AP-42 Section 11.6
Reference 32
Report Sect. 4
Reference 26

Source category: Portland Cement
Plant name : Lehigh Portland Cement Co.
Test date : 11/8 - 11/9/84
Process : wet
Date: 01/12/93
Location: Cementon, NY
Ref. No.: 26
Basis for process rate : kiln feed in GPM

Source	Type of control	Pollutant	Run No.	Emission rate, lb/hr	Process rate, ton/hr	Emission factor kg/Mg	Emission factor lb/ton	Volumetric flow rate, DSCFM	Concen ppm
rotary kiln (coal-fired)	ESP	BASED ON KILN FEED RATE IN GPM CONVERTED TO CLINKER PRODUCTION RAT							
		filt. PM	1	8.50	62.5	0.0680	0.136		
		filt. PM	2	8.60	62.5	0.0688	0.138		
		filt. PM	3	12.00	63.3	0.0948	0.190		
		AVERAGE				0.0772	0.154	RATING:	C
		SO2	1	1,256	62.5	10.0	20.1		
		SO2	2	1,196	62.5	9.57	19.1		
		SO2	3	980	63.3	7.74	15.5		
		AVERAGE				9.12	18.2	RATING:	C
		CO2	1	116,430	62.5	931	1,863	105,726	16.1
		CO2	2	96,904	62.5	775	1,550	99,072	14.3
		CO2	3	121,915	63.3	963	1,926	110,707	16.1
		AVERAGE				890	1,780	RATING:	C

Notes: 1. Data rated C because of uncertainty of process rates and poor documentation.

-71500-2007

Reference 52:
(1). Coal-fired wet process kiln w/ESP

COMPLIANCE TEST
PARTICULATE AND SULFUR (

CEMENTON KI

Data: Rating C
Process data unclear
(3/4 not 24.)

PREPARED FOR:

LEHIGH PORTLAND CEMENT COMPANY
CEMENTON FACILITY
CEMENTON, NEW YORK
GREENE COUNTY

PREPARED BY:

R. L. BAKER
KVB, INC .
ENGINEERING AND RESEARCH DIVISION

DECEMBER 1984

KVB®
A Research-Cottrell Company

CONTENTS

FIGURES

SECTION 1.0

INTRODUCTION

A series of particulate emission compliance tests was conducted by KVB Inc. on the kiln at the Lehigh Portland Cement Company located in Cementon, New York during November 8-9, 1984. The purpose of this program was to demonstrate compliance with the New York State Department of Environmental Conservation's particulate emissions limitation of 0.05 grains per dry standard cubic foot and the sulfur emissions limitation of 1.9 pounds per 10^6 Btu. Testing was completed within two months of the September start up during which extensive reparis were made to the electrostatic precipitator.

The compliance test series consisted of three EPA Method 5 tests with a Method 6 sulfur dioxide impinger train conducted at the kiln exhaust after an electrostatic precipitator. Throughout the testing, the facility was operating at its present maximum sustained output of approximately 1500 tons per day of clinker (400 GPM slurry input) while firing approximately 16.5 tons per hour of pulverized coal.

Visual opacity readings were taken throughout the two-day test period in accordance with EPA Method 9 procedures by a NYS DEC Region IV representative, Mr. Ronald Daoust. Particulate emissions testing at the stack was conducted by KVB, Inc. and observed by a NYS DEC representative, Mr. Bruce Gould. Mr. Richard Forgea of the NYS DEC Region IV reviewed the test protocol prior to the initial day of testing and was cognizant of all the test methods and procedures employed.

The particulate emissions test series was conducted by KVB, Inc. under the direction of Mr. R. L. Baker, Project Engineer, assisted by Mr. P. C. Coviello, Principal Technician and Mr. R. A. Parker, Senior Technician.

This report contains the results of the particulate emissions tests and associated documentation of the raw data, reduced data, and test conditions. Applicable pre-test data, field test data, operational data, and

reduced data are presented in the appendices. The fuel analysis presented in this report indicates the results of individual samples taken during each compliance test day.

SECTION 2.0

SUMMARY OF TEST RESULTS

The results of the particulate emission compliance test conducted on the kiln exhaust stack of Lehigh's Cementon facility in Cementon, New York, are presented in Table 2-1. This data represents the emission level of the kiln exhaust stack while firing pulverized coal to produce approximately 1500 tons per day of Portland cement. The applicable emissions limitation for this facility is 0.05 grains per dry standard cubic foot.

TABLE 2-1. PARTICULATE EMISSIONS RESULTS

Date	Test No.	Time Period (hr)	Particulate Emissions Gr/DSCF*	lb/hr**
11/8/84	LC Comp 1	1525 - 1657	0.009	8.5
11/9/84	LC Comp 2	1316 - 1428	0.010	8.6
11/9/84	LC Comp 3	1610 - 1722	0.013	12.0
AVERAGE			0.011	9.7

*Standard conditions 68°F and 29.92 in Hg at stack oxygen level

**Based on stack velocity method of analysis

The emissions levels in Table 2-1 were computed through KVB's Emission Data Reduction Computer Program (See Appendix A and H) which is in accordance with the appropriate EPA methods. The raw test data taken during each test appears in Appendix B.

A representative of the NYS DEC Region IV was present at the test site during the initial compliance testing day and was fully cognizant of the testing procedures used. The results indicate that the particulate emission levels for the Cementon kiln are well below the 0.05 GR/DSCF limit. The compliance test filters are being preserved and are available for inspection by the NYS DEC upon request.

Visible opacity was recorded using EPA Method 9 and was conducted during each day of compliance testing by a NYS DEC Region IV representative.

The sulfur dioxide emissions testing was conducted to demonstrate compliance with the 1.9 pound per million Btu regulation. Results of the sulfur testing, run concurrently with the particulate testing, appears below in Table 2-2.

TABLE 2-2. SULFUR EMISSIONS RESULTS

			Sulfur Emissions		
Date	Test No.	Test Period	ppm at 3% as SO_2	lb/hr S	lb/10^6 Btu
11/8/84	LC Comp 1	1525 - 1657	1540	628	1.48
11/9/84	LC Comp 2	1316 - 1428	1537	598	1.42
11/9/84	LC Comp 3	1610 - 1722	1205	490	1.17
AVERAGE			1427	571	1.36

SECTION 3.0

KILN DESCRIPTION

The Lehigh Portland Cement facility consists of a single wet process kiln manufactured by Allis Chalmers. The original design capacity of the kiln was approximately 1500 tons of clinker production per day (TPD). The 550-foot long kiln is normally fired on pulverized coal. Pertinent kiln operational data taken during the compliance testing is included as Appendix C.

The exhaust gases exit the kiln and enter a western electrostatic precipitator (ESP) prior to entering a single 270-foot stack. The kiln gases are drawn from the clinker cooler by the use of an induced draft fan situated at the base of the stack. A schematic of the exhaust gas path and the location of the sampling plane is illustrated in Figure 3-1. Operational data documenting the power levels which existed in the ESP appear in Appendix D.

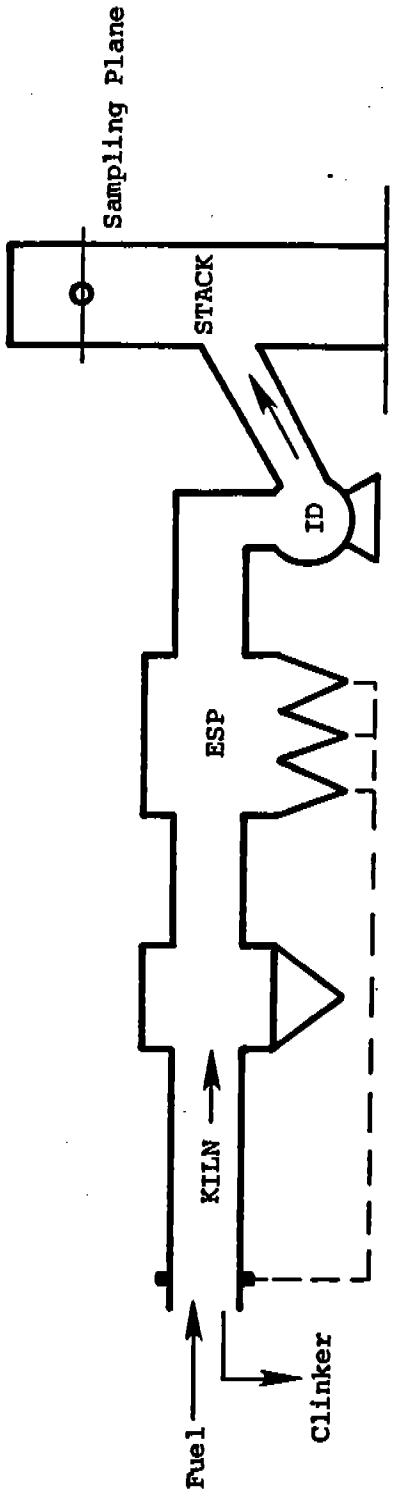


Figure 3-1. Lehigh Portland Cement, Cementon Facility - Kiln Exhaust Gas Path and Sampling Port Location

SECTION 4.0

EMISSION SAMPLING AND ANALYSIS

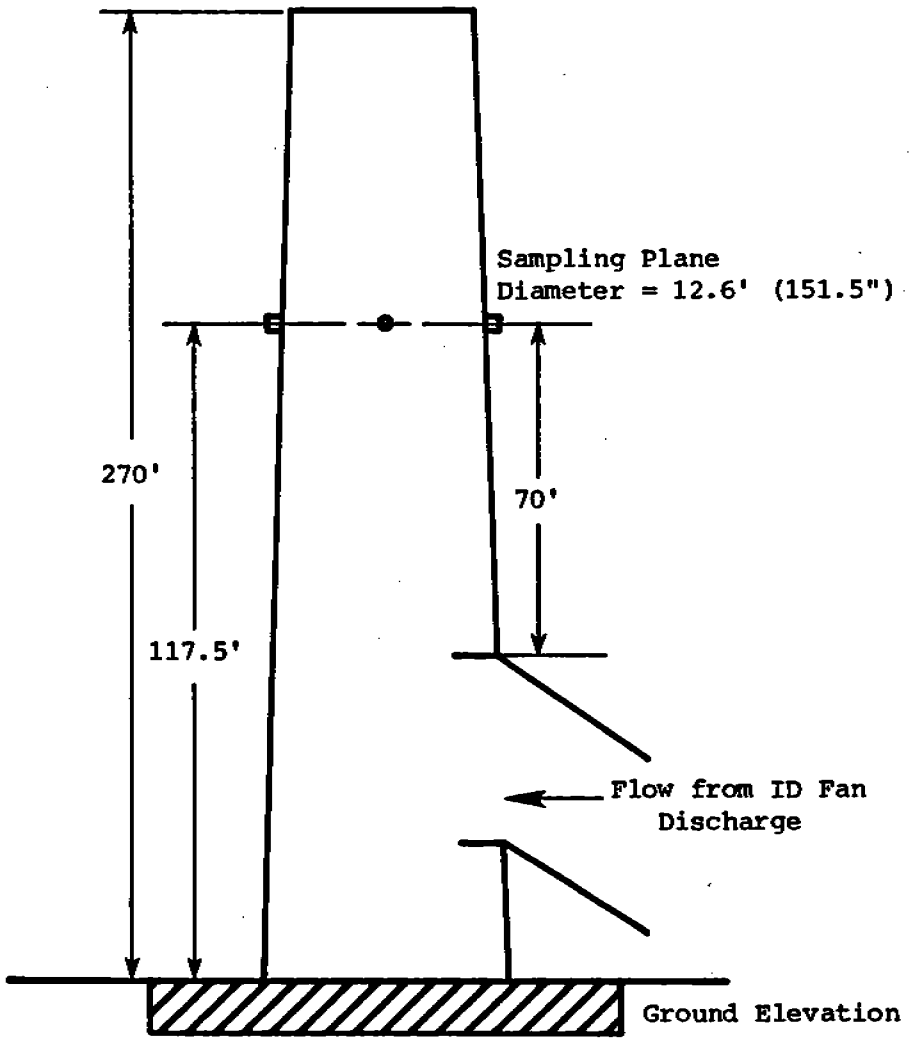
The various procedures used in stack sampling, laboratory analyses and data reduction are described and discussed in the following sections.

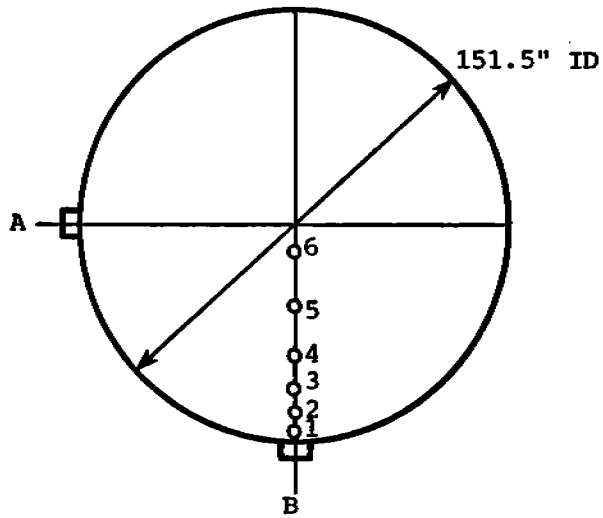
4.1 SAMPLING PLANE AND TRAVERSE POINT LOCATION

Testing was performed in the stack at test ports located 5.50 diameters downstream of the last flow disturbance and 14.0 diameters upstream of the stack exit. Figure 4-1 illustrates the sampling location at the Cementon facility. Twenty-four sampling points were specified by EPA Method 1. There are two ports installed 90 degrees apart in the stack, therefore, 12 points were sampled in each port. Sample point locations are presented in Figure 4-1.

