-day basis. They understand that a New Source Performance standard does not effect their present facility, but it would effect any new kilns built at the site after the promulgation of the standard.

I realize that Solite will have an opportunity to comment on the regulation before it is promulgated, but I was asked to relay their concerns to you nevertheless.

Our report for the test at the Carolina Stalite facility will be forwarded to you as soon as we get it back from our print shop.

Sincerely,

Michael Y. Aldridge, Environmental Engineer
Monitoring Management

cc: Mr. Tom Purvis, Solite Corp.

Statement of Results of Testing

of the Number 5 Kiln at

CAROLINA SOLITE CORPORATION

Aquadale, North Carolina, for

Sulfur Dioxide Emissions

The number 5 kiln of CAROLINA SOLITE CORPORATION was tested on April 17-18, 1978 for sulfur dioxide emissions by the Source Testing Staff of the Air Quality Section, Division of Environmental Management, N. C. Department of Natural Resources and Community Development.

The test method was E.P.A. Method 6 with modifications. The emission rate was found to be 1.80, 1.26, and 1.28 pounds of SO_2 per million BTU input for three different test runs. These numbers may not be completely accurate because of slight leak problems with the sampling train, slight impurity of the isopropanol, and possible inaccuracy in determining BTU input. The emission rate allowed for this source by NCAC 2D .0511, "Particulates, SO_2 From Lightweight Aggregate Processes" is 2.3 pounds of SO_2 per million BTU.

State personnel involved with the testing were J. A. Shanklin and R. E. Wooten, Jr., of the Source Testing Staff, Air Quality Section; and D. Shepherd, M. Landis, and S. Maynard of the South Piedmont Field Office, Air Quality Section.

The test report contains information about process rates and control equipment which CAROLINA SOLITE CORPORATION considers proprietary. Therefore, it cannot be distributed outside this agency without the expressed permission of CAROLINA SOLITE CORPORATION.

Robert E. Wooten, Jr., P.E.
Environmental Engineer I
Air Quality Section
June 28, 1978

A-80-17

II-D-

PARTICULATE EMISSION TEST REPORT

for a lightweight aggregate kiln at

CAROLINA STALITE

Gold Hill, North Carolina

Performed by the Source Testing Staff
of the
North Carolina Department
of Natural Resources & Community Development
Division of Environmental Management
Environmental Operations Section
November 27 & 28, 1979

RECEIVED MAR 2 6 1980

PARTICULATE EMISSION TEST REPORT

for a lightweight aggregate kiln at

CAROLINA STALITE

Gold Hill, North Carolina

Performed by the Source Testing Staff
of the
North Carolina Department
of Natural Resources & Community Development
Division of Environmental Management
Environmental Operations Section
November 27 & 28, 1979

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INTRODUCTION

This report presents the results of a particulate source test performed on November 27 & 28, 1979, on a lightweight aggregate kiln. The source tested was the purple kiln at Carolina Stalite, Gold Hill, North Carolina.

The test was performed by M. Y. Aldridge, J. A. Shanklin, G. L. Comer, and R. E. Wooten, Jr. of the source testing staff of the Environmental Operations Section, N. C. Division of Environmental Management. Mike Landis of the Mooresville Regional Office, Division of Environmental Management, provided assistance.

The purpose of the test was to determine compliance with the particulate portion of 15 NCAC 2D .0511 "Particulates, SO_2 From Lightweight Aggregate Processes" (Reference 1).

SOURCE AND PROCESS DESCRIPTION

Carolina Stalite produces lightweight aggregate by heating shale to high temperatures in rotary kilns. The discharge from the kiln goes through a rock preheater/cooler to a baghouse and then through a fan and exhaust stack.

Standard 15 NCAC 2D .0511 requires that kilns be equipped with particulate control devices which remove 95% or better of the particulate.

SAMPLING AND ANALYTICAL PROCEDURES

Simultaneous tests were performed ahead of the baghouse and on the exhaust stack to determine particulate removal efficiency. Three test runs were performed (inlet plus outlet).

Sampling and sample analysis were performed according to procedures developed by the U.S. Environmental Protection Agency and published in the August 18, 1977 Federal Register (Reference 2).

Sampling port locations and the number of test points used were determined according to Method 1 (see Appendix E).

The flue gas composition was determined in accordance with Method 3 for the purpose of determing molecular weight. One determination was made during the outlet test (Run 1) and one during the inlet test (Run 3). A gas sample was continuously extracted from a point near the particulate sampling nozzle and collected in a Tedlar bag. After the test run was completed, the gas sample was analyzed for CO_2 and O_2 (the balance was presumed to be Nitrogen) with an Orsat apparatus. The results of the gas analyses are shown in Appendix B.

Particulate testing was done in accordance with EPA Method 5.

During run two for the inlet, the sampling rate was 113.5% I whereas the acceptable tolerance is $90\% \leq \%I \leq 110\%$. On state done tests, the pollutant mass rate is usually taken to be the average of the pollutant mass rate calculated on the concentration basis in the EPA Method 5 manner (pmr_c) and the pollutant mass rate calculated on the basis of the ratio of nozzle area and stack area (pmr_a). It can be shown that when sampling is over isokinetic, the pmr_c will be correct or less and the pmr_a will be correct or greater. Since the state must prove violation and %I is out of specification, the greater value, pmr_a, is used to compute the particulate removal efficiency for run 2.

After the run 3 inlet test, an excessive leak rate was measured (.038 cfm versus .02 cfm). The cause was found to be a crack in a glass fitting between the filter and the first impinger. The point during the test when the crack occurred is unknown. For a normal Method 5 test, the meter volume is adjusted for excessive leaks by a formula given in the test method which makes the measured emission higher. Since a higher inlet

pmr_{avg} would cause a greater efficiency for a given outlet emission and since the burden of proof is on the state, the run was calculated with actual and adjusted meter volumes. The adjusted meter volume calculations were used in figuring the collection efficiency.

SUMMARY OF RESULTS

Note the following test summary sheet.

Carolina Stalite's Purple Kiln was operating with less particulate control efficiency than is required by standard 15 NCAC 2D .0511.

Robert E. Wooten, Jr., P.E.
Source Test Engineer
February 13, 1980

REFERENCES

1. North Carolina Administrative Code, Title 15, Chapter 2, Subchapter 2D, Section .0511 "Particulates, SO_2 From Lightweight Aggregate Processes", Environmental Management Commission, Raleigh, N.C. (February 1, 1976, amended April 1, 1977).

2. Federal Register, Standards of Performance for New Stationary Sources, Volume 42, Number 160, U.S. Government Printing Office, Washington, D.C. (August 18, 1977).

TEST SUMMARY - CAROLINA STALITE PURPLE KILN

	Parameter	Run 1 Inlet	Run 1 Outlet	Run 2 Inlet	Run 2 Outlet	Run 3 Inlet	Run 3 Outlet
Q_s	Stack volume flow rate, acfm	23,900	42,000	17,700	33,200	17,900	34,500
Q_{std}	Stack volume flow rate, scfm	16,800	33,900	12,400	27,900	12,800	28,700
V_{std}	Sample volume, scf	41.22	40.46	31.93	33.66	31.54**	33.84
%I	Percent isokinetic	105.3	103.8	113.5	105.1	99.7**	102.6
pmr_{avg}	Emission rate, lb/hr	532.5	51.9	420.6*	25.0	420.7**	49.1
	Particulate Collection Efficiency	90.25%		94.06%		88.33%	
	Average Efficiency			90.88%			
	Required Particulate Collection Efficiency by 15 NCAC 2D .0511	95%		95%		95%	