4.2 VELOCITY TRAVERSE

The gas velocity was measured at the traverse points specified in Figure 4-1, using an "S" type pitot tube. The presence of cyclonic flow was quantified by the following procedure. The pitot tube was positioned at each of the traverse points such that the face openings are perpendicular to the stack cross-sectional plane. A null (zero) reading at "0° Reference" was construed to indicate the absence of cyclonic flow. If the reading was not zero, the pitot tube was rotated in increments until a null reading was obtained. The absolute angle of a null reading was recorded in degrees as a deviation from the perpendicular, and the summation of all the traverse points was calculated. The resultant overall average for the sampling plane averaged 1.4 degrees which is within the acceptable limit (10 degrees). The cyclonic flow check was performed at a steady state condition under normal production rate conditions. This data is included as Appendix E.





24 Total Sampling Points

Figure 4-1. Stack Sample Plane and Sample Point Matrix

4.3 PARTICULATE SAMPLING PROCEDURES

Particulate sampling was in accordance with the EPA Method 5. Particulate matter was collected by out-of-stack filtration utilizing the basic configuration shown in Figure 4-2. A 14-foot heated inconcel probe was utilized for the sampling. The sampled gases passed directly from the probe into a glass housing which contained a preweighed 11 cm glass fiber filter. The glass filter material, Reeve Angel Grade 934 AH, had been previously shown to be chemically inert having a pH of seven. The filter housing was contained in a small oven thermostatically controlled to maintain a temperature no higher than 320°F.

After the filter, the flue gas sample was drawn through a flexible vacuum line to six Greenburg-Smith impingers maintained below 68°F. The first and second impingers each were filled with 100 ml of IPA 80 percent in water to serve as condensors. The third was left dry and the fourth and fifth contained approximately 100 ml of hydrogen peroxide, followed by a blank and finally 250 grains of weighed silica gel. The outlet of the last impinger was connected by an umbilical cord to a RAC Staksampler meter/control box. The meter/control box contained a vacuum pump, regulation valves, instantaneous flow meter, integrating flowmeter, pitot tube, manometer and vacuum gauge. Flowrates were adjusted to obtain isokinetic sampling utilizing the RAC Stacksampler box and associated nomographs.

Sampling times of three minutes per traverse point were used for each test, yielding a total test time of 72 minutes. Prior to and after each test, the sampling train was checked for leakage. A seal was placed over the end of the sampling nozzle and a vacuum was drawn. For the pre-test check, a 15" Hg vacuum pressure was drawn for the post-test check, the vacuum was at least equal to the highest vacuum recorded during the testing. A leakage rate equal to or less than 0.02 cfm was considered acceptable. The pitot tubes were also checked before each test in accordance with the procedure outlined in the FEDERAL REGISTER.

At each point the various sample train parameters were recorded; the raw data are presented in Appendix B.

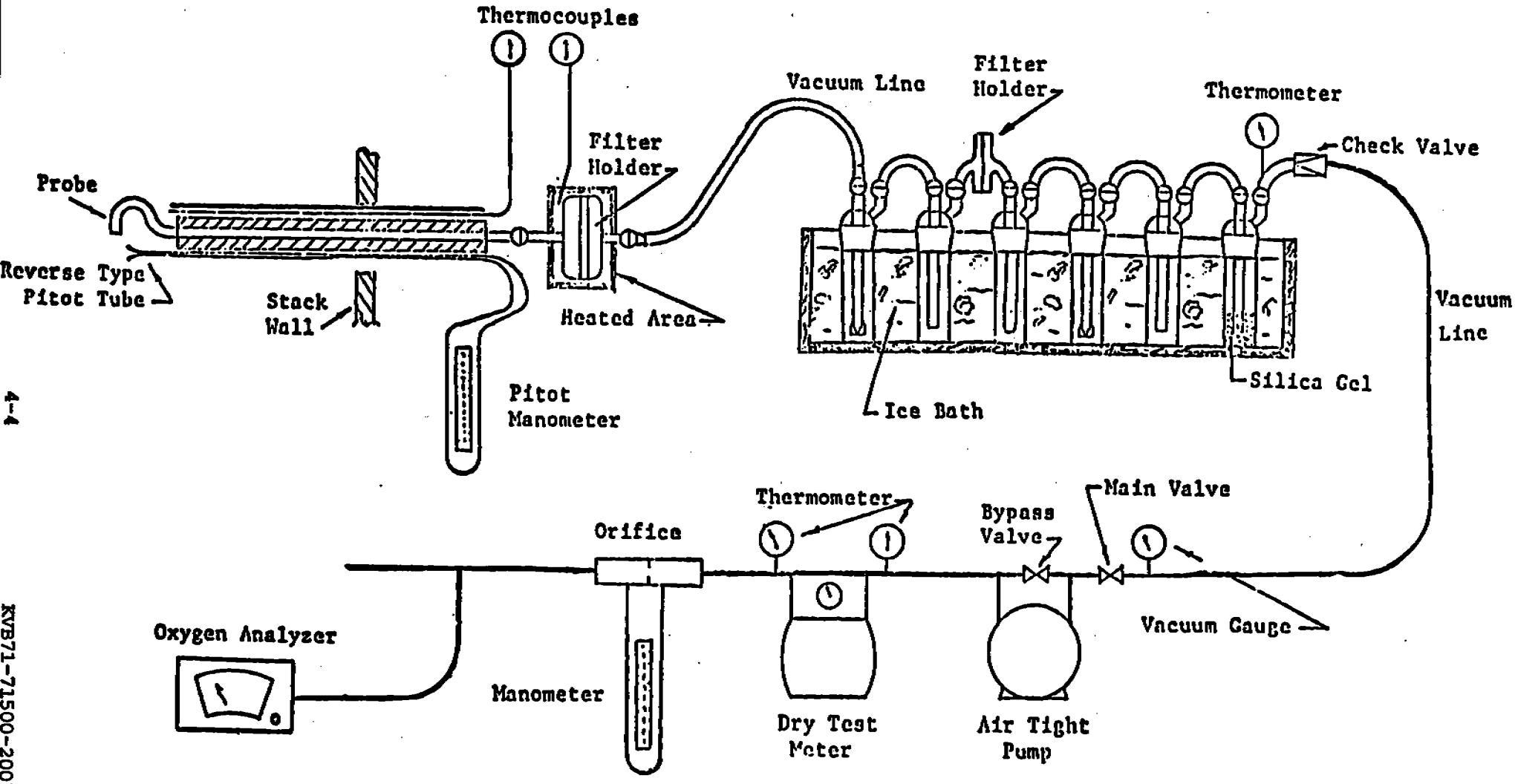


Figure 4-2. EPA Methods 5 and 6 Combined Emissions Train

Required O_2 measurements were obtained using a portable Teledyne analyzer, calibrated on ambient air which drew the sample from a tap located at the gas exit of the RAC box. The excellent correspondence between Teledyne and Orsat analysis has been witnessed by personnel from EPA, as well as the NYS DEC and was therefore, approved for use during the compliance testing, at the pre-test conference. Orsat analyses were run on a two-port composite sample collected in a Tedlar bag for each of the compliance tests.

A pulverized coal fuel sample was taken during each test day, and the analysis of a composite sample was used to reduce the data. The fuel analysis was performed by an independent laboratory (Warner Laboratories) and a copy is presented in Appendix J.

4.4 LABORATORY PROCEDURES

The reported particulate emissions are a combination of the particulate matter collected on the glass filter and the particulate matter deposited on the sampling nozzle, probe and upstream filter housing which are recovered with an acetone rinse.

Prior to testing a series of filters were held in a desiccator for 24 hours and weighed. Immediately following each test the filter was weighed and promptly transferred to a desiccator for a period not less than 24 hours prior to final weighing. The particulate matter upstream of the filter was collected by rinsing the sampling probe and all associated glassware with acetone, brushing the sampling probe to loosen adhered particles, rinsing the brush and probe again and collecting the entire rinse in a tared beaker. This acetone rinse was evaporated to dryness using a warm air flow. The sample handling history is summarized in the chain of custody forms in Appendix K.

The resultant collected samples were cooled in an ambient desiccator and weighed to the nearest 0.1 milligram. The tare and final weights for each test are presented in Appendix F.

The volumes of water from the flue gas samples were determined by measuring the volume in the flexible hose (filter housing to first impinger) and impingers plus the weight difference of the silica gel. A summary of the

filter weights, wash weights, condensate volumes and dry gas volumes are presented in Table 4-1.

TABLE 4-1. WEIGHT AND VOLUME SUMMARY

Test No.	Filter Wt. (mg)	Wash Wt. (mg)	Total Wt. (mg)	Condensate VOL. (ml)	Meter Sample VOL. (SCF)*
LC Comp 1	18.6	11.9	30.5	430.5	51.491
LC Comp 2	16.6	14.9	31.5	431.0	47.825
LC Comp 3	21.6	20.4	42.0	456.5	49.948

*Dry at 68°F and 29.92 Hg

4.5 DATA REDUCTION

The particulate data reduction technique utilized KVB's computerized particulate emissions data reduction program which uses the EPA "F Factor" method presented in the FEDERAL REGISTER of August 18, 1977 (Volume 42, Number 160) and June 11, 1979 (Volume 44, Number 113). The actual equations used by the KVB program are presented in Appendix H. Sample calculations for each compliance test appear in Appendix I.

Input to the computer program includes the raw sampling data, laboratory weights, kiln operational data and the fuel analysis. The computer output contains the final particulate mass loadings in various units, the fuel analysis, operational data and the percent of isokinetic sampling. The percent isokinetic samplings for the tests ranged from 102.3 to 106.7 percent. Included in the output is a listing of the individual sampling point raw data and the individual sampling point velocities. Average values for each variable are listed. The printed outputs are presented in Appendix A.

Table 4-2 contains a summary of the particulate mass loadings and percent isokinetic sampling for each of the compliance test runs.

TABLE 4-2. PARTICULATE LOADINGS AND PERCENT ISOKINETIC

Test No.	Particulate Mass Loadings GR/DSCF	LB/HR	Percent of Isokinetic
LC Comp 1	0.009	8.5	105.3
LC Comp 2	0.010	8.6	106.7
LC Comp 3	0.013	12.0	102.3
AVERAGE	0.011	9.7	104.8

4.6 CALIBRATION DATA

Equipment for the testing was calibrated under the following conditions by KVB personnel. Appendix G presents the calibration data.

1. Precalibration of the dry gas meter and flow orifice. These calibrations were performed at KVB facility. The flow range covered 0.5 to 4.5 inches H_2O of orifice manometer setting (ΔH).

2. Postcalibration of the dry gas meter and flow orifice. These calibrations were performed at KVB facility as specified in the FEDERAL REGISTER (Volume 39, No. 177, September 11, 1974). A series of three post calibrations were performed on each metering system utilized for compliance testing at the average ΔH and at the maximum vacuum experienced during the testing.

3. Probe nozzle calibration. The 3/8" nominal size orifice was calibrated on site using a set of inside calipers. Four diameters were measured. The resultant mean diameter was 0.376 inches.

4. Pitot tube calibration. The pitot tubes were calibrated by Nutech Corporation outlined in the FEDERAL REGISTER, June 8, 1976, Volume 41, No. 111.

REFERENCES.

1. FEDERAL REGISTER, Vol. 36, No. 247, December 23, 1971, and Vol. 39, No. 177, September 11, 1974.

2. New York State Environmental Conservation Law 3-0301, 19-0301, Sec. 220.1, 220.2, and 225.0.

3. "Compliance Test Protocol - Particulate and Sulfur Oxide Emissions, Cementon Kiln," KVB, Inc., November 1984, KVB TM No. 71-71500-TP, R. Baker.

APPENDIX A

METHOD 5 - COMPUTER REDUCED DATA

KVB, INC. 18006 SKYPARK BLVD. IRVINE, C.A. 92714 (714) 250-6200

********* PARTICULATE EMISSIONS DATA REDUCTION PROGRAM *********

COMPANY - LEHIGH PORTLAND CEMENT
LOCATION - CEMENTON NY
UNIT(S) - KILN EXHAUST STACK
TEST DATE - 11-8-84
TEST NO. - COMPLIANCE 1
TEST SITE - STACK

********** FUEL ANALYSIS **********

COAL	PCT BY WT	MOLES/LB-FUEL
CARBON	69.39	5.783(-02)
HYDROGEN	4.73	4.730(-02)
SULFUR	2.66	8.313(-04)
OXYGEN	5.81	1.816(-03)
NITROGEN	1.26	4.500(-04)
ASH	16.15	

HIGH HEATING VALUE(BTU/LB)	12606.00
EPA 'F FACTOR'(DSCF/MBTU)	9702.0

********** ORSAT ANALYSIS **********

	PCT BY VOLUME
CARBON DIOXIDE	16.10
OXYGEN	8.00
CARBON MONOXIDE	0.02
NITROGEN	47.62
WATER	28.26

********** TEST CONDITIONS **********

KILN FEED(GPM)	400.0
TOTAL HEAT INPUT(KBTU/HR)	423561.6
FUEL FLOW(LB/HR)	33600.0
BAROMETRIC PRESSURE(IN. HG)	29.85
STACK GAS STATIC PRESS(IN H2O)	-0.55
NOZZLE DIAMETER(IN)	0.376
PITOT TUBE COEFFICIENT	0.840
DUCT AREA AT SAMPLING PLANE(SQ. FT)	122.7
PROBE LENGTH (FT)	14.0
PROBE MATERIAL	INCONEL

********** FLUE GAS PARAMETERS **********

MOLECULAR WEIGHT DRY(COMBINED)	31.60
MOLECULAR WEIGHT WET(COMBINED)	27.76
MOLECULAR WEIGHT DRY(ORSAT)	32.04
MOLECULAR WEIGHT WET(ORSAT)	28.07
PERCENT MOISTURE(MEASURED)	28.26
ACFM AT SAMPLING PLANE BASED ON:	
FUEL FLOW AND COMBUSTION CHEMISTRY	192765.2
STACK VELOCITY	237043.9

KVB, INC. 18006 SKYPARK BLVD. IRVINE, C.A. 92714 (714) 250-6200

********* PARTICULATE EMISSIONS DATA REDUCTION PROGRAM *********

COMPANY - LEHIGH PORTLAND CEMENT
LOCATION - CEMENTON NY
UNIT(S) - KILN EXHAUST STACK
TEST DATE - 11-8-84
TEST NO. - COMPLIANCE 1
TEST SITE - STACK

**************** PARTICULATE DATA ****************

PARTICULATE MASS(MG)	30.50
CONDENSATE VOLUME(ML)	430.50
CONDENSATE VOLUME(SCF)	20.279
DRY GAS METERED VOLUME(DSCF)	51.491
AVERAGE 02 MEASURED(%)	7.33
TOTAL DURATION OF TEST(MINUTES)	72.00

* EMISSIONS BASED ON VELOCITY AND FUEL FLOW METHOD *

LB/DSCF	1.306(-06)
LB/WSCF	9.369(-07)
GRAINS/ACF	4.166(-03)
GRAINS/DSCF	9.141(-03)
GRAINS/WSCF	6.558(-03)
LB/HR(BASED ON STACK VELOCITY)	8.465(00)
LB/HR(BASED ON FLUE GAS COMPOSITION)	6.883(00)
PERCENT ISOKINETIC SAMPLING	105.34

KVB, INC. 18006 SKYPARK BLVD. IRVINE, C.A. 92714 (714) 250-6200

********* PARTICULATE EMISSIONS DATA REDUCTION PROGRAM *********

COMPANY - LEHIGH PORTLAND CEMENT
LOCATION - CEMENTON NY
UNIT(S) - KILN EXHAUST STACK
TEST DATE - 11-8-84
TEST NO. - COMPLIANCE 1
TEST SITE - STACK

IDENT.	TIME (MIN)	VOLUME (CU FT)	O2 (%)	DEL P (IN H2O)	DEL H	T-METER (F)	T-STACK (F)	GAS VEL (FT/SEC)
N12	3.00	2.114	7.60	0.19	1.80	52.0	370.0	31.3
N11	3.00	2.030	7.60	0.19	1.80	55.0	370.0	31.3
N10	3.00	2.030	7.70	0.18	1.70	57.0	370.0	30.5
N9	3.00	2.100	7.70	0.20	1.90	58.0	370.0	32.1
N8	3.00	2.120	7.40	0.20	1.90	66.0	370.0	32.2
N7	3.00	2.220	7.50	0.23	2.10	65.0	370.0	34.5
N6	3.00	2.330	7.50	0.29	2.70	66.0	370.0	38.7
N5	3.00	2.230	7.50	0.23	2.10	67.0	371.0	34.5
N4	3.00	2.220	6.60	0.21	2.00	68.0	370.0	33.0
N3	3.00	2.150	6.50	0.20	1.85	67.0	371.0	32.2
N2	3.00	1.750	6.60	0.15	1.40	67.0	371.0	27.9
N1	3.00	2.038	6.60	0.14	1.30	67.0	365.0	26.9
W12	3.00	2.400	7.20	0.26	2.35	63.0	370.0	36.7
W11	3.00	2.250	7.20	0.26	2.35	66.0	370.0	36.7
W10	3.00	2.360	7.20	0.28	2.55	68.0	370.0	38.1
W9	3.00	2.390	7.40	0.27	2.50	70.0	370.0	37.4
W8	3.00	2.270	7.40	0.23	2.10	71.0	370.0	34.5
W7	3.00	2.230	7.40	0.22	2.05	71.0	369.0	33.7
W6	3.00	2.210	7.50	0.20	1.85	72.0	370.0	32.1
W5	3.00	2.090	7.60	0.16	1.45	72.0	365.0	28.7
W4	3.00	2.040	7.60	0.17	1.60	72.0	364.0	29.5
W3	3.00	1.960	7.50	0.15	1.40	73.0	362.0	27.7
W2	3.00	1.900	7.50	0.14	1.30	73.0	360.0	26.7
W1	3.00	1.795	7.60	0.13	1.20	73.0	357.0	25.7
TOTAL	72.00	51.227						
AVERAGE			7.33	0.20	1.89	66.6	368.1	32.2

** NOTE ** AVERAGE OF DELTA P'S BY SUM OF SQUARE ROOTS **

KVB, INC. 18006 SKYPARK BLVD. IRVINE, C.A. 92714 (714) 250-6200

********* PARTICULATE EMISSIONS DATA REDUCTION PROGRAM *********

COMPANY - LEHIGH PORTLAND CEMENT
LOCATION - CEMENTON NY
UNIT(S) - KILN EXHAUST STACK
TEST DATE - 11-9-84
TEST NO. - COMPLIANCE 2
TEST SITE - STACK

********** FUEL ANALYSIS **********

COAL	PCT BY WT	MOLES/LB-FUEL
CARBON	70.68	5.890(-02)
HYDROGEN	4.83	4.830(-02)
SULFUR	2.40	7.500(-04)
OXYGEN	5.53	1.728(-03)
NITROGEN	1.30	4.643(-04)
ASH	15.26	

HIGH HEATING VALUE(BTU/LB)	12812.00
EPA 'F FACTOR'(DSCF/MBTU)	9727.0

********** ORSAT ANALYSIS **********

	PCT BY VOLUME
CARBON DIOXIDE	14.30
OXYGEN	7.80
CARBON MONOXIDE	0.07
NITROGEN	48.03
WATER	29.80

********** TEST CONDITIONS **********

KILN FEED(GPM)	400.0
TOTAL HEAT INPUT(KBTU/HR)	420233.6
FUEL FLOW(LB/HR)	32800.0
BAROMETRIC PRESSURE(IN. HG)	29.79
STACK GAS STATIC PRESS(IN H2O)	-0.70
NOZZLE DIAMETER(IN)	0.376
PITOT TUBE COEFFICIENT	0.840
DUCT AREA AT SAMPLING PLANE(SQ. FT)	122.7
PROBE LENGTH (FT)	14.0
PROBE MATERIAL	INCONEL

********** FLUE GAS PARAMETERS **********

MOLECULAR WEIGHT DRY(COMBINED)	31.00
MOLECULAR WEIGHT WET(COMBINED)	27.12
MOLECULAR WEIGHT DRY(ORSAT)	31.70
MOLECULAR WEIGHT WET(ORSAT)	27.62
PERCENT MOISTURE(MEASURED)	29.80
ACFM AT SAMPLING PLANE BASED ON:	
FUEL FLOW AND COMBUSTION CHEMISTRY	175733.0
STACK VELOCITY	223463.0

KVB, INC. 18006 SKYPARK BLVD. IRVINE, C.A. 92714 (714) 250-6200

********* PARTICULATE EMISSIONS DATA REDUCTION PROGRAM *********

COMPANY - LEHIGH PORTLAND CEMENT
LOCATION - CEMENTON NY
UNIT(S) - KILN EXHAUST STACK
TEST DATE - 11-9-84
TEST NO. - COMPLIANCE 2
TEST SITE - STACK

********** PARTICULATE DATA **********

PARTICULATE MASS(MG)	31.50
CONDENSATE VOLUME(ML)	431.00
CONDENSATE VOLUME(SCF)	20.302
DRY GAS METERED VOLUME(DSCF)	47.825
AVERAGE O2 MEASURED(%)	6.75
TOTAL DURATION OF TEST(MINUTES)	72.00

* EMISSIONS BASED ON VELOCITY AND FUEL FLOW METHOD *

LB/DSCF	1.452(-06)
LB/WSCF	1.019(-06)
GRAINS/ACF	4.504(-03)
GRAINS/DSCF	1.016(-02)
GRAINS/WSCF	7.135(-03)
LB/HR(BASED ON STACK VELOCITY)	8.627(00)
LB/HR(BASED ON FLUE GAS COMPOSITION)	6.784(00)
PERCENT ISOKINETIC SAMPLING	106.73

KVB, INC. 18006 SKYPARK BLVD. IRVINE, C.A. 92714 (714) 250-6200

********* PARTICULATE EMISSIONS DATA REDUCTION PROGRAM *********

COMPANY - LEHIGH PORTLAND CEMENT
LOCATION - CEMENTON NY
UNIT(S) - KILN EXHAUST STACK
TEST DATE - 11-9-84
TEST NO. - COMPLIANCE 2
TEST SITE - STACK

IDENT.	TIME (MIN)	VOLUME (CU FT)	O2 (%)	DEL P (IN H2O)	DEL H	T-METER (F)	T-STACK (F)	GAS VEL (FT/SEC)
N12	3.00	2.178	6.50	0.19	1.75	61.0	370.0	31.8
N11	3.00	2.100	6.40	0.20	1.85	62.0	370.0	32.6
N10	3.00	2.250	6.40	0.20	1.85	65.0	370.0	32.6
N9	3.00	1.790	6.60	0.18	1.20	67.0	370.0	30.9
N8	3.00	1.720	6.60	0.11	1.00	67.0	370.0	24.2
N7	3.00	1.640	7.20	0.11	1.00	67.0	370.0	24.1
N6	3.00	1.750	7.20	0.13	1.20	70.0	370.0	26.2
N5	3.00	1.700	7.10	0.10	0.95	71.0	370.0	23.0
N4	3.00	1.850	7.10	0.09	0.85	71.0	370.0	21.8
N3	3.00	1.250	7.00	0.11	1.00	72.0	370.0	24.1
N2	3.00	1.500	7.00	0.10	0.95	72.0	370.0	23.0
N1	3.00	1.550	7.00	0.10	0.95	72.0	370.0	23.0
W12	3.00	2.350	6.40	0.25	2.30	67.0	370.0	36.4
W11	3.00	2.300	6.40	0.25	2.30	69.0	370.0	36.4
W10	3.00	2.550	6.60	0.32	3.00	73.0	370.0	41.2
W9	3.00	2.550	6.60	0.30	2.80	75.0	375.0	40.0
W8	3.00	2.320	6.80	0.25	2.35	76.0	376.0	36.5
W7	3.00	2.380	6.80	0.25	2.35	74.0	376.0	36.5
W6	3.00	2.250	6.60	0.23	2.10	75.0	375.0	35.0
W5	3.00	2.180	6.60	0.20	1.85	77.0	375.0	32.7
W4	3.00	2.170	6.80	0.20	1.85	78.0	373.0	32.6
W3	3.00	2.130	6.80	0.18	1.70	79.0	373.0	31.0
W2	3.00	1.860	6.80	0.13	1.20	79.0	370.0	26.3
W1	3.00	1.836	6.80	0.13	1.20	79.0	370.0	26.3
TOTAL	72.00	48.154						
AVERAGE			6.75	0.17	1.65	71.6	371.4	30.4

** NOTE ** AVERAGE OF DELTA P'S BY SUM OF SQUARE ROOTS **

KVB, INC. 18006 SKYPARK BLVD. IRVINE, C.A. 92714 (714) 250-6200

********* PARTICULATE EMISSIONS DATA REDUCTION PROGRAM *********

COMPANY - LEHIGH CEM COMP3
LOCATION - CEMENTON NY
UNIT(S) - KILN EXHAUST STACK
TEST DATE - 11-9-84
TEST NO. - COMPLIANCE 3
TEST SITE - STACK

********** FUEL ANALYSIS **********

COAL	PCT BY WT	MOLES/LB-FUEL
CARBON	70.68	5.890(-02)
HYDROGEN	4.83	4.830(-02)
SULFUR	2.40	7.500(-04)
OXYGEN	5.53	1.728(-03)
NITROGEN	1.30	4.643(-04)
ASH	15.26	

HIGH HEATING VALUE(BTU/LB)	12812.00
EPA 'F FACTOR'(DSCF/MBTU)	9727.0

********** ORSAT ANALYSIS **********

	PCT BY VOLUME
CARBON DIOXIDE	16.10
OXYGEN	7.50
CARBON MONOXIDE	0.03
NITROGEN	46.27
WATER	30.10

********** TEST CONDITIONS **********

KILN FEED(GPM)	405.0
TOTAL HEAT INPUT(KBTU/HR)	420233.6
FUEL FLOW(LB/HR)	32800.0
BAROMETRIC PRESSURE(IN. HG)	29.79
STACK GAS STATIC PRESS(IN H2O)	-0.80
NOZZLE DIAMETER(IN)	0.376
PITOT TUBE COEFFICIENT	0.840
DUCT AREA AT SAMPLING PLANE(SQ. FT)	122.7
PROBE LENGTH (FT)	14.0
PROBE MATERIAL	INCONEL