* pmr_a

** corrected for leak

Calculation Summary

SOURCE Carolina Stalite Outlet Date 27-28 Nov 79

LOCATION Gold Hill

ENTRY	RUN 1	RUN 2	RUN 3	ANSWER
Ave. ΔH (in H_2O)	1.2934	0.8991	0.9263	
P_{atm} (in Hg)	29.3200	29.0600	29.0100	
	29.4151	29.1261	29.0781	P_m (in Hg)
P_s(gage)(in H_2O)	0.0200	0.0200	0.0200	
	29.3215	29.0615	29.0115	P_s (in Hg)
T_m (^oR)	540.0000	534.0000	544.0000	
V_m (ft^3)	40.5330	33.5220	34.3900	
	39.1024	32.3810	32.5550	$V_{m_{std}}$ (ft^3)
V_{lq} (ml)	28.8000	27.0000	27.2000	
	1.3622	1.2771	1.2866	V_{vstd} (ft^3)
	40.4647	33.6581	33.8416	V_{std} (ft^3)
	3.3665	3.7943	3.8017	%M
	0.9663	0.9621	0.9620	M_d
MW_d	29.0500	29.0500	29.0500	
	28.6780	28.6307	28.6299	M
T_s (^oR)	642.0000	613.0000	618.0000	
$\Sigma\sqrt{\Delta p}$	12.8706	10.3686	10.7287	
$n_{\Delta p}$	32.0000	32.0000	32.0000	
	0.4022	0.3240	0.3353	Ave $\sqrt{\Delta p}$
C_p	0.8400	0.8400	0.8400	
	25.2344	19.9696	20.7654	v_s (ft/sec)
D_s (in)	71.2800	71.2800	71.2800	
	27.7117	27.7117	27.71.7	A_s (ft^2)
	41957.	33203.	3452[illegible].	Q_s (ft^3/min)
	33937.	27878.	28705.	Q_{std} (ft^3/min)
W_t (gm)	0.4589	0.2225	0.4315	
	50.9188	24.3815	48.4222	pmr_c (lb/hr)
D_n (in)	0.3020	0.3020	0.3020	
	0.0716	0.0716	0.0716	A_n (in^2)
θ (min)	64.0000	64.0000	64.0000	
	52.8469	25.6231	49.6915	pmr_a (lb/hr)
	103.7867	105.0925	102.6214	%I
	51.8828	25.0023	49.0568	pmr_{avg} (lb/hr)
%CO				
$\%O_2$				
$\%N_2$				
				%EA
F Factor				HI (10^6 BTU/hr.)
				pmr_u(lbs/10^6BTU)

Calculation Summary

SOURCE Carolina Stalite Inlet Date 27-28 Nov 79

LOCATION Gold Hill - Purple line

ENTRY	RUN 1	RUN 2	RUN 3	ANSWER
Ave. ΔH (in H_2O)	1.5275	0.8875	0.8973	
P_{atm} (in Hg)	29.3200	29.0600	29.0100	
	29.4323	29.1253	29.0760	P_m (in Hg)
P_s(gage)(in H_2O)	-7.8000	-7.8000	-7.8000	
	28.7465	28.4865	28.4365	P_s (in Hg)
T_m (^oR)	552.0000	532.0000	542.0000	
V_m (ft^3)	41.4530	30.9290	32.4010	
	39.1435	29.9877	30.7831	$V_{m_{std}}$ (ft^3)
V_{lq} (ml)	44.0000	41.0000	37.7000	
	2.0812	1.9393	1.7832	V_{vstd} (ft^3)
	41.2247	31.9270	32.5663	V_{std} (ft^3)
	5.0484	6.0742	5.4756	%M
	0.9495	0.9393	0.9452	M_d
MW_d	29.2200	29.2200	29.2200	
	28.6536	28.5385	28.6056	M
T_s (^oR)	725.0000	720.0000	706.0000	
$\Sigma\sqrt{\Delta p}$	9.6843	7.1446	7.3062	
$n_{\Delta p}$	20.0000	20.0000	20.0000	
	0.4842	0.3572	0.3653	Ave $\sqrt{\Delta p}$
C_p	0.8400	0.8400	0.8400	
	32.6189	24.1392	24.4368	v_s (ft/sec)
D_s (in)	47.3000	47.3000	47.3000	
	12.2025	12.2025	12.2025	A_s (ft^2)
	23882.	17674.	17891.	Q_s (ft^3/min)
	16770.	12984.	12762.	Q_{std} (ft^3/min)
W_t (gm)	9.6382	7.2199	7.8686	
	518.7206	370.4950	407.9657	pmr_c (lb/hr)
D_n (in)	0.2950	0.2910	0.3040	
	0.0683	0.0665	0.0726	A_n (in^2)
θ (min)	60.0000	60.0000	60.0000	
	546.3649	420.6066	420.0308	pmr_a (lb/hr)
	105.3293	113.5256	102.9574	%I
	532.5427	395.5508	413.9983	pmr_{avg} (lb/hr)
%CO				
$\%O_2$				
$\%N_2$				
				%EA
F Factor				
				HI (10^6 BTU/hr.)
				pmr_u(lbs/10^6BTU)

Calculation Summary

SOURCE Carolina Stalite — Inlet Date 28 Nov 79

LOCATION Purple Kiln — Correction made in Vm for leak rate of .038 cfm @ 6½ in Hg at end of test

ENTRY	RUN 3			ANSWER
Ave. ΔH (in H_2O)	0.8973			
P_{atm} (in Hg)	29.0100			
	29.0760			P_m (in Hg)
P_s(gage)(in H_2O)	-7.8000			
	28.4365			P_s (in Hg)
T_m (°R)	542.0000			
V_m (ft^3)	31.3210			
	29.7570			$V_{m_{std}}$ (ft^3)
V_{lq} (ml)	37.7000			
	1.7832			$V_{v_{std}}$ (ft^3)
	31.5402			V_{std} (ft^3)
	5.6538			%M
	0.9435			M_d
MW_d	29.2200			
	28.5856			M
T_s (°R)	706.0000			
$\Sigma\sqrt{\Delta p}$	7.3062			
$n_{\Delta p}$	20.0000			
	0.3653			Ave $\sqrt{\Delta p}$
C_p	0.8400			
	24.4453			v_s (ft/sec)
D_s (in)	47.3000			
	12.2025			A_s (ft^2)
	17898.			Q_s (ft^3/min)
	12767.			Q_{std} (ft^3/min)
W_t (gm)	7.8686			
	421.3849			pmr_c (lb/hr)
D_n (in)	0.3040			
	0.0726			A_n (in^2)
θ (min)	60.0000			
	420.0308			pmr_a (lb/hr)
	99.6787			%I
	420.7079			pmr_{avg} (lb/hr)
%CO				
$\%O_2$				
$\%N_2$				
				%EA
F Factor				
				HI (10^6 BTU/hr.)
				pmr_u(lbs/10^6BTU)

EQUATIONS

1. Absolute Pressure in Dry Gas Meter - P_m (in. Hg.)

$$P_m = P_{atm} + \frac{\Delta H}{13.6}$$

2. Absolute Stack Pressure - P_s (in. Hg.)

$$P_s = P_{atm} + \frac{P_{s(gage)}}{13.6}$$

3. Sample Volume at Standard Conditions - $V_{m_{std}}$ (ft^3)

$$V_{m_{std}} = V_m \frac{T_{std}}{T_m} \frac{P_m}{P_{std}}$$

4. Volume of Water Vapor Collected, Corrected to Standard Conditions - $V_{v_{std}}$ (ft^3)

$$V_{v_{std}} = K_2 V_{lq} \frac{T_{std}}{P_{std}} \qquad K_2 = 0.00267 \text{ (units conversion)}$$

5. Total Sample Volume at Standard Conditions - V_{std} (ft^3)

$$V_{std} = V_{m_{std}} + V_{v_{std}}$$

6. Percent Moisture in Stack Gas - %M

$$\%M = \frac{V_{v_{std}}}{V_{std}} \times 100$$

7. Mole Fraction of Dry Gas - M_d

$$M_d = \frac{100 - \%M}{100}$$

8. Molecular Weight of Wet Gas - M (lb/lb mole)

$$M = (MW_d \times M_d) + 18(1 - M_d)$$

9. Stack Velocity - v_s (ft/sec)

$$v_s = K_p C_p \sqrt{\frac{T_s}{P_s M}} \quad \frac{\Sigma\sqrt{\Delta p}}{n_{\Delta p}}$$

K_p = 85.48 (units conversion factor)