********** FLUE GAS PARAMETERS **********

MOLECULAR WEIGHT DRY(COMBINED)	31.58
MOLECULAR WEIGHT WET(COMBINED)	27.49
MOLECULAR WEIGHT DRY(ORSAT)	32.11
MOLECULAR WEIGHT WET(ORSAT)	27.87
PERCENT MOISTURE(MEASURED)	30.10
ACFM AT SAMPLING PLANE BASED ON:	
FUEL FLOW AND COMBUSTION CHEMISTRY	188154.5
STACK VELOCITY	243087.8

KVB, INC. 18006 SKYPARK BLVD. IRVINE, C.A. 92714 (714) 250-6200

********* PARTICULATE EMISSIONS DATA REDUCTION PROGRAM *********

COMPANY - LEHIGH CEM COMP3
LOCATION - CEMENTON NY
UNIT(S) - KILN EXHAUST STACK
TEST DATE - 11-9-84
TEST NO. - COMPLIANCE 3
TEST SITE - STACK

********** PARTICULATE DATA **********

PARTICULATE MASS(MG)	42.00
CONDENSATE VOLUME(ML)	456.50
CONDENSATE VOLUME(SCF)	21.504
DRY GAS METERED VOLUME(DSCF)	49.948
AVERAGE O2 MEASURED(%)	7.28
TOTAL DURATION OF TEST(MINUTES)	72.00

* EMISSIONS BASED ON VELOCITY AND FUEL FLOW METHOD *

LB/DSCF	1.854(-06)
LB/WSCF	1.296(-06)
GRAINS/ACF	5.759(-03)
GRAINS/DSCF	1.298(-02)
GRAINS/WSCF	9.071(-03)
LB/HR(BASED ON STACK VELOCITY)	1.200(01)
LB/HR(BASED ON FLUE GAS COMPOSITION)	9.287(00)
PERCENT ISOKINETIC SAMPLING	102.31

KVB, INC. 18006 SKYPARK BLVD. IRVINE, C.A. 92714 (714) 250-6200

********* PARTICULATE EMISSIONS DATA REDUCTION PROGRAM *********

COMPANY - LEHIGH CEM COMP3
LOCATION - CEMENTON NY
UNIT(S) - KILN EXHAUST STACK
TEST DATE - 11-9-84
TEST NO. - COMPLIANCE 3
TEST SITE - STACK

IDENT.	TIME (MIN)	VOLUME (CU FT)	O2 (%)	DEL P (IN H2O)	DEL H	T-METER (F)	T-STACK (F)	GAS VEL (FT/SEC)
N12	3.00	2.055	7.80	0.20	1.70	70.0	373.0	32.4
N11	3.00	2.030	7.80	0.20	1.70	73.0	373.0	32.4
N10	3.00	2.070	7.60	0.20	1.70	76.0	375.0	32.4
N9	3.00	2.040	7.60	0.20	1.70	77.0	368.0	32.3
N8	3.00	2.040	7.20	0.20	1.70	78.0	358.0	32.1
N7	3.00	2.120	7.20	0.23	1.90	75.0	355.0	34.4
N6	3.00	2.320	7.20	0.30	2.50	79.0	355.0	39.3
N5	3.00	2.330	7.20	0.29	2.45	80.0	355.0	38.6
N4	3.00	2.280	7.30	0.27	2.25	81.0	354.0	37.2
N3	3.00	2.190	6.50	0.22	1.90	82.0	357.0	33.7
N2	3.00	2.030	6.50	0.18	1.50	82.0	357.0	30.5
N1	3.00	1.933	6.70	0.18	1.50	82.0	356.0	30.5
W12	3.00	2.400	7.20	0.26	2.40	78.0	370.0	36.9
W11	3.00	2.360	7.20	0.26	2.40	70.0	370.0	36.9
W10	3.00	2.430	7.40	0.27	2.50	72.0	375.0	37.7
W9	3.00	2.360	7.40	0.25	2.30	75.0	377.0	36.3
W8	3.00	2.400	7.40	0.27	2.50	76.0	377.0	37.7
W7	3.00	2.390	7.30	0.25	2.30	77.0	375.0	36.3
W6	3.00	2.210	7.30	0.20	1.90	78.0	375.0	32.5
W5	3.00	2.030	7.30	0.18	1.60	78.0	371.0	30.7
W4	3.00	1.910	7.40	0.15	1.30	78.0	370.0	28.0
W3	3.00	1.850	7.40	0.15	1.30	78.0	369.0	28.0
W2	3.00	1.560	7.40	0.10	0.87	78.0	365.0	22.8
W1	3.00	1.445	7.30	0.10	0.87	78.0	365.0	22.8
TOTAL	72.00	50.783						
AVERAGE			7.28	0.21	1.86	77.1	366.5	33.0

** NOTE ** AVERAGE OF DELTA P'S BY SUM OF SQUARE ROOTS **

APPENDIX B

METHOD 5 RAW DATA

L TION [illegible] (PLANT)

U: FUEL

OPERATORS RC

RAC BOX # 513-1

11-8-84

AMBIENT TEMPERATURE, °F 45

METER VOL. (START/END) 205.056 / 256.355

Page 1 of 2

TER LEAK CHECK:

fore test: Vac= 12 In.Hg.

eter Leak Rate= .011 CFM

ter test: Vac= 5 In.Hg.

eter Leak Rate= .006 CFM

KVB — A Research-Cottrell Company

Nomograph Setup

P_{meter} = C = .70

P_{stack} = .99 T_{stack} = 380

T_{meter} = 70 ΔP = .2

$\Delta H_@$ = 1.96 Noz (Ideal) 375

% H_2O = 29 Noz (Actual) = .376

Ψ =

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	~~450~~	100 ml	= 390
#2	117	− 100 H_2O_2	= 17
#3	107	− 100 H_2O_2	= 7
#4		− 0	= 0
#5 (Silica Gel)	216.5	− 200 g	= 16.5
		−	=

Total Vol. H_2O 430.5 ml

Filter# 4

Particulate Wt:

Filter ____ mg

Acetone ____ mg

Total ____ mg

11 Sampling Time Point, Min.	21 Particulate Wt., mg	31 Condensate Vol., ml	41 Fuel Flow gal/hr	51 Load ~~MW~~	61 C_{pitot}	71 Stack Press. In.Hg-Gauge	Barometric Pressure
3		430.5		1600 TPH	0.84		29.85

TEST RESULTS

Test Averages:

ΔPs = 0.21 T_{stack} = 368 °F

ΔH = 1.88 T_{meter} = 66 °F

Sample Vol. = 51.227 Ft^3

Point	Time	METER CONDITIONS ΔPs	ΔH	Meter Reading	TEMPERATURES, °F Stack	Probe	Oven	Impingers In	Impingers Out	Meter In	Meter Out	O_2, %	Vac.
2	1525	.19	1.8	205.056	380	295	299	52	50	54	50	7.6	4
1	1528	.19	1.8	207.17	380	302	300		50	58	52	7.6	4
0	1531	.18	1.7	209.20	380	305	300		50	62	52	7.7	4
9	1534	.20	1.9	211.23	380	302	302		50	66	53	7.7	4
8	1537	.20	1.9	213.33	380	301	305		50	70	54	7.4	4
	1540	.23	2.1	215.45	380	300	305		50	74	56	7.5	4
	1543	.29	2.7	217.67	380	301	298		50	76	56	7.5	5
	1546	.23	2.1	220.00	371	301	290		50	79	56	7.5	5
	1549	.21	2.0	222.23	370	299	302		50	80	56	6.6	5
	1552	.20	1.85	224.45	371	297	304		50	81	56	6.5	5
2	1555	.15	1.4	226.60	371	295	305		50	81	56	6.6	5
	1558	.14	1.3	228.35	365	299	304		50	81	56	6.6	5
	1601			230.388									
				LEAK CHECK at END OF PORT →									
			1879		863.166								
												51.339	
												.112	
					863.166							51.227	

Percent O_2 = 7.3

$MW_{stack\ gas}$ = ____ (~28

Velocity = 32.4 ft/se

Total Sample Time = 72 min.

ISOKINETICS = 103.2 %

Particulate Emissions

____ lbs/10^6 BT

COMMENTS:

ORSAT

CO_2 : 16.1 %

O_2 : 6.0 %

CO (KVB): 214 PPM

L[illegible]TION _____

U[illegible] _____ FUEL _____

OPERATORS _____

RAC BOX # _____

[illegible] NUMBER _____

S _____

AMBIENT TEMPERATURE, °F _____

METER VOL. (START/END) _____ / _____

COMPLIANCE #1 _____

Page 1 of 2

METER LEAK CHECK:

Before test; Vac= _____ In.Hg.

Meter Leak Rate= _____ CFM

After test: Vac= _____ In.Hg.

Meter Leak Rate= _____ CFM

KVB
A Research-Cottrell Company

Nomograph Setup

P_{meter} = C =

P_{stack} = T_{stack} =

T_{meter} = ΔP =

$\Delta H_@$ = Noz (Ideal) =

% H_2O = Noz (Actual) =

Y =

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1			
#2			
#3			
#4			
#5 (Silica Gel)			

Total Vol. H_2O _____ ml

Filter# 4

Particulate Wt

Filter _____ m

Acetone _____ m

Total _____ m

Sampling Time Point, Min.	Particulate Wt., mg	Condensate Vol., ml	Fuel Flow gal/hr	Load MW	C_{pitot}	Stack Press. In.Hg-Gauge	Barometric Pressure

Traverse Point	Time	METER CONDITIONS			TEMPERATURES, °F							O_2, %	Vac.
								Impingers		Meter			
		ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	In	Out	In	Out		
12	1621	.26	2.35	220.500	370	295	305		50	66	60	7.2	5
11	1624	.26	2.35	222.90	370	300	305		50	70	61	7.2	5
10	1627	.28	2.55	235.15	370	305	305		50	75	61	7.2	5
9	1630	.27	2.50	237.51	370	302	311		50	78	62	7.4	5
8	1633	.23	2.1	239.90	370	301	308		50	80	62	7.4	5
7	1636	.22	2.05	241.17	369	298	295		50	81	62	7.4	5
6	1639	.20	1.85	244.40	370	297	296		50	82	63	7.5	5
5	1642	.16	1.45	246.61	365	286	304		50	80	64	7.6	4
4	1645	.17	1.6	248.70	364	296	287		50	81	64	7.6	4
3	1648	.15	1.40	250.74	362	296	278		50	83	64	7.5	4
2	1651	.14	1.3	252.70	360	296	280		50	83	64	7.5	3
1	1654	.13	1.2	254.60	357	295	285		50	83	64	7.6	3
	1657			256.395									

TEST RESULTS

Test Averages:

ΔP_s = _____ T_{stack} = _____ °F

ΔH = _____ T_{meter} = _____ °F

Sample Vol.= _____ Ft^3

Percent O_2 = _____

$MW_{stack\ gas}$ = _____ (~28

Velocity = _____ ft/se

Total Sample Time = _____ min.

ISOKINETICS = _____ %

Particulate Emissions

_____ $lbs/10^6$ BT

COMMENTS:

TION _____ FUEL _____

OPERATORS PC

RAC BOX # 513-1

DATE 11-9-84

AMBIENT TEMPERATURE, °F 45

METER VOL. (START/END) 262.222 / 310.396

Page 1 of 2

TER LEAK CHECK:

fore test: Vac=10 In.Hg.

eter Leak Rate=.004 CFM

ter test: Vac= 5 In.Hg.

eter Leak Rate=.003 CFM

KVB — A Research-Cottrell Company

Nomograph Setup

P_{meter} = .99 C = .70

P_{stack} = T_stack = 380

T_{meter} = 70 ΔP = .2

$\Delta H_@$ = 1.96 Noz (Ideal) = .375

% H_2O = 29 Noz (Actual) = .376

Ψ =

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	490	− 100 Init =	390
#2	117	− 100 H_2O =	17
#3	111	− 100 H_2O =	11
#4	0	− 0 =	
#5 (Silica Gel)	213	− 200 g =	13
		− =	

Total Vol. H_2O 431 ml

Filter# 5

Particulate Wts:

Filter _____ mg

Acetone _____ mg

Total _____ mg

11 Sampling Time Point, Min.	21 Particulate Wt., mg	31 Condensate Vol., ml	41 Fuel Flow gal/hr	51 Load ~~MW~~ 1750	61 C_{pitot}	71 Stack Press. In.Hg-Gauge	Barometric Pressure
3		431		1600	.84	-.7 "H_2O	29.79

TEST RESULTS

Test Averages:

ΔPs = .16 T_{stack} = 371 °F

ΔH = 1.65 T_{meter} = 70 °F

Sample Vol.= _____ Ft^3

11	21	31	41	51	61								
#	Start Time 13:C	METER CONDITIONS ΔPs	ΔH	Meter Reading	TEMPERATURES, °F Stack	Probe	Oven	Impingers In	Impingers Out	Meter In	Meter Out	O_2, %	Vac.
2	0	.19	1.75	262.222	370	299	310		45	60	62	6.5	4
1	3	.20	1.85	264.40	370	305	310		45	64	62	6.4	4
0	6	.20	1.85	266.50	370	305	310		45	68	62	6.4	4
	9	.13	1.2	268.75	370	302	308		45	72	62	6.6	3
5	12	.11	1.0	270.54	370	300	304		45	73	62	6.6	3
9	15	.11	1.0	272.26	370	300	297		45	76	62	7.2	5
6	18	.13	1.2	273.90	370	300	295		45	78	63	7.2	4
5	21	.10	0.95	275.65	370	300	296		45	80	63		
4	24	.09	.85	277.35	370	298	290		45	80	63		3
3	27	.11	1.0	279.20	370	298	285		45	82	62	7.0	3
2	30	.10	.95	28.45	370	298	285		45	82	62	7.0	3
1	33	.10	.95	281.95	370	298	285		45	82	62	7.0	3
	36			283.500									

665

Percent O_2 = _____

$MW_{stack\ gas}$ = _____ (~28

Velocity = _____ ft/se

Total Sample Time = 72 min.