10. Stack Volume Flow Rate - Q_s (ft^3/min)

$$Q_s = K_1 v_s A_s' \qquad K_1 = 60 \text{ (units conversion)}$$

11. Stack Volume Flow Rate at Standard Conditions - Q_{std} (ft^3/min)

$$Q_{std} = \frac{T_{std}}{P_{std}} \frac{P_s}{T_s} Q_s$$

12. Pollutant Mass Rate Based on Particulate Concentration - pmr_c (lb/hr)

$$pmr_c = K_3 \frac{W_t \rho_{std}}{V_{std}} \qquad K_3 = 0.1323 \text{ (units conversion)}$$

13. Pollutant Mass Rate Based on the Ratio of the Cross Sectional Area of the Stack and the Sampling Nozzle - pmr_a (lb/hr)

$$pmr_a = K_3 \frac{W_t}{\theta} \frac{A_s}{A_n} \qquad K_3 = 0.1323 \text{ (units conversion)}$$

14. Percent Isokineticity - %I

$$\%I = \frac{pmr_a}{pmr_c} \times 100$$

15. Average Pollutant Mass Rate - pmr_{avg} (lb/hr)

$$pmr_{avg} = \frac{pmr_a + pmr_c}{2}$$

16. Percent Excess Air - %EA

$$\%EA = \frac{\%O_2 - .5(\%CO)}{.264(\%N_2) - \%O_2 + .5(\%CO)} (100)$$

17. Heat Input Rate - HI (10^6 BTU/hr)

$$HI = \frac{60 \; Q_{std} \; M_d}{F(100 + \%EA)} (100)$$

18. Specific Emission Rate - pmr_u (lb/10^6 BTU)

$$pmr_u = \frac{pmr_{avg}}{HI}$$

NOMENCLATURE

A_n	(in^2), Cross sectional area of nozzle
A_s	(in^2), Cross sectional area of stack
A_s'	(ft^2), Cross sectional area of stack
C_p	Pitot tube calibration coefficient
%EA	Percent Excess Air
F	($scfd/10^6$ BTU), F factor
ΔH	(in H_2O), Average orifice meter reading
HI	(10^6 BTU/hr), Heat Input Rate
%I	Percent Isokineticity
M	(lb/lb mole), Molecular Weight of wet gas
%M	Percent Moisture
M_d	Mole fraction of dry gas
MW_d	(lb/lb mole) Molecular weight of dry gas
$n_{\Delta p}$	Number of Δp readings
P_{atm}	(in Hg), Local atmospheric pressure
P_m	(in Hg), Absolute pressure in dry gas meter
P_s	(in Hg), Absolute stack pressure
$P_{s(gage)}$	(in H_2O), Measured static stack pressure
P_{std}	(29.92 in Hg), Standard pressure
pmr_a	(lb/hr), Pollutant mass rate based on ratio of areas
pmr_{avg}	(lb/hr), Average pollutant mass rate
pmr_c	(lb/hr), Pollutant mass rate based on concentration
pmr_u	(lb/10^6 BTU), Specific emission rate
Δp	(in H_2O), Velocity pressure
Q_s	(ft^3/min), Actual stack volume flow rate
Q_{std}	(ft^3/min), Stack volume flow rate at standard conditions

T_m (^oR), Average dry gas meter temperature

T_s (^oR), Average stack temperature

T_{std} (530 ^oR), Standard temperature

V_{lq} (ml), Liquid volume

V_m (ft^3), Sample volume measured by dry gas meter

$V_{m_{std}}$ (ft^3), Sample volume at standard conditions

V_{std} (ft^3), Total sample volume at standard conditions

$V_{v_{std}}$ (ft^3), Volume of water vapor collected, corrected to standard conditions

v_s (ft/sec), Stack velocity

W_t (gm), Total weight of particulate collected

θ (min), Duration of test

DRY MOLECULAR WEIGHT DETERMINATION

PLANT Carolina Solite
DATE 27-28 Nov 79
SAMPLING LOCATION Precipitator - Run/Exit
SAMPLE TYPE (BAG, INTEGRATED, CONTINUOUS) Bag Integrated
ANALYTICAL METHOD Orsat
AMBIENT TEMPERATURE 60°F
OPERATOR REW

COMMENTS:

Run 1 Exit - Taken 27 Nov Analyzed 28 Nov

Time	read	%	read	%	read	%							Average Volume	Multiplier	Molecular Weight M_d
$\%CO_2$	2.0	2.0	1.9	1.9									1.95	.44	0.86
$\%O_2$	20.5	18.5	20.5	18.6									18.55	.32	5.94
$\%N_2$		79.5		79.5									79.5	.28	22.26
															29.05

Run Inlet

Time	read	%	read	%											
$\%CO_2$	3.5	3.5	3.5	3.5									3.5	.44	1.54
$\%O_2$	19.9	16.4	20.1	16.6									16.5	.32	5.28
$\%N_2$		80.1		79.9									80.0	.28	22.40
															29.22

Run

Time															
$\%CO_2$														.44	
$\%O_2$														.32	
$\%N_2$														.28	

12-12-79
SSB
12-13-79
✓Meyer

APPENDIX C

ANALYTICAL DATA

Lab No. 4023

Plant Carolina Stalite - Inlet, Purple Line

Run Number 1 Date 11/27/79

Location Gold Hill

FILTER WEIGHTS	Box 4			TOTALS
Filter Number	55701			
Final Weight (g)				*
Tare Weight (g)	.4060			.4060

WASHINGS				TOTALS
Beaker Number	11			
Volume (Acetone)	600			
Final Weight (g)	175.9723			175.9723
Tare Weight (g)	165.9225			165.9225

ACETONE BLANK

Lot Number	Fisher 775109
Beaker Number	3
Volume (ml)	300
Final Weight (g)	164.0317
Tare Weight (g)	164.0289
Blank Residue (g)	.0028

TOTAL PARTICULATE CATCH

Filter Final Weight	*
+ Washings, Final Weight	175.9723
- Filter Tare	.4060
- Beaker Tare (Washings)	165.9225
- Corrected Blank	.0056
= Total Particulate (g)	9.6382

BLANK CORRECTION =

$$\frac{(\text{Vol. Washings})}{(\text{Vol. Blank})} \times (\text{Blank Residue})$$

$$\frac{(600)}{(300)} \times (.0028) = .0056$$

IMPINGERS (1, 2, 3)

Final Volume (ml)	234
Initial Volume (200 ml)	200
Water Collected (ml)	34

SILICA GEL

Final Weight (g)	210.0
Initial Weight (g)	200
Moisture Collected (g)	10.0

Total Water Collected (ml) 44.0

*These blocks will be blank if filter is weighed together with the washings.

12-12-79
12-13-79
✓ Meyer

APPENDIX C

ANALYTICAL DATA

Lab No. 4024

Plant Carolina Stalite - Inlet, Purple Line

Run Number 2 Date 11/28/79

Location Gold Hill

FILTER WEIGHTS	Box 5			TOTALS
Filter Number	55702			
Final Weight (g)				*
Tare Weight (g)	.4092			.4092

WASHINGS				TOTALS
Beaker Number	17			
Volume (Acetone)	500			
Final Weight (g)	183.8242			183.8242
Tare Weight (g)	176.1904			176.1904

ACETONE BLANK

Lot Number	Fisher 775109
Beaker Number	3
Volume (ml)	300
Final Weight (g)	164.0317
Tare Weight (g)	164.0289
Blank Residue (g)	.0028

TOTAL PARTICULATE CATCH

Filter Final Weight	*
+ Washings, Final Weight	183.8242
- Filter Tare	.4092
- Beaker Tare (Washings)	176.1904
- Corrected Blank	.0047
= Total Particulate (g)	7.3199

BLANK CORRECTION =

$$\frac{(\text{Vol. Washings})}{(\text{Vol. Blank})} \times (\text{Blank Residue})$$

$$\frac{(500)}{(300)} \times (.0028) = .0047$$

IMPINGERS (1, 2, 3)		SILICA GEL	
Final Volume (ml)	234	Final Weight (g)	207.0
Initial Volume (200 ml)	200	Initial Weight (g)	200
Water Collected (ml)	34	Moisture Collected (g)	7.0

Total Water Collected (ml) 41.0

*These blocks will be blank if filter is weighed together with the washings.

12-12-79
SDB
12-13-79
V Meyer

APPENDIX C

ANALYTICAL DATA

Lab No. 4025

Plant Carolina Stalite - Inlet, Purple Line

Run Number 3 Date 11/28/79

Location Gold Hill

FILTER WEIGHTS	Box 6			TOTALS
Filter Number	55703			
Final Weight (g)				*
Tare Weight (g)	.4082			.4082

WASHINGS				TOTALS
Beaker Number	XN			
Volume (Acetone)	400			
Final Weight (g)	169.0740			169.0740
Tare Weight (g)	160.7935			160.7935

ACETONE BLANK

Lot Number Fisher 775109

Beaker Number 3

Volume (ml) 300

Final Weight (g) 164.0317

Tare Weight (g) 164.0289

Blank Residue (g) .0028

TOTAL PARTICULATE CATCH

Filter Final Weight *

+ Washings, Final Weight 169.0740

- Filter Tare .4082

- Beaker Tare (Washings) 160.7935

- Corrected Blank .0037

= Total Particulate (g) 7.8686

BLANK CORRECTION =

$$\frac{(\text{Vol. Washings})}{(\text{Vol. Blank})} \times (\text{Blank Residue})$$

$$\left(\frac{400}{300}\right) \times (.0028) = .0037$$

IMPINGERS (1, 2, 3)

Final Volume (ml) 230

Initial Volume (200 ml) 200

Water Collected (ml) 30

SILICA GEL

Final Weight (g) 207.7

Initial Weight (g) 200

Moisture Collected (g) 7.7

Total Water Collected (ml) 37.7

*These blocks will be blank if filter is weighed together with the washings.

12-12-79
12-13-79
Meyer

APPENDIX C

ANALYTICAL DATA

Lab No. 4026

Plant Carolina Stalite - Exit, Purple Line

Run Number 1E Date 11/27/79

Location Gold Hill

FILTER WEIGHTS	Box 1			TOTALS
Filter Number	55665			
Final Weight (g)				*
Tare Weight (g)	.3966			.3966

WASHINGS				TOTALS
Beaker Number	8			
Volume (Acetone)	300			
Final Weight (g)	184.1518			184.1518
Tare Weight (g)	183.2935			183.2935

ACETONE BLANK

Lot Number	Fisher 775109
Beaker Number	3
Volume (ml)	300
Final Weight (g)	1640317
Tare Weight (g)	1640289
Blank Residue (g)	.0028

TOTAL PARTICULATE CATCH

Filter Final Weight	*
+ Washings, Final Weight	184.1518
- Filter Tare	.3966
- Beaker Tare (Washings)	183.2935
- Corrected Blank	.0028
= Total Particulate (g)	.4589

BLANK CORRECTION =

$$\frac{(\text{Vol. Washings})}{(\text{Vol. Blank})} \times (\text{Blank Residue})$$

$$\frac{(300)}{(300)} \times (.0028) = .0028$$

IMPINGERS (1, 2, 3)

Final Volume (ml)	219
Initial Volume (200 ml)	200
Water Collected (ml)	19

SILICA GEL

Final Weight (g)	209.8
Initial Weight (g)	200
Moisture Collected (g)	9.8

Total Water Collected (ml) 28.8

*These blocks will be blank if filter is weighed together with the washings.

12-12-79
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12-13-79
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APPENDIX C

ANALYTICAL DATA

Lab No. 4027

Plant Carolina Stalite-EXIT, Purple Line

Run Number 2E Date 11/28/79

Location Gold Hill

Box 2

FILTER WEIGHTS				TOTALS
Filter Number	55666			
Final Weight (g)				*
Tare Weight (g)	.4031			.4031

WASHINGS				TOTALS
Beaker Number	5			
Volume (Acetone)	250			
Final Weight (g)	168.8801			168.8801
Tare Weight (g)	168.2522			168.2522

ACETONE BLANK

Lot Number	Fisher 775109
Beaker Number	3
Volume (ml)	300
Final Weight (g)	164.0317
Tare Weight (g)	164.0289
Blank Residue (g)	.0028

TOTAL PARTICULATE CATCH

Filter Final Weight	*
+ Washings, Final Weight	168.8801
- Filter Tare	.4031
- Beaker Tare (Washings)	168.2522
- Corrected Blank	.0023
= Total Particulate (g)	.2225

BLANK CORRECTION =

$$\frac{(\text{Vol. Washings})}{(\text{Vol. Blank})} \times (\text{Blank Residue})$$

$$\left(\frac{250}{300}\right) \times (.0028) = .0023$$

IMPINGERS (1, 2, 3)

Final Volume (ml)	219
Initial Volume (200 ml)	200
Water Collected (ml)	19

SILICA GEL

Final Weight (g)	208.0
Initial Weight (g)	200
Moisture Collected (g)	8.0

Total Water Collected (ml) 27.0

*These blocks will be blank if filter is weighed together with the washings.

12-12-79
12-13-79
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APPENDIX C

ANALYTICAL DATA

Lab No. 4028

Plant Carolina Stalite - Exit, Purple Line

Run Number 3E Date 11/28/79

Location Gold Hill

Box 3

FILTER WEIGHTS				TOTALS
Filter Number	55668			
Final Weight (g)				*
Tare Weight (g)	.3990			.3990

WASHINGS				TOTALS
Beaker Number	20			
Volume (Acetone)	450			
Final Weight (g)	186.8284			186.8284
Tare Weight (g)	185.9937			185.9937

ACETONE BLANK

Lot Number Fisher 775109

Beaker Number 3

Volume (ml) 300

Final Weight (g) 164.0317

Tare Weight (g) 164.0289

Blank Residue (g) .0028

TOTAL PARTICULATE CATCH

Filter Final Weight *

+ Washings, Final Weight 186.8284

- Filter Tare .3990

- Beaker Tare (Washings) 185.9937

- Corrected Blank .0042

= Total Particulate (g) .4315

BLANK CORRECTION =

$$\frac{(\text{Vol. Washings})}{(\text{Vol. Blank})} \times (\text{Blank Residue})$$

$$\left(\frac{450}{300}\right) \times (.0028) = .0042$$

IMPINGERS (1, 2, 3)

Final Volume (ml) 218

Initial Volume (200 ml) 200

Water Collected (ml) 18

SILICA GEL

Final Weight (g) 209.2

Initial Weight (g) 200

Moisture Collected (g) 9.2

Total Water Collected (ml) 27.2

*These blocks will be blank if filter is weighed together with the washings.

AIR QUALITY SECTION

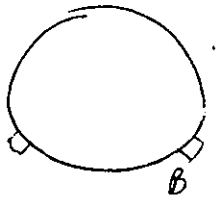
SOURCE SAMPLING FIELD DATA

Plant Carolina Stalite
Date 27 Nov 79
Location Purification - Exit
Sample Type particulate
Run Number 1
Operator REW
Sample Box No. 1
Meter Box No. 3

Meter $\Delta H_@$ 1.884
C Factor 1.06
Probe Type SS
Probe Length
Probe Tip Dia., In. .302
Probe Heater Setting
Heater Box Setting
Assumed Moisture % 5

Ambient Temperature
Barometric Pressure, In. Hg. 29.37
Static Pressure (P_s), +.02
Stack Dimension(s)
Distance: Disturbance to port
Distance: Port to exit
Leak Rate .002 cfm@ 15 in Hg
Filter number(s) 55665

Remarks:



Lung 2

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
B 1	0 3:45pm	968.391	.12		.99	150		69	2	—	—
2	2	969.53	.15		1.25	180		69	2	—	—
3	4	970.71	.17		1.4	180		70	2	—	50
4	6	971.98	.17		1.4	190		70	2	—	48
5	8	973.28	.17		1.4	190		71	2	160	48
6	10	974.59	.18		1.45	190		72	2	165	50
7	12	975.89	.18		1.45	190		73	2½	165	52
8	14	977.22	.19		1.55	190		74	2½	175	53
9	16	978.56	.16		1.3	190		75	2	185	54
10	18	979.85	.16		1.3	190		76	2	190	54
11	20	981.11	.17		1.4	190		77	2	195	55
12	22	982.40	.17		1.4	190		78	2	200	55
13	24	983.70	.16		1.3	190		79	2	200	54
14	26	985.08	.17		1.4	190		80	2	205	54
15	28	986.27	.17		1.4	190		81	2	205	54
16	30	987.58	.15		1.2	180		82	2	205	54