ISOKINETICS = _____ %

Particulate Emissions

_____ lbs/10^6 BT

COMMENTS:

ORSAT

CO_2 : 14.3%

O_2 : 7.8%

CO (raw): 691 PPM

TION Lehigh Cement

FUEL

OPERATORS RC

RAC BOX # 513-L

DATE 11-9-84

AMBIENT TEMPERATURE, °F

METER VOL. (START/END) /

Page 1 of 2

R LEAK CHECK:

re test: Vac= In.Hg.

er Leak Rate= CFM

r test: Vac= In.Hg.

er Leak Rate= CFM

KVB
A Research-Cottrell Company

Nomograph Setup

P_{meter} = C =

P_{stack} = T_{stack} =

T_{meter} = ΔP =

$\Delta H_@$ = Noz (Ideal) =

% H_2O = Noz (Actual) =

Y =

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1			
#2			
#3			
#4			
#5 (Silica Gel)			

Total Vol. H_2O ml

Filter#

Particulate Wts

Filter mg

Acetone mg

Total mg

11 ng Time int, Min.	21 Particulate Wt., mg	31 Condensate Vol., ml	Fuel Flow gal/hr	41 Load MW	51 C_{pitot}	61 Stack Press. In.Hg-Gauge	71 Barometric Pressure

TEST RESULTS

Test Averages:

ΔPs = Tstack = °F

ΔH = Tmeter = °F

Sample Vol.= Ft³

11 Time	21 METER CONDITIONS ΔPs	ΔH	31 Meter Reading	41 TEMPERATURES, °F Stack	Probe	Oven	51 Impingers Out	61 Meter In	Meter Out	O_2, %	Vac.
0	.25	2.3	283.500	370	302	302	45	66	68	6.4	5
3	.25	2.3	285.85	370	310	310	45	72	66	6.4	5
6	.32	3.0	288.15	370	306	310	45	78	68	6.6	6
9	.30	2.8	290.70	375	306	310	45	82	68	6.6	6
12	.25	2.35	293.25	376	304	310	45	84	68	6.8	5
15	.25	2.35	295.57	376	295	302	45	80	68	6.8	5
18	.23	2.1	297.95	375	305	301	45	84	68	6.6	5
21	.20	1.85	300.22	375	303	296	45	85	69	6.6	5
24	.20	1.85	302.70	373	299	297	45	87	70	6.8	5
27	.18	1.7	304.57	373	299	298	45	88	71	6.8	5
30	.13	1.2	306.70	370	298	298	45	89	71	6.8	5
33	.13	1.2	308.56	370	298	297	45	89	71	6.8	5
36			310.396								

Percent O_2 =

$MW_{stack\ gas}$ = (~28)

Velocity = ft/sec

Total Sample Time = min.

ISOKINETICS = %

Particulate Emissions

lbs/10^6 BTU

COMMENTS:

FUEL

OPERATORS RC

RAC BOX # 513-1

DATE 11-9-84

AMBIENT TEMPERATURE, °F 55

METER VOL. (START/END) 314,700 / 365,483

METER LEAK CHECK:

Before test: Vac=10 In.Hg.

Meter Leak Rate=.005 CFM

After test: Vac=5 In.Hg.

Meter Leak Rate=.004 CFM

KVB — A Research-Cottrell Company

Nomograph Setup

P_{meter} = .99 C = .70

P_{stack} = T_{stack} = 380

T_{meter} = 70 ΔP = .2

$\Delta H_@$ = 1.96 Noz (Ideal) = 370

Noz (Actual) = 376

$\% H_2O$ = 21 Y =

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1	515	100 Init	= 415
#2	121	100 160₂	= 21
#3	106	100 160₂	= 6
#4	0	0	= 0
#5 (Silica Gel)	214.5	200g	= 14.5
			=

Total Vol. H_2O 456.5 ml

Filter# _____

Particulate Wts

Filter _____ mg

Acetone _____ mg

Total _____ mg

Sampling Time Point, Min.	Particulate Wt., mg	Condensate Vol., ml	Fuel Flow gal/hr	Load MW	C_{pitot}	Stack Press. In.Hg-Gauge	Barometric Pressure
3		456.5		1600 TAS	.84	-.80 "H₂O	29.79

TEST RESULTS

Test Averages:

ΔPs = 0.21 T_{stack} = 366 °F

ΔH = 1.9 T_{meter} = 78 °F

Sample Vol.= 50.783 Ft^3

Percent O_2 = _____

$MW_{stack\ gas}$ = _____ (~28)

Velocity = _____ ft/sec

Total Sample Time = 72 min.

ISOKINETICS = _____ %

Particulate Emissions

_____ lbs/10^6 BTU

Point	Start Time /6/0	METER CONDITIONS ΔPs	ΔH	Meter Reading	TEMPERATURES, °F Stack	Probe	Oven	Impingers In	Impingers Out	Meter In	Meter Out	O_2, %	Vac.
12	0	.26	2.4	314.700	370	280	304		45	67	70	7.2	4
11	3	.26	2.4	317.10	370	280	303		45	71	70	7.2	4
10	6	.27	2.5	319.46	375	283	305		45	75	70	7.4	4
9	9	.25	2.3	321.89	377	300	306		45	79	70	7.4	5
8	12	.27	2.5	324.25	377	304	302		45	82	70	7.4	5
7	15	.25	2.3	326.65	375	302	301		45	85	70	7.3	5
6	18	.20	1.9	329.04	375	304	300		45	87	70	7.3	5
5	21	.18	1.6	331.25	371	300	302		45	87	70	7.3	5
4	24	.15	1.3	333.28	370	299	299		45	87	70	7.4	4
3	27	.15	1.3	335.19	369	299	269		45	87	70	7.4	4
2	30	.10	.87	337.04	365	299	292		45	87	70	7.4	3
1	33	.10	.87	338.60	365	298	295		45	87	70	7.3	3
	36			340.045									

COMMENTS: ACSAT

O_2 : 16.1 %

O_2 : 7.5 %

$\Phi_{(EVO)}$ 346 ppm

L. _____ FUEL _____

OPERATORS RC

RAC BOX # 513-1

AE

AMBIENT TEMPERATURE, °F

METER VOL. (START/END)

ER LEAK CHECK:

ore test; Vac= In.Hg.

ter Leak Rate= CFM

er test: Vac= In.Hg.

ter Leak Rate= CFM

KVB
A Research-Cottrell Company

Nomograph Setup

P_{meter}= C =

P_{stack}= T_{stack}=

T_{meter}= ΔP =

$\Delta H_@$ = Noz (Ideal)=

% H_2O = Noz (Actual)=

γ =

Imp.	Vol. (End)	Vol. (Start)	ΔVol. (ml)
#1			
#2			
#3			
#4			
#5 (Silica Gel)			

Total Vol. H_2O _____ ml

Filter#

Particulate Wt:

Filter _____ mg

Acetone _____ mg

Total _____ mg

ng Time oint, Min.	Particulate Wt., mg	Condensate Vol., ml	Fuel Flow gal/hr	Load MW	C_{pitot}	Stack Press. In.Hg-Gauge	Barometric Pressure

Time	METER CONDITIONS			TEMPERATURES, °F							O_2, %	Vac.
							Impingers		Meter			
	ΔP_s	ΔH	Meter Reading	Stack	Probe	Oven	In	Out	In	Out		
0	.20	1.7	340.045	373	290	307		45	71	>70	7.8	4
3	.20	1.7	342.10	373	300	306		45	76	70	7.8	4
6	.20	1.7	344.13	375	303	306		45	80	71	7.6	4
9	.20	1.7	346.20	368	304	306		45	83	71	7.6	4
12	.20	1.7	348.24	358	302	307		45	85	71	7.2	4
15	.23	1.9	350.28	355	290	302		45	80	71	7.2	4
18	.3	2.5	352.40	355	305	305		45	85	73	7.2	5
21	.29	2.45	354.72	355	305	304		45	87	73	7.2	5
24	.27	2.25	357.005	354	303	301		45	89	74	7.3	5
27	.22	1.9	359.33	357	303	301		45	90	74	6.5	5
30	.18	1.5	361.52	357	300	303		45	91	74	6.5	5
33	.18	1.5	363.55	356	299	303		45	91	74	6.7	5
36			365.483									

TEST RESULTS

Test Averages:

ΔP_s = _____ T_{stack} = _____ °F

ΔH = _____ T_{meter} = _____ °F

Sample Vol.= _____ Ft^3

Percent O_2 = _____

$MW_{stack\ gas}$ = _____ (~28)

Velocity = _____ ft/sec

Total Sample Time = _____ min.

ISOKINETICS = _____ %

Particulate Emissions

_____ lbs/10^6 BTU

COMMENTS:

APPENDIX C

KILN OPERATIONAL DATA

LEHIGH PORTLAND CEMENT - CEMENTON - KILN OPERATIONAL DATA - PROJECT #71500

DATE	11/8/84		ID FAN AMPS KW/ST	340/210	320/200
TIME	12:35	15:10	ID FAN DAMPER %	100	100
TEST No.	PRETEST	COMP-1	BACKEND DRAFT	-0.8	-0.8
DESCRIPTION			HOOD DRAFT	-0.05	-0.05
		TEST START	UNDERGRATE PRESS	11.8	11.5
		15:18	COMPARTMENT 1&2	11.0 105/100	11.2 105/100
COAL FEED (~~LB/HR~~ TPH TRAVER)	17.0	17.0	COMPARTMENT 3&4	6.5 120/115	6.5 120/115
KILN FEED (GPM)	400	400	COMPARTMENT 5&6	NA 108	NA 108
KILN SPEED (RPM)	1.2	1.2	COMPARTMENT 7&8	NA	NA
KILN DRIVE AMPS KVA	112	110	COOLER SPEED #/1/2	10/10	10/9
KILN SHELL TEMP	880	890	COOLER BED DEPTH	NA	NA
TOTALIZER	12:45 03233	15:16 04643	KILN EXIT 02 LEHIGH/KVB	2.5/.	2.3/2.5
COAL MILL FEED TPH	16.5	16.8	KILN EXIT CO_2	ORSAT	ORSAT
MILL INLET TEMP	320	390	QUENCH AIR DAMP	100	100
MILL OUTLET TEMP	170	190	EXCESS AIR DAMP	NA	NA
COAL MILL AMPS	26	27	PRIMARY AIR DAMP	100	100
MILL 200 MESH	LAB	LAB	~~PRIMARY/DILUTION AIR DAMP~~ KW ~~AMPS~~	240 ~~AMPS~~	230
MILL 100 MESH	LAB	LAB	6K3 AMPS/DAMP	NA	NA
			SEC AIR TEMP	195	200
SLURRY DENSITY	LAB	LAB	ESP IN PRES.	1.8	1.6
BACK END TEMP	440	460	A/B/CN/CS	ESP	
PRECHAIN TEMP	1660	1620	EPS PRI VOLTS		
MATERIAL TEMP	1190	1160	EPS PRI AMPS		
BURN ZONE TEMP	2680	2620	EPS SEC MILLIAMP		
CLINKER TEMP	2200	2180			

LEHIGH PORTLAND CEMENT - CEMENTON - KILN OPERATIONAL DATA - PROJECT #71500

DATE	11/8/84	ID FAN AMPS KW/SET	340/204
TIME	16:48	ID FAN DAMPER %	100
TEST No.	Comp 1	BACKEND DRAFT	-0.9
DESCRIPTION	STK TEST	HOOD DRAFT	-0.05
		UNDERGRATE PRESS	13.0
		COMPARTMENT 1&2	10/6.8 105/100
COAL FEED (~~LB/HR~~) TPH TIMER	16.6	COMPARTMENT 3&4	110/115
KILN FEED (GPM)	400	COMPARTMENT 5&6	105
KILN SPEED (RPM)	1.2	COMPARTMENT 7&8	NA
KILN DRIVE AMPS KVA	105	COOLER SPEED #1/1/2	10/10
KILN SHELL TEMP	870	COOLER BED DEPTH	NA
TOTALIZER	16:52 05591	KILN EXIT O2 LEHIGH/KVB	1.8/2.6
COAL MILL FEED TPH	16.9	KILN EXIT CO_2	ORSAT
MILL INLET TEMP	340	QUENCH AIR DAMP	NA
MILL OUTLET TEMP	175	EXCESS AIR DAMP	NA
COAL MILL AMPS	27	PRIMARY AIR DAMP	100
MILL 200 MESH	LAB	~~DILUTION~~ PRIMARY AIR ~~DAMP~~ KW	235
MILL 100 MESH	LAB	6K3 AMPS/DAMP	NA
		SECAIR TEMP	2200
SLURRY DENSITY	LAB	ESP IN RES.	-1.8
BACK END TEMP	450	A/B/CN/CS	ESP
PRECHAIN TEMP	1625	EPS PRI VOLTS	
MATERIAL TEMP	1160	EPS PRI AMPS	
BURN ZONE TEMP	2900	EPS SEC MILLIAMP	
CLINKER TEMP	2400	NOTE: 16:30	FUEL SEC. 16.8-16.6
		16:40	FUEL SEC 16.6-16.4
		17:00	ID FAN AMPS 204-202