AQ-44

12-15-72 6-2-76 WOGP

Plant Carolina Stalite Run No. 1 Exit Date 27 Nov 79

TRAVERSE POINT NUMBER	SAMPLING TIME min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F
16	32		988.821									
A 1	32		988.821	.11		.90	160		81	2	—	—
2	34		989.87	.15		1.2	180		82	2	—	—
3	36		991.03	.16		1.3	180		82	2	205	—
4	38		992.28	.16		1.3	180		82	2	205	50
5	40	4:30 PM	993.55	.17		1.4	180		83	2 1/2	205	50
6	42		994.85	.18		1.5	180		84	2 1/2	205	50
7	44		996.19	.17		1.4	180		84	2 1/2	215	50
8	46		997.50	.17		1.4	180		85	2 1/2	215	52
9	48		998.81	.16		1.3	180		85	2 1/2	220	53
10	50		1000.10	.15		1.2	180		86	2	220	53
11	52		1001.34	.15		1.2	180		86	2	220	53
12	54		1002.55	.15		1.2	180		87	2	220	52
13	56		1003.76	.17		1.4	180		87	2 1/2	225	53
14	58		1005.0—	.16		1.3	180		87	2 1/2	225	52
15	60		1006.19	.17		1.4	180		88	2 1/2	220	53
16	62		1007.60	.17		1.4	180		88	2 1/2	225	53
16	64		1008.924									
			40.433	$\Sigma\sqrt{\Delta p}$ = 0.4022								
				$n_{\Delta p}$		ΣH = 1.2934			$\bar{T}_m$ = 80°F			
				$\Sigma\sqrt{\Delta p}$ = 12.8706			$\bar{T}_s$ = 182°F		540°R			
				$n_{\Delta p}$ = 32			642°R					
	End leak Rate			.000	cfm @ 4 in Hg							

AQ-44 (con.)

12-15-72 WOGR

AIR QUALITY SECTION

SOURCE SAMPLING FIELD DATA

Plant Carolina Stalite
Date 28 Nov 79
Location Purple Kiln - Exit
Sample Type Particulate
Run Number 2
Operator MYA
Sample Box No. 2
Meter Box No. 3

Meter $\Delta H_@$ 1.884
C Factor 1.06
Probe Type Stainless
Probe Length 7 ft
Probe Tip Dia., In. .302
Probe Heater Setting 4
Heater Box Setting 6
Assumed Moisture % 5

Ambient Temperature
Barometric Pressure, In. Hg. 29.06
Static Pressure (P_s), +.02
Stack Dimension(s)
Distance: Disturbance to port
Distance: Port to exit
Leak Rate 0 / cfm@ 15 /
Filter number(s) 55666

Remarks:

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) / SAMPLING TIME, min 10:31	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
A 1	00	9.92	.07		.55	130		64	1.5	160	55
2	2	10.82	.08		.70	146		64	1.5	165	50
3	4	11.72	.09		.79	150		65	1.5	170	50
4	6	12.67	.10		.85	150		65	1.5	175	45
5	8	13.68	.11		.93	150		66	1.5	175	45
6	10	14.74	.10		.85	150		67	1.5	175	45
7	12	15.75	.11		.93	150		67	1.5	175	47
8	14	16.80	.10		.85	150		68	1.5	175	47
9	16	17.83	.10		.85	150		69	1.5	175	49
10	18	18.85	.08		.68	150		70	1.5	175	49
11	20	19.79	.08		.68	150		71	1.5	177	49
12	22	20.72	.07		.59	150		71	1.5	177	50
13	24	21.58	.08		.68	150		72	1.5	180	50
14	26	22.49	.07		.59	150		73	1.5	182	50
15	28	23.36	.08		.68	150		74	1.5	182	50
16	30	24.28	.08		.68	150		75	1.5	182	50
16	32	25.212									

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12-15-72 6-2-76 WOGR

Plant Carolina Stalite Run No. 2 Date 28 Nov 79

Purple Kiln – Exit

TRAVERSE POINT NUMBER B	SAMPLING TIME min / CLOCK TIME (24 hr CLOCK) 11:15	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F
1	00	25.212	.09		.76	138		75	1.5	—	—
2	2	26.17	.12		1.0	155		76	2.0	—	—
3	4	27.21	.13		1.1	157		76	2.0	—	—
4	6	28.37	.13		1.1	158		77	2.0	175	49
5	8	29.55	.13		1.1	160		78	2.0	175	49
6	10	30.72	.12		1.0	160		78	2.0	175	50
7	12	31.84	.14		1.2	160		79	2.0	170	50
8	14	33.03	.12		1.0	160		80	2.0	170	50
9	16	34.17	.13		1.1	160		80	2.0	170	51
10	18	35.33	.12		1.0	160		81	2.0	165	51
11	20	36.45	.12		1.0	160		81	2.0	165	51
12	22	37.56	.14		1.2	160		82	2.0	165	51
13	24	38.75	.14		1.2	160		82	2.0	165	51
14	26	40.0	.13		1.1	160		83	2.0	165	51
15	28	41.17	.11		.93	160		83	2.0	165	52
16	30	42.28	.13		1.1	160		84	2.0	165	52
16	32	43.442									
			$\Sigma\sqrt{\Delta p}$ = 10.3686								
			$n\Delta p$ = 32			$\bar{T}_s$ = 153°F		$\bar{T}_m$ = 74°F			
			$\frac{\Sigma\sqrt{\Delta p}}{n\Delta p}$ = 0.9240			613°R		534°R			
				$\bar{\Delta H}$ = 0.8991							
	End Leak Rate		.000 cfm @ 3 in Hg								

AQ-44 (con.)

12-15-72 WOGR

AIR QUALITY SECTION

SOURCE SAMPLING FIELD DATA

Plant Carolina Stalite
Date 28 Nov 79
Location Purge Kiln - Exit
Sample Type particulate
Run Number 3
Operator REW
Sample Box No. 3
Meter Box No. 3

Meter $\Delta H_@$ 1.884
C Factor 1.06
Probe Type S-S
Probe Length 7' / 8' liner
Probe Tip Dia., In. .302
Probe Heater Setting
Heater Box Setting
Assumed Moisture % 5

Ambient Temperature 65 °F
Barometric Pressure, In. Hg. 29.02
Static Pressure (P_s), +.02
Stack Dimension(s)
Distance: Disturbance to port
Distance: Port to exit
Leak Rate .002 cfm@ 15 in Hg
Filter number(s) 55668

Remarks:

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
B 1	0 12:58PM	043.690	.07		.58	130		72	1	—	62
2	2	044.56	.10		.82	160		72	1	180	57
3	4	045.53	.12		1.0	160		73	2	—	50
4	6	—	.11		.90	160		73	2	200	50
5	8	047.66	.11		.90	160		74	2	—	50
6	10	048.72	.10		.82	160		75	2	205	50
7	12	049.73	.12		1.0	160		76	2	—	52
8	14	050.84	.12		1.0	160		77	2	215	54
9	16	051.95	.11		.90	160		78	2	—	54
10	18	053.01	.12		1.0	160		80	2	220	55
11	20	054.11	.12		1.0	160		80	2	—	56
12	22	055.23	.12		1.0	160		82	2	225	56
13	24	056.34	.11		.90	160		83	2	—	57
14	26	057.40	.12		1.0	160		84	2	230	58
15	28	058.50	.13		1.1	160		85	2	—	58
16	30	059.67	.11		.90	160		86	2	230	57

AQ-44

12-15-72 6-2-76 MOCR

Plant Carolina Stalite - Purple Kiln Exit Run No. 3 Date 28 Nov 79

TRAVERSE POINT NUMBER	SAMPLING TIME min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F
16	32	060.753									
A 1	32 1:36 pm	060.753	.08		.69	130		86	1	—	60
2	34	061.68	.10		.86	150		86	2	—	58
3	36	062.70	.11		.89	160		87	2	—	57
4	38	063.77	.12		.97	160		88	2	—	56
5	40	064.86	.11		.89	160		88	2	—	56
6	42	065.93	.12		.97	160		88	2	230	53
7	44	067.04	.12		.97	160		89	2	—	54
8	46	068.14	.12		.97	160		90	2	230	54
9	48	069.2	.12		.97	160		90	2	230	55
10	50	070.36	.13		1.05	160		91	2	230	55
11	52	071.50	.13		1.05	160		91	2	230	55
12	54	072.66	.12		.97	160		92	2	230	55
13	56	073.78	.12		.97	160		92	2	235	56
14	58	074.89	.11		.89	160		93	2	235	56
15	60	075.98	.10		.82	160		94	2	230	56
16	62	077.02	.11		.89	160		94	2	235	56
16	64	078.080									
			$\Sigma\sqrt{\Delta p}$ = 10.7257			$\bar{T}_s$ = 158 °F					
			$N\Delta p$ = 32			= 618 °R		$\bar{T}_m$ = 84 °F			
		34.390	$\frac{\Sigma\sqrt{\Delta p}}{N\Delta p}$ = 0.3353								
								544 °R			
				$\overline{\Delta H}$ = 0.9263							

End Wab rate .001 cfm @ 3 in Hg.

AQ-44 (con.)

12-15-72 WOGR

AIR QUALITY DIVISION

SOURCE SAMPLING FIELD DATA

Plant Carolina Stalite - Inlet, Purple line

Date 11/27/79

Location Gold Hill

Sample Type Particulate

Run Number 1

Operator JAS

Sample Box No. 4

Meter Box No. 2

Meter $\Delta H_@$ 1.844

C Factor 1.05

Probe Type Pyrex

Probe Length 5'

Probe Tip Dia., In. .295

Probe Heater Setting ca 50%

Heater Box Setting Hi

Assumed Moisture % 5

Ambient Temperature 65

Barometric Pressure, In. Hg. 29.30

Static Pressure (P_s), -7.8

Stack Dimension(s) 47.3"

Distance: Disturbance to port 344"

Distance: Port to exit 84"

Leak Check ~~Reference Δp~~ 0.00 @ 15 / 0.00 @ 9½

Filter number(s) 55701

Remarks:

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
A1	0 1545	515.170	0.25		1.70	170		78	4½	190	65
2	3	517.21	0.28		2.00	200		78	5	195	54
3	6	519.55	0.19		1.15	280		79	4	196	54
4	9	521.57	0.20		1.25	290		80	4	200	54
5	12	523.43	0.24		1.50	300		82	5	206	54
6	15	525.46	0.24		1.50	295		84	5	210	54
7	18	527.51	0.22		1.35	300		86	5	214	54
8	21	529.50	0.21		1.30	295		88	4½	220	54
9	24	531.44	0.22		1.35	295		90	5	223	54
10	27	533.38	0.20		1.25	290		92	–	227	54
A10	30	535.270									
B1	30	535.270	0.18		1.40	150		94	5	232	68
2	33	537.25	0.35		2.35	210		96	7	232	57
3	36	539.68	0.39		2.70	280		97	8½	235	55
4	39	542.40	0.17		1.05	260		98	5	235	53

AQ-44

12-15-72

Plant Caroling Stalite-Inlet, Purple line Run No. 1 Date 11/27/79

TRAVERSE POINT NUMBER	SAMPLING TIME min	CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F
B5	42		544.44	0.20		1.25	280		99	6	235	55
6	45		546.31	0.25		1.55	290		100	6½	235	55
7	48		—	0.22		1.50	290		101	6½	235	55
8	51		550.43	0.24		1.50	296		102	6½	235	55
9	54		552.50	0.25		1.55	290		103	7	238	56
10	57		554.59	0.22		1.35	290		100	7	240	57
B10	60		556.623									
			41.453	$\Sigma\sqrt{\Delta p} = 9.6843$		$\bar{T}_s = 265$ F		$\bar{T}_m = 92$ F				
				$n_{op} = 20$		725 R			552 R			
				$\Sigma\sqrt{\Delta p}$ / n_{op} = 0.4842								
					$\bar{\Delta H} = 1.5275$							

AQ-44 (con.)

12-15-72 WOGR

AIR QUALITY DIVISION

SOURCE SAMPLING FIELD DATA

Plant Carolina Stalite - Inlet, Purpleline
Date 11/28/79
Location Gold Hill
Sample Type Particulate
Run Number 2
Operator GLC
Sample Box No. 5
Meter Box No. 2

Meter $\Delta H_@$ 1.844
C Factor 1.05
Probe Type Pyrex
Probe Length 5'
Probe Tip Dia., In. 0.291
Probe Heater Setting 50%
Heater Box Setting Hi
Assumed Moisture % 5

Ambient Temperature 60°F
Barometric Pressure, In. Hg. 29.05
Static Pressure (P_s), -7.8
Stack Dimension(s) 47.3"
Distance: Disturbance to port 344'
Distance: Port to exit 84"
~~Reference Δp~~ leak check .001 @16½ / D @9
Filter number(s) 55702

Remarks:

TRAVERSE POINT NUMBER	SAMPLING TIME, min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft³	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
A 1	0	10:38	556.900	.06		.39	210		62		202	58
2	3		558.00	.37		2.4	240		62		191	55
3	6		560.09	.09		.25	250		62	2½	184	52
4	9		561.48	.06		.38	250		64	3	184	52
5	12		562.62	.08		.52	250		64	3	185	53
6	15		563.88	.09		.58	250		66	3	188	54
7	18		565.2	.09		.58	250		68	3	190	54
8	21		566.50	.08		.52	250		70	3	190	55
9	24		567.7	.08		.52	250		70	3	190	55
10	27		569.1	.07		.45	250		72	3	191	55
A 10	30		570.244	~~.37~~ .32		~~7~~	~~270~~					
B 1	30		570.244	.32		2.1	270		74	5½	191	58
2	33		572.29	.15		1.0	240		75	4	188	55
3	36		574.23	.13		.84	260		76	4	185	56
4	39		575.82	.13		.82	280		77	4	184	56

AQ-44

12-15-72

Plant Carolina Stalite - Inlet, Purple line Run No. 2 Date 11/27/79

TRAVERSE POINT NUMBER	SAMPLING TIME min	CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F
			575.82									
B# 5	42		577.38	.14		.90	280		79	4	172	56
6	45		578.98	.18		1.15	290		80	4.5	170	56
7	48		580.76	.18		1.15	280		80	4.5	174	56
8	51		582.57	.17		1.1	280		81	4.5	176	56
9	54		584.48	.18		1.15	280		81	5	170	56
10	57		586.15	.15		.95	280		81	4.5	171	56
B# 10	60		587.829									
				$\Sigma\sqrt{\Delta p}$ = 7.1446		$\overline{T_s}$ = 260F		$\overline{T_m}$ = 72F				
			30.929	$n\Delta p$ = 20			720R		532R			
				$\frac{\Sigma\sqrt{\Delta p}}{n\Delta p}$ = 0.3572								
					$\overline{\Delta H}$ = .8875							

AQ-44 (con.)

12-15-72 WOGB

AIR QUALITY DIVISION

SOURCE SAMPLING FIELD DATA

Plant Carolina Stalite-Inlet, Purple line

Date 11/28/79

Location Gold Hill

Sample Type Particulate

Run Number 3

Operator JAG

Sample Box No. 6

Meter Box No. 2

Meter $\Delta H_@$ 1.844

C Factor 1.05

Probe Type Pyrex

Probe Length 5'

Probe Tip Dia., In. .304

Probe Heater Setting 50%

Heater Box Setting Hi

Assumed Moisture % 5

Ambient Temperature 60

Barometric Pressure, In. Hg. 28.99

Static Pressure (P_s), -7.8

Stack Dimension(s) 47.3"

Distance: Disturbance to port 344"

Distance: Port to exit 84"

Leak Check ~~Reference Δp~~ 0.001@15 / .038@6½

Filter number(s) 55703

Remarks:

Cause found to be cracked elbow between filter & impinger

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\ in}$), °F	OUTLET ($T_{m\ out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
B 1	0 1302	588.107	0.09		0.62	190		72	3	196	62
2	3	589.48	0.13		0.89	215		72	3½	198	52
3	6	591.03	0.11		0.71	250		73	3½	198	52
4	9	592.51	0.12		0.78	260		74	3½	200	52
5	12	594.00	0.13	.83	0.83	265		74	4	200	52
6	15	595.61	0.15		0.96	270		76	4	198	55
7	18	597.28	0.15		0.96	270		78	4	196	56
8	21	598.94	0.13		0.83	270		79	3½	196	56
9	24	600.52	0.13		0.83	270		80	4	196	56
10	27	602.07	0.12		0.78	270		82	4	196	58
10	30	603.595									
A 1	30	603.596	0.24		1.05	145		84	6	210	58
2	33	605.88	0.15		1.00	235		85	4½	210	56
3	36	607.74	0.12		0.77	260		86	4	210	56
4	39	609.29	0.13		0.80	265		87	4	210	58

AQ-44

Plant Caroling Stalite-Inlet, Purple Line Run No. 3 Date 11/28/79

TRAVERSE POINT NUMBER	SAMPLING TIME min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE °F
A5	42	610.83	0.14		0.89	270		88	4½	208	58
6	45	612.48	0.13		0.80	270		89	4½	210	58
7	48	614.05	0.13		0.84	250		90	4½	210	58
8	51	615.64	0.18		1.25	205		92	5½	210	58
9	54	617.42	0.14/	0.10	0.98/.63	190/260		92	5¼	210	58
10	57	619.11	0.10		0.63	255		93	4½	210	60
A10	60	620.508									
			$\Sigma\sqrt{\Delta p}$ = 7.3062					$\bar{T}_m$ = 82°F			
		32.401	$n_{\Delta p}$ = 20					542 R			
			$\frac{\Sigma\sqrt{\Delta p}}{n_{\Delta p}}$ = 0.3653								
				$\bar{\Delta H}$ = .8973							
						$\bar{T}_s$ = 246 F					
						706°R					

AQ-44 (con.)

12-15-72 WOGA

Preliminary Field Data

Plant Carolina Stalite

Date 27 Nov 79

Port Location Purple Kiln Exit

Nearest Disturbance:

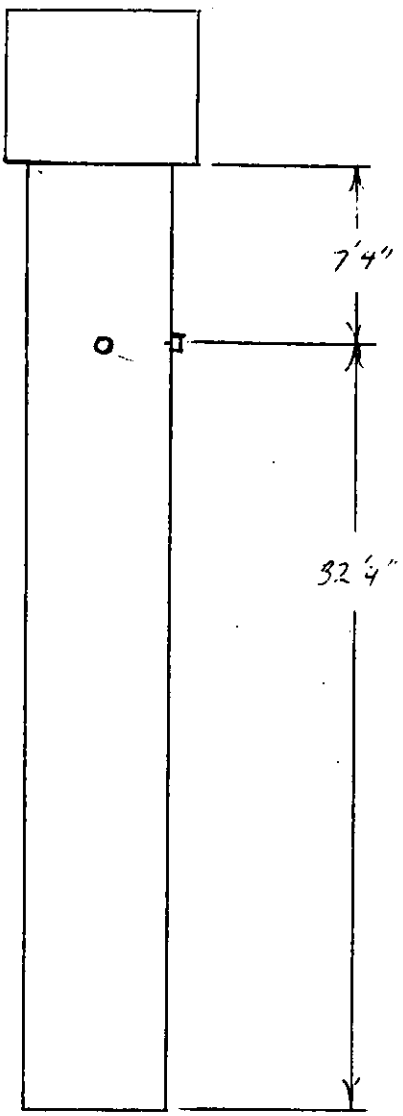
Before Port 5.43D

After Port 1.23D

Duct Diameter A 5.95' B 5.93'

nipple 0.16' 0.17'

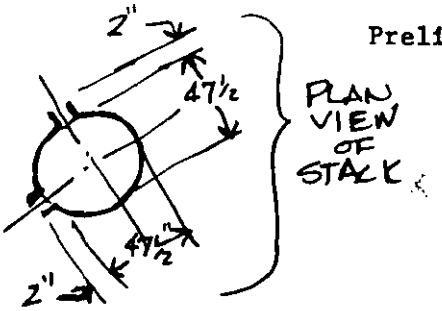
32 Points — 16 per traverse



Point Number	% of Diameter	Distance From Near Wall
A&B 1	1.6	0.09
2	4.9	0.29
3	8.5	0.50
4	12.5	0.74
5	16.9	1.00
6	22.0	1.30
7	28.3	1.68
8	37.5	2.22
9	62.5	3.71
10	71.7	4.25
11	78.0	4.63
12	83.1	4.93
13	87.5	5.19
14	91.5	5.43
15	95.1	5.64
16	98.4	5.84

Sketch of stack or duct showing location of sampling ports

Preliminary Field Data



Plant Carolina Stalite - Purple Line

Date 11/27/79

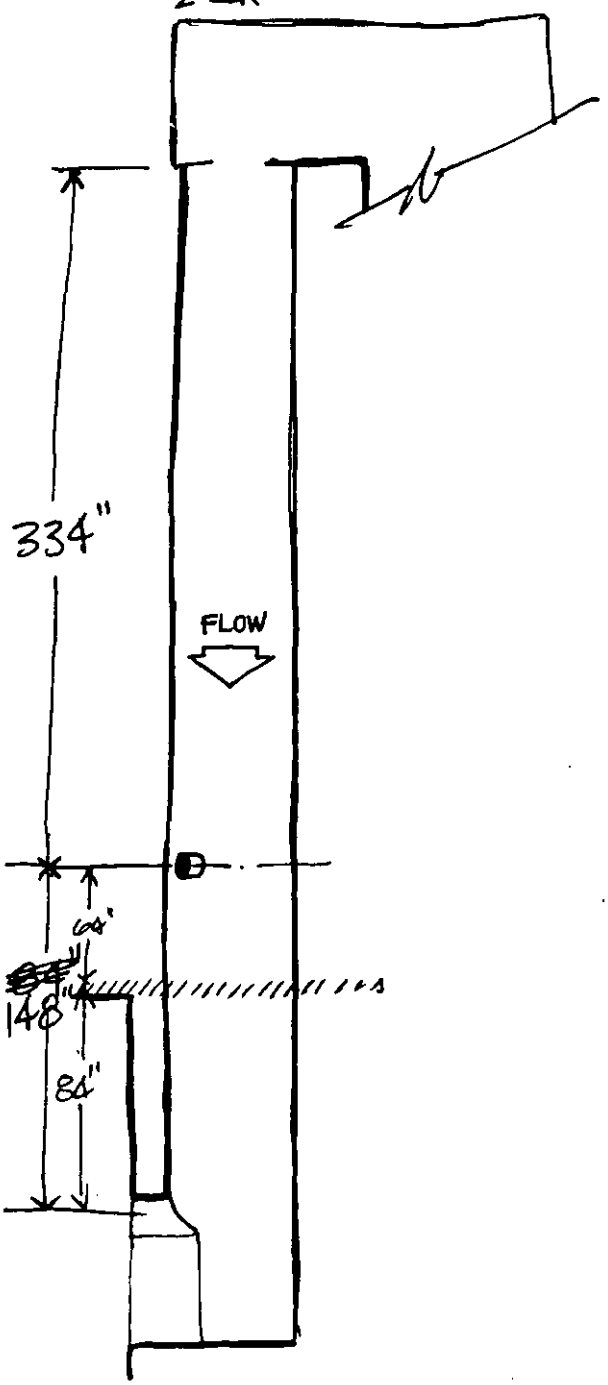
Port Location Ductwork Between Kiln & Control Device (Baghouse)

Nearest Disturbance:

Before Port 334" (7.1 diab)

After Port 148" (3.13 diab)

Duct Diameter 47⅛ x 47½ ⇨ 47.3" avg.