LEHIGH PORTLAND CEMENT - CEMENTON - KILN OPERATIONAL DATA - PROJECT #71500

DATE	11/9/84		ID FAN AMPS KVA/SET	330/212	335/214
TIME	13:12	14:50	ID FAN DAMPER %	100	100
TEST No.	COMP 2		BACKEND DRAFT IN H2O	-0.9	-0.9
DESCRIPTION	STK TEST		HOOD DRAFT	-0.05 NF	-0.05 NF
	13:15	14:50	UNDERGRATE PRESS IN H2O	12.5	12.4
		COMP 2 END @ 15:15	COMPARTMENT 1&2	107/98	106/98
COAL FEED (LB/HR) THRU KILN	16.5	16.3	COMPARTMENT 3&4	130/118	130/119
KILN FEED (GPM)	400	400	COMPARTMENT 5&6	112 —	112
KILN SPEED (RPM)	1.1	1.10	COMPARTMENT 7&8	——	—
KILN DRIVE AMPS KVA	105	110	COOLER SPEED 0/1/2	6.5/12.2	6.5/12
KILN SHELL TEMP	890	880	COOLER BED DEPTH	NA	NA
TOTALIZER SLURRY FLOW	13:19 03644	15:12 04680	KILN EXIT O2 LEHIGH/KVB	2.0/2.5	2.1/2.4
COAL MILL FEED TPH	16.2	16.3	KILN EXIT CO_2	NA	NA
MILL INLET TEMP	300	330	QUENCH AIR DAMP	~~NF~~ 100	100
MILL OUTLET TEMP	190	190	EXCESS AIR DAMP	NA	NA
COAL MILL AMPS	27	27.5	PRIMARY AIR DAMP	?	—
MILL 200 MESH	LAB	LAB	~~PRIMARY~~ DILUTION AIR DAMP KVA	230	230
MILL 100 MESH	LAB	LAB	~~6K3 AMPS/DAMP~~	NA	NA
			SEC AIR TEMP	2020	2000
SLURRY DENSITY	LAB	LAB	ESP IN PRES IN H2O	-1.85	-1.80
BACK END TEMP	460	470	A/B/CN/CS		
PRECHAIN TEMP	1660	1620	EPS PRI VOLTS		
MATERIAL TEMP	1100	1130	EPS PRI AMPS		
BURN ZONE TEMP	3050	2650	EPS SEC MILLIAMP		
CLINKER TEMP	2000	2000			
/			COAL TRIP - WATER PRESSURE		
NOTE: KILN UPSET 7:58 - 11:45					

LEHIGH PORTLAND CEMENT - CEMENTON - KILN OPERATIONAL DATA - PROJECT #71500

DATE	11/9/04		ID FAN AMPS kW/SET	330/212 330/209
TIME	16:15 17:05		ID FAN DAMPER %	100 100
TEST No.	Comp #3		BACKEND DRAFT in H2O	-0.9 -0.95
DESCRIPTION	STK TEST		HOOD DRAFT	-0.05 -0.05
	2ND PORT		UNDERGRATE PRESS	13.0 12.8
	16:15 17:05		COMPARTMENT 1&2	106/98 106/99
COAL FEED (LB/HR) TAMVER	16.8 16.8		COMPARTMENT 3&4	130/119 131/117
KILN FEED (GPM)	400 405		COMPARTMENT 5&6	108 111
KILN SPEED (RPM)	1.10 1.14		COMPARTMENT 7&8	— —
KILN DRIVE AMPS KVA	105 103		COOLER SPEED 0/1/2	12.2/6.2 12.3/6.2
KILN SHELL TEMP	880 880		COOLER BED DEPTH	— —
TOTALIZER Slurry Flow TPH	16:12 17:12 05252 05329		KILN EXIT O2 LEHIGH LAB	1.9/2.3 2.2/2.7
COAL MILL FEED	16.3 16.5		KILN EXIT CO_2	ORSAT ORSAT
MILL INLET TEMP	320 325		QUENCH AIR DAMP	100 100
MILL OUTLET TEMP	185 180		EXCESS AIR DAMP	NA NA
COAL MILL AMPS	28.0 27.0		PRIMARY AIR DAMP	NA NA
MILL 200 MESH	LAB LAB		~~DILUTION~~ PRIMARY AIR ~~DAMP~~ KVA	230 228
MILL 100 MESH	LAB LAB		~~6K3 AMPS/DAMP~~	— —
			SEC AIR TEMP	2015 2010
SLURRY DENSITY	LAB LAB		ESP IN in H2O	-1.7 -1.8
BACK END TEMP	470 430		A/B/CN/CS	
PRECHAIN TEMP	1620 1580		EPS PRI VOLTS	
MATERIAL TEMP	1130 1140		EPS PRI AMPS	
BURN ZONE TEMP	3050 2850		EPS SEC MILLIAMP	
CLINKER TEMP	1950 1920			
404 ΔT	72 60			

LEHIGH PORTLAND CEMENT - CEMENTON - KILN OPERATIONAL DATA - PROJECT #71500

DATE	11/9/84	ID FAN AMPS KW/SET	327/207
TIME	17:48	ID FAN DAMPER %	100
TEST No.	Comp 3	BACKEND DRAFT IN H2O	-0.8
DESCRIPTION	STK TEST	HOOD DRAFT	-0.05
		UNDERGRATE PRESS	12.5
	17:48	COMPARTMENT 1&2	116/99
COAL FEED(LB/HR) THRUPUT	17.0	COMPARTMENT 3&4	130/119
KILN FEED (GPM)	405	COMPARTMENT 5&6	112 —
KILN SPEED(RPM)	1.12	COMPARTMENT 7&8	—
KILN DRIVE AMPS	98	COOLER SPEED 0/1/2	11.9
KILN SHELL TEMP KVA	960	COOLER BED DEPTH	NA
TOTALIZER SLURRY FLOW	17:48 0687	KILN EXIT 02 LEHIGH/KVB	1.7/2.3
COAL MILL FEED TPH	16.7	KILN EXIT CO_2	NA
MILL INLET TEMP	335	QUENCH AIR DAMP	100
MILL OUTLET TEMP	195	EXCESS AIR DAMP	NA
COAL MILL AMPS	27.5	PRIMARY AIR DAMP	NA
MILL 200 MESH	LAB	~~DILUTION~~ PRIMARY KVA AIR DAMP	230
MILL 100 MESH	LAB	~~6K3 AMPS/DAMP~~	—
		SEC AIR TEMP	1850
SLURRY DENSITY	LAB	ESP IN IN H2O	-1.75
BACK END TEMP	450	A/B/CN/CS	
PRECHAIN TEMP	1570	EPS PRI VOLTS	
MATERIAL TEMP	1130	EPS PRI AMPS	
BURN ZONE TEMP	2700	EPS SEC MILLIAMP	↓
CLINKER TEMP	1850		
404-I	64		
NOTE: SPEED CHANGE @ 17:55			

TEST COMPLETED 17:53

So. Th - 304 J - DK

CEMENTON PLANT

DAILY KILN REPORT

DATE 11-8-84

TIME	KILN RPM/GPM	TEST TANK TIME	SLURRY COUNTER	DIFFERENCE	ID FAN SPEED/02	ID FAN INLET TEMP	EXIT GAS TEMP	MATERIAL TEMP CHAIN	GAS TEMP CHAINS	MID KILN GAS	BURNING ZONE TEMP	COAL COUNTER	COAL MILL OUT TEMP	SECONDARY AIR	UNDERGRATE PRESSURE	HOOD DRAFT	DUST COLL DIFF	DUST RETURN RPM
8:00 7AM	222 400	17.2	13685	572	370-2.8	450	485	1200	1660	2050	2600	7460	170	-	13.5	13	8.0	40
9:00 8	222-400	17.2	563	563	370-1.9	450	485	1200	1670	2600	2600	9310	170	-	13.6	12	8.2	40
0:00 9	222 400	17.2	1171	568	370-2.0	450	485	1200	1675	2050	2350	0910	170	1880	12.4	.15	8.0	40
1:00 10	222-400	17.0	"		370-2.7	450	480	1193	1660	2050	2625	2600	160	2050	12.0	.13	8.4	—
2:00 11N	222-400	16.8	2270	1139	370-2.7	450	480	1195	1660	2010	2750	4150	170	2160	12.0	.13	8.0	20
1:00 12PM	222.400	16.8	2824	554	370-2.0	450	480	1195	1665	2010	5840	5840	150	2660	12.1	.14	8.0	20
2:00 1	222 400	16.8	3340	516	370-2.1	450	480	1200	1660	2060	2600	7610	160	2020	10.6	.13	8.2	20
3:00 2	222 400	16.8	3961	571	360-2.4	440	470	1180	1640	2040	2600	9190	166	2000	13.0	.13	7.8	—
4:00 3	222/400	16.8	4518	557	355/2.7	430	450	1160	1620?	2010	2600	0803	180	2000	12.0	.13	8.4	2
5:00 4	222/400	16.8	5068	570	355/2.1	430	460	1160?	1625?	2010	2660	2444	185	2000	12.5	.13	8.2	2
6:00 5	222/400	16.4	5660	572	350/1.6	425	450	1150?	1620?	2000	3000	4057	180	2190	12.6	.13	9.6	2
7:00 6	222/400	17.2	6232	572	350/2.2	410	435	1155?	1625?	1960?	2760	5704	185	2000	13.0	.13	9.0	30
8:00 7	222/400	17.2	6805	573	355/2.2	430	460	1155	1625	1970	2700	7384	180	1960	12.9	.14	8.4	30
9:00 8	222/400	17.0	7379	574	360/2.5?	420	450	1155	1625	2000	2660	9044	190	1960	12.1	.13	8.6	40
0:00 9	224/400	17.0	7949	570	360/2.4	430	465	1155	1625	2010	2850	0698	180	1900	12.2	.13	8.6	40
1:00 10	222/400	16.8	8522	573	355/2.2	430	460	1155	1625	1990	2750	2330	180	2000	13.5	.13	7.8	40
2:00 11MN	222/400	16.9	9105	583	360/2.2	425	455	1155	1625 1625	2000	2650	3889	190	1930	13.0	.13	9.5	40
1:00 12AM	222/400	16.9	9679	574	360/1.5	430	455	1105	1585	2000	2675	5737	185	2040	13.0	.14	10.5	40
2:00 1	220/400	16.6	10254	575	360/1.9	435	465	1105?	1610	2000	2975	7098	170	2050	11.75	.13	11.2	40
3:00 2	224/400	16.4	10828	574	360/1.8	420	440	1105?	1570	1960	2625	8946	190	2030	12.5	.14	10.6	40
4:00 3	222/400	16.8	11401	573	360/2.1	420	450	1105?	1555	2000	2675	0340	160	1970	12.5	.16	9.8	40
5:00 4	220/400	16.8	11984	583	360/2.0	430	450	1105?	1565	1975	2750	2200	180	1920	12.5	.13	9.8	40
6:00 5	224/400	16.8	12540	556	360/1.6	425	450	1095?	1560	2000	2625	3687	165	2020	12.75	.14	9.8	40
7:00 6	224/400	16.8	13163	623	360/1.6	425	450	1095?	1560	1975	2625	5599	180	2010	13.0	.13	9.8	40
8:00 7	222/400	16.8	13682	519	360/1.6	420	450	1095?	1550	2000	2560	7077	190	1970	12.7	.15	9.4	40

PRODUCTION REMARKS: (RESONS FOR SLOWDOWN, OIL USE, ETC.)
ALSO NOTE ALL STOPPAGES AND REASONS THEREFORE.

7:50 420 DUST KILN DOWN
8:15 420 OFF

TAKE DUST OFF KILN GRIMM NO BAKER REQUIRED

24T

FREE LIME	$CaCO_3$	MOIST
.10		
.10	SiO 2.85	LSF 91.10
.06		
1.10		
.09		
.10	2.60	89.34

~~South - 3-4-5 - DIR~~

CEMENTON PLANT

DAILY KILN REPORT

DATE 11-9-84

TIME	KILN RPM/GPM	TEST TANK TIME	SLURRY COUNTER	DIFFERENCE	ID FAN SPEED/02	ID FAN INLET TEMP	EXIT GAS TEMP	MATERIAL TEMP CHAIN	GAS TEMP CHAINS	MID KILN GAS	BURNING ZONE TEMP	COAL COUNTER	COAL MILL OUT TEMP	SECONDARY AIR	UNDERGRATE PRESSURE	HOOD DRAFT	DUST COLL DIFF	DUST RETURN RPM
8:00 7AM	222/400	16.8	13682	519	360/1.6	420	450	1095?	1550	2000	2560	7077	190	1970	12.7	.15	9.4	40
9:00 8	222/400	17.0	BUSY		360/1.8	415	430	1100?	1530	1925	2740	BUSY	160	1760	12.8	.13	6.2	40
0:00 9	BUSY		1138	1138	365/—	405	430	1095?	1510	1895	2340	BUSY	160	1980	13.6			40
1:00 10			BUSY									BUSY						
2:00 11N	190/365	16.0	2288	1150	355/—	470	520	1095?	1690	2075	3000+	3394	160	2020	14.6	.13	7.2	40
1:00 12PM	210/390	16.2	2952	564	355/2.0	475	455	1095?	1670	2075	3000+	4701	180	1840	10.4	.14	11.8	40
2:00 1	215/390	16.4	3425	573	310/2.1	440	460	1095?	1640	2045	2940	6438	205	2120	12.8	.14	10.8	40
3:00 2	220/420	16.4	4000	575	365/2.2	435	455	1165	1620	2025	2980	8036	190	1960	12.6	.13	10.8	40
4:00 3	220/400	16.2	4661	661	365/2.2	440	465	1130	1610	2050	2620	9989	175	2080	13.5	.14	10.4	40
5:00 4	220/400	16.3	5166	505	365/1.8	440	470	1130	1620	2050	2600	1260	160	2100	12.7	.14	9.4	40
6:00 5	224/410	16.1	5725	559	360/1.5	430	440	1130	1590	2000	3000	2721	165	2000	12.5	.14	11.4	40
7:00 6	190/355	16.2	6258	533	360/1.4	420	405	1130	1560	2000	2420	4423	175	1560	10.4	.14	10.2	—
8:00 :	205/395	16.6	6782	424	355/2.0	450	490	1130	1620	2050	2750	6001	160	1980	13.8	.13	10.4	40
9:00 8	215/390	16.4	7095	313	360/1.6	450	430	1130	1650	2050	?000	7669	170	2100	13.2	.13	10.0	—
0:00 9	220/400	16.6	7493	398	360/1.6	445	490	1130	1650	2050	2950	9258	170	2150	14.0	.14	11.0	40
1:00 10	220/400	16.2	7851	384	360/1.8	440	470	1130	1640	2050	2600	0844	160	2000	13.6	.13	10.2	40
2:00 11MN	220/400	16.2	8249	398	369/1.9	440	465	1150	1645	2050	2650	2369	180	1980	13.0	.13	10.4	40
1:00 12AM	220/400	16.2	8633	384	370/1.7	435	460	1155	1640	2050	2725	4005	190	1940	13.0	.14	10.2	40
2:00 1	220/400	15.4	9023	390	370/1.0	435	465	1155	1620	2000	2625	5379	180	1830	12.5	.14	11.0	40
3:00 2	220/400	16.2	9410	387	370/1.5	435	460	1150	1585	2000	2100	7073	170	1800	13.5	.14	10.2	0
4:00 3	220/400	16.6	9798	388	370/1.8	435	460	1150	1590	2025	2300	8445	175	1630	12.0	.14	10.5	40
5:00 4	220/400	16.4	10186	388	370/1.4	435	460	1150	1590	2025	2600	0098	180	1940	13.25	.14	10.2	40
6:00 5	220/400	16.0	10573	387	370/1.7	435	465	1145	1620	2010	2800	1707	180	1850	13.0	.14	10.5	40
7:00 6	220/400	15.8	10960	387	370/1.5	435	465	1150	1630	2000	2725	3440	175	1840	12.75	.13	11.2	40
8:00 7	220-400	15.8	11348	388	370-1.5	440	465	1150	1620	2000	2700	4970	160	1850	12.9	.14	10.8	40

PRODUCTION REMARKS: (RESONS FOR SLOWDOWN, OIL USE, ETC.)
ALSO NOTE ALL STOPPAGES AND REASONS THEREFORE.

7:53 pm Lost Air Air again!
8:28 pm Lost Air Air again!
8:57 pm "
8:57 pm "
8:58 pm "
10:55 pm Kiln driver kicked off
555 SLOWED KILN COLD
6:33 pm - Changed BASIN

FREE LIME	LSF $CaCO_3$	S/R MOIST
.15		
.10	90.15	2.74
.103		
.11	90.09	2.67
.06		
.11	90.49	2.60

O_2 - 700

C shift

2:40A Dust on Kiln
2:45A Coal 17.C T.P.H.
3:25A Coal 17.2 T.P.H.
4:15A Coal 17.0 T.P.H.
5:25A Coal 17.2 T.P.H.

A Shift 11-8

9:05A All dust off As per mike — on 2.0% CO 80 - under
9:30A 1 Line Coal off 17.T
10:15A Coal to 16.8 T
10:50A ~~Coal~~ Dust To kiln 20%
11:50A ~~Dust off~~

13:08 TRIM ID 2 PTS — 2-2.5 O2
1:45 Dust off — Less Than 1700 on
1:54 Trim ID 2 PTS
2:21 " " 2 PTS —
2:45 Coal to 17.0T —

11/8/84 — 3-11 SHIFT

2:40 PM COAL TO 16.8 —
4:28 PM COAL TO 16.6 - KILN WARM
4:40 PM COAL TO 16.4 - ↑
4:44 PM 2 PTS OFF ID FAN — (204)
5:00 PM 2 PTS OFF ID FAN — (202)
5:04 PM DUST TO KILN
5:15 PM COAL TO 16.6
5:25 PM COAL TO 16.8, 2 PTS ID (204)
5:30 PM COAL TO 17.0
5:50 PM COAL TO 17.2
6:05 2 PTS ID FAN (206)
6:35 PM DUST OFF (KILN COOLING)
6:55 PM DUST ON
7:05 PM COAL 17.0
7:20 2 PTS ID FAN (208) 420 DUST SCREW DOWN TO REPAIR HANGER
8:00 PM 2 PTS ID (210) → OPENING DOORS ON SCREW
8:40 PM 2 PTS ID (212)
8:45 PM 2 PTS OFF ID (210) — CLOSING 420 UP
9:40 PM COAL TO 16.8
9:55 PM 2 PTS OFF ID (208)
10:00 COAL TO 16.9

11-8-84 11-7

11:00 PM Coal To 17.1
1:55PM Coal To 16.9
2:30AM Coal To 16.6

1:05A Coal To 16.4 C shift.
1:40A Coal To 16.3
2:00A Coal To 16.4
2:05A Coal To 16.6
2:40A Coal To 16.8

11/9/84 A

7:15A #5 COOLER FAN OFF INCREASED #3+4 fan slightly

0:53 AM lost primary air fan idly current clutch. 3 Min.
00 AM. COAL TO 17.0
28 AM lost primary air fan 30-45 sec
53 AM. lost primary air fan.
57 AM. lost primary air fan.
58 AM lost primary air fan.
1 AM. Adjusted dampers on cyclone
1 AM Slowed Kiln 10 Pts.
20 AM " " 10 Pts
30 AM " " 25 Pts
30 AM. Slowed I.D. FAN 25 Pts.
40 AM Slowed Kiln 75 Pts to 100 on S.S.
45 AM. TRIM I.D FAN 10 PTS
50 AM Picked up Kiln 5 Pts
55 AM " " " 5 Pts
04 AM. " " " 10 PTS
04 AM " " " 5 Pts
10 AM " " " 10 PTS.
AM " " " 5 PTS.
PM. " " " 5 PTS.
50 AM Kiln drives picked off. - Back on immediately!

11/9/84

1515 Am	#5 Cooler fan on.
1250 Pm	5 pts on kiln.
1445	2 LINES COAL INC
1500	1 LINE COAL DEC 16.4 B Shift.
352 Pm	2 Pts off ID FAN TO 212
422	ADDED 2 Pts TO KILN TO 222
422	2 Pts off ID FAN TO 210
442	ADDED 2 Pts TO KILN SPEED TO 224
442	1 LINE off COAL TO 16.1
500 Pm	1 Pt off KILN SPEED TO 223
503 Pm	ADDED 1 LINE OF COAL TO 16.3
503	ADDED 2 Pts to ID TO 209
515 Pm	1 Pt off KILN
5:10	ADDED 2 LINES OF COAL
5:25	ADDED 2 Pts to ID
5:30	ADDED 2 Pts + ID
5:40	ADDED 1 LINE COAL
540	ADDED 1 Pt ID
555	SLOWED KILN to 190
	TESTING COMPLETED 17:53

APPENDIX D

ELECTROSTATIC PRECIPITATOR OPERATIONAL DATA

KVB
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PRECIPITATOR OPERATING DATA

DATE: 11/8/84

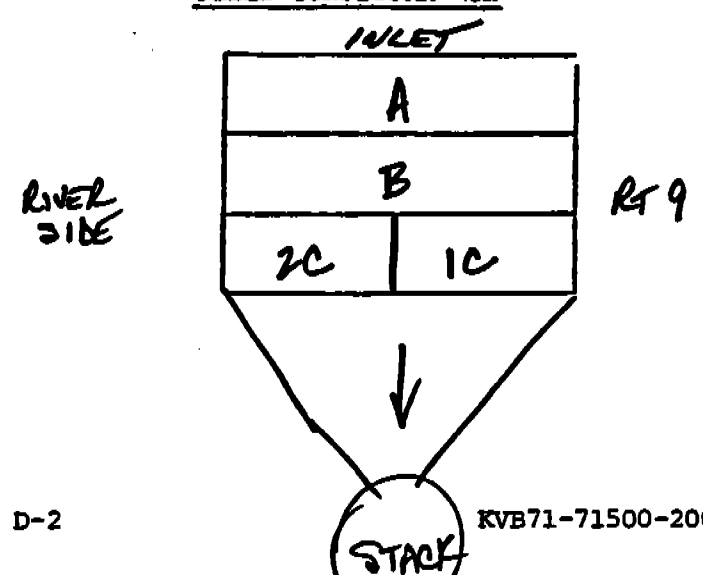
TIME: 11:20

TEST #: PC-

FIELD	1-2A	1-2B	1-C (RG 9 ROAD)	2-C (RIVER SIDE)			
TRANSFORMER PRIMARY VOLTS	370	340	180	240			
TRANSFORMER PRIMARY CURRENT	25	170	98	124			
PRECIPITATOR AVERAGE CURRENT							
SPARK RATE (GAUGE) (ACTUAL)	50	0	—	0			
POWER CONTROL	8	8	105	97			
MODE	M	A	M	D			
RAPPER PRIMARY VOLTAGE	70/70						
VIBRATOR CURRENT	84						
RAPPER VOLTAGE CONTROL							
VIBRATOR CONTROL							

NOTES :

FIELD CONFIGURATION



KVB
A Research-Cottrell Company

PRECIPITATOR OPERATING DATA

LEHIGH CEMENT - CEMENTON

DATE: 11/3/94

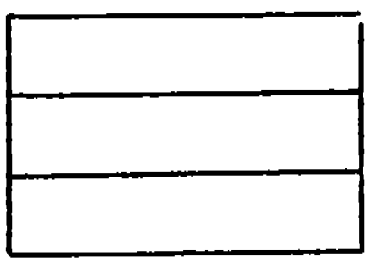
TIME: 15:35

TEST #: COMP-1

FIELD	1-2A	1-2B	1-C	2-C			
TRANSFORMER PRIMARY VOLTS	440	335	205	240			
TRANSFORMER PRIMARY CURRENT	65	185	125	125			
PRECIPITATOR AVERAGE CURRENT							
SPARK RATE (GAUGE) (ACTUAL)	10	0	—	0			
POWER CONTROL	100	8	100	96			
	M	A	M	A			
RAPPER PRIMARY VOLTAGE	70/70						
VIBRATOR CURRENT	83						
RAPPER VOLTAGE CONTROL							
VIBRATOR CONTROL							

NOTES :

FIELD CONFIGURATION:



KVB
A Research-Cottrell Company

PRECIPITATOR OPERATING DATA

DATE: 11/8/84

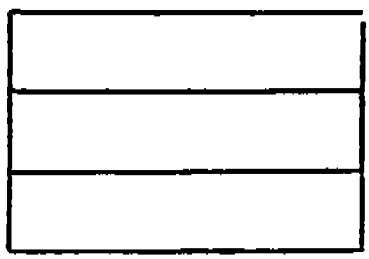
TIME: 17:45

TEST #: Comp 1

FIELD	1-2A	1-2B	1-C	2-C			
TRANSFORMER PRIMARY VOLTS	340	340	200	240			
TRANSFORMER PRIMARY CURRENT	70	175	120	130			
PRECIPITATOR AVERAGE CURRENT							
SPARK RATE (GAUGE) (ACTUAL)	50	0	—	0			
POWER CONTROL	100	7	100	97			
	M	A	M	A			
RAPPER PRIMARY VOLTAGE	70/70						
VIBRATOR CURRENT	84						
RAPPER VOLTAGE CONTROL							
VIBRATOR CONTROL							

NOTES :

FIELD CONFIGURATION



KVB
A Research-Cottrell Company

PRECIPITATOR OPERATING DATA

DATE: 11/9/84

TIME: 7:45

TEST #: Comp 2 Pre

FIELD	1-2A	1-2B	1-C	2-C			
TRANSFORMER PRIMARY VOLTS	420	330	200	235			
TRANSFORMER PRIMARY CURRENT	75	180	125	130			
PRECIPITATOR AVERAGE CURRENT	0	—	—	—			
SPARK RATE (GAUGE) (ACTUAL)	0	0	—	0			
POWER CONTROL	90	6	100	97			
	M	A	M	A			
RAPPER PRIMARY VOLTAGE	70/70						
VIBRATOR CURRENT	8#						
RAPPER VOLTAGE CONTROL							
VIBRATOR CONTROL							

NOTES :

FIELD CONFIGURATION:

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PRECIPITATOR OPERATING DATA

DATE: 11/9/84

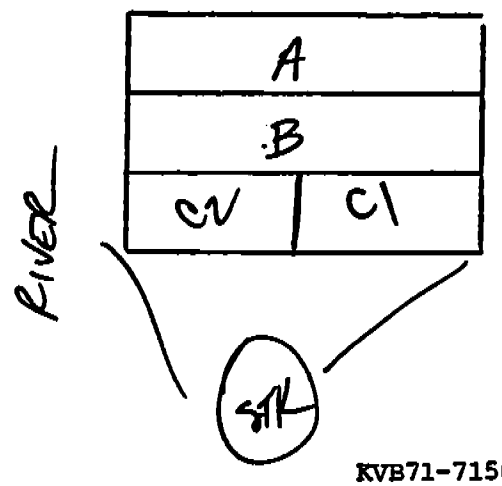
TIME: 13:48

TEST #: COMP-2

FIELD	1-2A	1-2B	1-C	2-C			
TRANSFORMER PRIMARY VOLTS	400	320	190	235			
TRANSFORMER PRIMARY CURRENT	16	175	120	125			
PRECIPITATOR AVERAGE CURRENT	—	—	—	—			
SPARK RATE (GAUGE) (ACTUAL)	5	0	(195)?	0			
POWER CONTROL	92	7	105	96			
MODE	M	A	M	A			
RAPPER PRIMARY VOLTAGE	°C/70						
VIBRATOR CURRENT ELECTRODES	83						
RAPPER VOLTAGE CONTROL							
VIBRATOR CONTROL							