Sketch of stack or duct showing location of sampling ports

Point Number	% of Diameter	Distance From Near Wall	
1	.026	1.23	1¼
2	.082	3.86	3⅞
3	.146	6.88	6⅞
4	.226	10.65	10⅝
5	.342	16.12	16⅛
6	.658	31.01	31
7	.774	36.47	36½
8	.854	40.24	40¼
9	.918	43.26	43¼
10	.974	45.90	45⅞

NOMOGRAPH DATA

PLANT Carolina Stalite

DATE 27 Nov 79

SAMPLING LOCATION Purple Kiln - Exit of baghouse

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.887
AVERAGE METER TEMPERATURE (AMBIENT + 20°F), °F	$T_{m_{avg.}}$	90
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	5
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.34
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	173
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.16
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.17
C FACTOR	1.06	
CALCULATED NOZZLE DIAMETER, in.	.303	
ACTUAL NOZZLE DIAMETER, in.	.302	
REFERENCE Δp, in. H_2O		

Prelim. Trav.

	Δp	T_s
1	.12	150
2	.13	170
3	.15	170
4	.16	170
5	.17	170
6	.17	180
7	.17	180
8	.17	180
9	.17	180
10	.16	180
11	.14	180
12	.16	170
13	.17	170
14		
15		
16		

$\bar{\Delta p}$ - 0.16

$\bar{T}_s$ - 173

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NOMOGRAPH DATA

PLANT Carolina Stalite - Inlet, Purple

DATE 11/27/79

SAMPLING LOCATION Ductwork between Kiln & Cleaning Device

CALIBRATED PRESSURE DIFFERENTIAL ACROSS ORIFICE, in. H_2O	$\Delta H_@$	1.844
AVERAGE METER TEMPERATURE (AMBIENT + 20 °F), °F	$T_{m_{avg.}}$	85 (65+20)
PERCENT MOISTURE IN GAS STREAM BY VOLUME	B_{wo}	5
BAROMETRIC PRESSURE AT METER, in. Hg	P_m	29.30
STATIC PRESSURE IN STACK, in. Hg ($P_m \pm 0.073$ x STACK GAUGE PRESSURE in in. H_2O)	P_s	-7.8 (29.9
RATIO OF STATIC PRESSURE TO METER PRESSURE	P_s/P_m	1
AVERAGE STACK TEMPERATURE, °F	$T_{s_{avg.}}$	267
AVERAGE VELOCITY HEAD, in. H_2O	$\Delta p_{avg.}$	.205
MAXIMUM VELOCITY HEAD, in. H_2O	$\Delta p_{max.}$	.25
C FACTOR	1.05	
CALCULATED NOZZLE DIAMETER, in.	.325	
ACTUAL NOZZLE DIAMETER, in.		
REFERENCE Δp, in. H_2O		✓

Δp	T_s
~~.25~~	~~210~~
.20	240
.15	270
.18	270
.22	280
.24	280
.23	280
.23	280
.25	280
.18	260
.24	270
.21	280
.20	280
.18	280
.18	280
.19	270
3.08	2687
.205	(~~4280/16~~) 4000/15

-7.8 in

EPA (Dur) 234
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03/30/92 1

NO PROCESS DATE
DISCARD

RGF 4-10

Emission Test Report
Review Checklist

Reviewer: R. MARINSHAW
Review Date: 11/17/92

A. Background Information

1. Facility name: CAROLINA STALITE CORP.

   Location: GOLD HILL, NC

2. Source category: LIGHTWEIGHT AGGREGATE

3. Test date: 11/27-28, 1979

4. Test sponsor: PLANT

5. Testing contractor: NC DEM

6. Purpose of test: COMPLIANCE

7. Pollutants measured

   (PM) PM-10 CO SO_2 NO_x VOC Pb CO_2

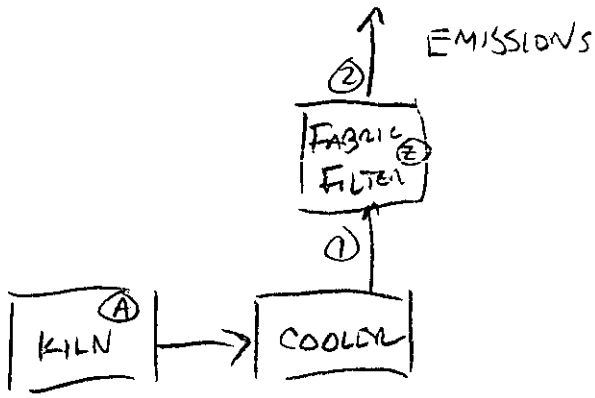
   Others (list):

8. Process overview: On an attached page provide a block diagram of the unit operations and associated air pollution control systems at the facility. Identify process tested with letters from the beginning of the alphabet (A, B, C, etc.) and APC systems with letters from end of alphabet (V, W, X, etc.). Also identify test locations with Arabic numerals (1,2,3, ...). Using the ID symbols from that sketch complete the table below that identifies processes or unit operations tested.

Test ID	Process	Process ID	Emissions tested		APCD (controlled emissions only)
			Uncontrolled	Controlled	
1	KILN	A	✓	✓	FABRIC FILTER

B. Process Information

1. Provide a brief narrative description of the process. With as much detail as possible, (e.g., if a furnace or conveyor system is used, identify the type of unit) describe the equipment used for those operations tested. (Note: If process description provided in test report is adequate, attach copy or reproduce here.)



2. For each process tested list feedstock materials and products. Indicate if activity factors are for feed (F) rate or product (P) rate.

Process ID	Feedstock materials	Products	Basis for activity factor	F/P

Basis for data: _____
(Indicate page/table Nos. in test report)

3. For each process or operation tested and each test run note process capacity and operating rate during test.

Process ID	Capacity	Units	Test run	Process rate	Units
			1		
			2		
			3		
			4		
			1		
			2		
			3		
			4		
			1		
			2		
			3		
			4		
			1		
			2		
			3		
			4		

Basis for data: _____

C. Air Pollution Control Systems Tested

1. For each air pollution control system pollution control system identified in A.8, note the following

ID	Type of APCD	Manufacturer	Model No.

Note: Be as specific as possible in identifying APCD. For example, indicate "pulse jet fabric filter" rather than simply "fabric filter."

2. For each system identified above, provide a narrative description. For fugitive systems describe capture techniques as well as the removal techniques (use a separate page if necessary)

3. Using the attached parameter list for guidance complete the table below. (Use additional pages as needed.)

APCD ID	Parameter	Units	Readings			
			Run 1	Run 2	Run 3	Run 4
Type of APCD:						
Type of APCD:						
Type of APCD:						

D. Sampling and Analysis Methods

1. Complete the following table

Test location	Pollutant	S & A method	Reference/ conditional method	Deviations noted
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N
			Y/N	Y/N

2. If a method used was not a reference or conditional method, provide a narrative discussion including any data manipulation needed to make results correspond to reference or conditional method results.

3. Describe any deviations identified above.

E. Emission Data Documentation

1. Tabulate the following stack gas data from the test report. (Use additional pages as needed.)

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
	Stack temperature					
	Moisture					
	Oxygen					
	Volumetric flow, actual					
	Volumetric flow, standard					
	Percent isokinetic					
	Pollutant concentration:					
	Stack temperature					
	Moisture					
	Oxygen					
	Volumetric flow, actual					
	Volumetric flow, standard					
	Percent isokinetic					
	Pollutant concentration:					
	Stack temperature					
	Moisture					
	Oxygen					
	Volumetric flow, actual					
	Volumetric flow, standard					
	Percent isokinetic					
	Pollutant concentration:					

2. Tabulate pollutant mass flux rates

Test ID	Pollutant	Units	Mass flux rates			
			Run 1	Run 2	Run 3	Run 4

3. Present example emission factor calculations below.

4. Tabulate emission factors

Process	Pollutant	Units	Average emission factor	
			Uncontrolled	Controlled

ATTACHMENT A
APCD PARAMETERS

Type of APCD	Parameters
Fabric filter	Cleaning mechanism Bag type Cleaning frequency Air to cloth ratio (A/C) Pressure drop Inlet temperature
ESP	Type (wet or dry) Number of fields Rapping cycle (if dry) Specific Collection Area (SCA) Particulate resistivity (if known) Spark rate Current and power levels
Venturi (or other high energy) scrubber	Pressure drop Liquid/gas (L/G) ratio Mist eliminator type
Packed-bed scrubber	Packing depth L/G ratio Caustic use (Y/N) pH Mist eliminator type
Carbon absorber	Bed depth Superficial gas velocity Bed temperature Desorption mechanism (media) Flue-gas moisture Cycle length Time-on-line after breakthrough