NOTES :

FIELD CONFIGURATION:



KVB
A Research-Cottrell Company

PRECIPITATOR OPERATING DATA

DATE: 11/9/84

TIME: 16:30

TEST #: Comp #3

FIELD	1-2A	1-2B	1-C	2-C			
TRANSFORMER PRIMARY VOLTS	405	325	175	235			
TRANSFORMER PRIMARY CURRENT	65	165	115	125			
PRECIPITATOR AVERAGE CURRENT	—	—	—	—			
SPARK RATE (GAUGE) (ACTUAL)	25	0	(195)	0			
POWER CONTROL	93	6	105	97			
MORE	M	A	M	A			
RAPPER PRIMARY VOLTAGE	70/70						
VIBRATOR CURRENT	83						
RAPPER VOLTAGE CONTROL							
VIBRATOR CONTROL							

NOTES :

FIELD CONFIGURATION:

KVB
A Research-Cottrell Company

PRECIPITATOR OPERATING DATA

DATE: 11/9/84

TIME: 18:10

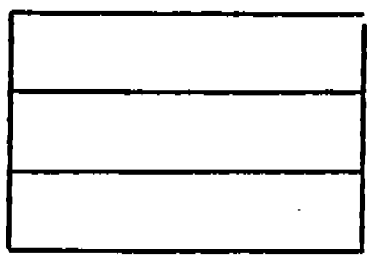
TEST #: Comp 3

FIELD	1-2A	1-2B	1-C	2-C			
TRANSFORMER PRIMARY VOLTS	400	320	185	235			
TRANSFORMER PRIMARY CURRENT	55	175	120	124			
PRECIPITATOR AVERAGE CURRENT							
SPARK RATE (GAUGE) (ACTUAL)	25	0*	185	0			
POWER CONTROL	91	6	100	94			
	M	A	M	A			
RAPPER PRIMARY VOLTAGE	70/70						
VIBRATOR CURRENT	03						
RAPPER VOLTAGE CONTROL							
VIBRATOR CONTROL							

NOTES :

* INTERMITTENT SPARK OVER 25/MIN

FIELD CONFIGURATION



KVB
A Research-Cottrell Company

PRECIPITATOR OPERATING DATA

DATE: 11-9-84

TIME: 1727

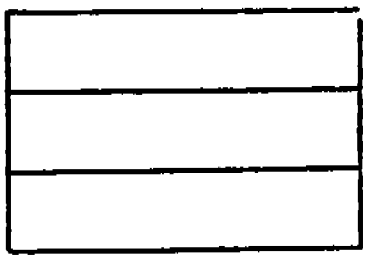
TEST #: COMPLIANCE #3

			ROAD	RIVER			
FIELD	1-2A	1-2B	1-C	2-C			
TRANSFORMER PRIMARY VOLTS	400	325	185	235			
TRANSFORMER PRIMARY CURRENT	55	170	120	124			
PRECIPITATOR AVERAGE CURRENT	—	—	—	—			
SPARK RATE (GAUGE) (ACTUAL)	40	25	190	—0—			
POWER CONTROL	91	6	100	94			
MODE	M	A	M	A			
RAPPER PRIMARY VOLTAGE	70 / 70						
VIBRATOR CURRENT	83						
RAPPER VOLTAGE CONTROL							
VIBRATOR CONTROL							

NOTES :

B-FIELD — INTERMITENT SPARKING up to 25 sparks/min.

FIELD CONFIGURATION



APPENDIX E

CYCLONIC FLOW DATA

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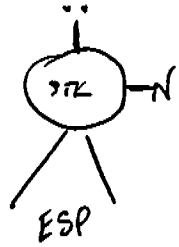

FIGURE 3 VELOCITY TRAVERSE AND CYCLONIC FLOW DATA

UNIT NO. LEHIGH
TEST NO. PRELIM
DATE: 11-6-84
TIME: 1500

BAROMETRIC PRESSURE 29.98
STATIC PRESSURE -.55
PITOT TUBE IDENT. NO. ST-4
OPERATOR PC

TRAVERSE POINT	VELOCITY DATA			CYCLONIC DATA	
	ΔP (inH$_2$O)	STACK TEMP (°F)	O_2 (%)	ΔP at 0° POSITION (inH$_2$O)	ANGLE OF ZERO ΔP (degrees)
NORTH 12	.13	352		.02	5
11	.15	353		.03	10
10	.18	353		.05	10
9	.17	353		0	—
8	.19	356	7.4	0	—
7	.19	359		0	—
6	.22	361		0	—
5	.21	363		0	—
4	.21	362		0	—
3	.19	361		0	—
2	.18	357		.03	5
1	.13	352		.02	5
WEST 12	.18	355		0	—
11	.22	355		0	—
10	.25	355		0	—
9	.21	354	7.3	0	—
8	.21	353		0	—
7	.22	352		0	—
6	.16	350		0	—
5	.14	350		0	—
4	.14	349		0	—
3	.12	347		0	—
2	.1	342		0	—
1	.09	342		0	—
AVERAGES	.175	353			+1.4°

APPENDIX F

LABORATORY SUMMARY

KVB

PARTICULATE LABORATORY SUMMARY

WEIGHTS

Plant LEHIGH - CEMENTON
Date 11/8/84
Test No. COMP 1

ITEM / WEIGHTS	FILTER #4	ACETONE WASH #16	SILICA
Final Weight (g)	0.6557	83.8345	216.5
Initial Weight (g)	0.6367	83.8224	200.0
± Blank Weight (g)	-0.0004	-0.0002	
Net Sample Weight (g)	0.0186	0.0119	16.5

Total Particulate Weight

18.6 mg, filter
\+ 11.9 mg, wash
30.5 mg, Total

MOISTURE VOLUMES

ITEM / VOLUMES	CONDENSATE VOLUME
Final Volume ml	714
Initial Vol., ml	300
Net Sample Vol. ml	414

Total Moisture Volume:

414 ml, condensate volume
\+ 16.5 ml, silica gel *
430.5 ml, Total

* 1 g/ml

KVB

PARTICULATE LABORATORY SUMMARY

WEIGHTS

Plant LEHIGH CEMENTON
Date 11/9/84
Test No. COMP 2

ITEM / WEIGHTS	FILTER #5	ACETONE WASH #6	SILICA
Final Weight (g)	0.6140	109.3010	213.0
Initial Weight (g)	0.5970	109.2859	200.0
+ Blank Weight (g)	-0.0004	- 0.0002	X
Net Sample Weight (g)	0.0166	0.0149	13.0

Total Particulate Weight

16.6 mg, filter
\+ 14.9 mg, wash
31.5 mg, Total

MOISTURE VOLUMES

ITEM / VOLUMES	CONDENSATE VOLUME
Final Volume ml	718
Initial Vol., ml	300
Net Sample Vol. ml	418

Total Moisture Volume:

418 ml, condensate volume
\+ 13 ml, silica gel *
431 ml, Total

* 1 g/ml

KVB

PARTICULATE LABORATORY SUMMARY

WEIGHTS

Plant LEHIGH - CEMENTON
Date 11/9/84
Test No. COMP 3

ITEM / WEIGHTS	FILTER #7	ACETONE WASH #4	SILICA
Final Weight (g)	0.6584	83.6452	214.5
Initial Weight (g)	0.6364	83.6246	200.0
+ Blank Weight (g)	-0.0004	-0.0002	X
Net Sample Weight (g)	0.0216	0.0204	14.5

Total Particulate Weight

21.6 mg, filter
\+ 20.4 mg, wash
42.0 mg, Total

MOISTURE VOLUMES

ITEM / VOLUMES	CONDENSATE VOLUME
Final Volume ml	742
Initial Vol., ml	300
Net Sample Vol. ml	442

Total Moisture Volume:

442 ml, condensate volume
\+ 14.5 ml, silica gel *
456.5 ml, Total

* 1 g/ml

PARTICULATE LABORATORY SUMMARY

WEIGHTS

Plant LEHIGH-CEMENTON
Date 11/9/84
Test No. BLANKS

ITEM / WEIGHTS	FILTER #B	ACETONE WASH #4/4	SILICA
Final Weight (g)	0.6186	83.6246	—
Initial Weight (g)	0.6190	83.6248	—
+ Blank Weight (g)	—	—	X
Net Sample Weight (g)	-0.0004	-0.0002	—

Total Particulate Weight

-0.4 mg, filter
+ -0.2 mg, wash
-0.6 mg, Total

MOISTURE VOLUMES

ITEM / VOLUMES	CONDENSATE VOLUME
Final Volume ml	—
Initial Vol., ml	—
Net Sample Vol. ml	—

Total Moisture Volume:

— ml, condensate volume
+ — ml, silica gel *
— ml, Total

* 1 g/ml

NOVEMBER 1984

LEHIGH PORTLAND CEMENT

LABORATORY SUMMARY SHEET

KVB A Research-Cottrell Company

#71500

1D NUMBER		FILTER #4	FILTER #5	FILTER #6	FILTER #7	FILTER #8	BEAKER #16	BEAKER #6	BEAKER #4	BEAKER #44
TEST NUMBER		COMP 1	COMP 2	SPARE	COMP 3	BLANK	COMP 1	COMP 2	COMP 3	BLANK
TEST DATE		11/6/84	11/9/84		11/9/84	11/9/84	11/6/84	11/9/84	11/9/84	11/9/84
		MS	MS	MS	MS	ACE	ACE	ACE	ACE	ACE
FINAL WEIGHT 1		.6555	.6146	UNUSED	.6583	.6186	83.8356	109.3010	83.6449	83.6246
2		.6556	.6136		.6575	.6188	83.8334	109.3016	83.6451	83.6248
3		.6559	.6138		.6593	.6185	83.8345	109.3003	83.6455	83.6244
AVERAGE FINAL WEIGHT		.6557	.6140		.6584	.6186	83.8345	109.3010	83.6452	83.6246
TARE WEIGHT 1		.6369	.5970	.5995	.6362	.6189	83.8224	109.2861	83.6247	83.6250
2		.6365	.5969	.5998	.6365	.6192	83.8222	109.2857	83.6244	83.6246
3		.6366	.5970	.5997	.6364	.6190	83.8225	109.2859	83.6247	83.6249
AVERAGE TARE WEIGHT		.6367	.5970	.5997	.6364	.6190	83.8224	109.2859	83.6246	83.6248
AVERAGE FINAL WEIGHT		.6557	.6140		.6584	.6186	83.8345	109.3010	83.6452	83.6246
AVERAGE TARE WEIGHT		.6367	.5970	.5997	.6364	.6190	83.8224	109.2859	83.6246	83.6248
PRELIM SAMPLE WEIGHT										
FINAL SAMPLE WEIGHT MG		19.0	17.0		22.0	-0.4	12.1	15.1	20.6	-0.2

KVB
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METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant LEHIGH - CEMENTON, NY Run No. COMP-1

Sample location KILN EXHAUST STACK

Relative humidity NOT RECORDED - CLEAR SKIES

Density of acetone (pa) LAB GRADE g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	#16 COMP 1	173 ML
filter(s)	#4 COMP 1	11/8/84

Acetone rinse container no. #16

Acetone rinse volume (Vaw) 173 ml

Acetone blank residue concentration (Ca) 0.2 MG/175 ML mg/g

Wa = Ca Vaw pa = ( )( )( ) = —— mg

Date and time of wt 11/8/84 Gross wt _____ mg

Date and time of wt 11/9/84 & 11/10/84 Gross wt _____ mg

Average gross wt 83.8345 mg

Tare wt 83.8224 mg

Less acetone blank wt (Wa) 0.0002 mg

Weight of particulate in acetone rinse 11.9 mg

Filter(s) container no. #4 COMP 1

Date and time of wt 11/9/84 Gross wt _____ mg

Date and time of wt 11/10/84 Gross wt _____ mg

Average gross wt 0.6557 mg

Tare wt 0.6367 mg

Weight of particulate on filter(s) 18.6 mg

Weight of particulate in acetone rinse 11.9 mg

Total weight of particulate 30.5 mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks: _____

Signature of analyst _____

Signature of reviewer [signature]

KVB
A Research-Cottrell Company

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant LEHIGH - CEMENTON, NY Run No. Comp-2

Sample location KILN EXHAUST STACK

Relative humidity NOT RECORDED - OVERCAST

Density of acetone (ρa) LAB GRADE g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	#6 Comp 2	184 ml
filter(s)	#5 Comp 2	11/9/84

Acetone rinse container no. #6

Acetone rinse volume (Vaw) 184 ml

Acetone blank residue concentration (Ca) 0.2 mg/175 ml mg/g

Wa = Ca Vaw ρa = ( )( )( ) = — mg

Date and time of wt 11/9/84 Gross wt _____ mg

Date and time of wt 11/10/84 Gross wt 10 _____ mg

Average gross wt 109.3010 mg

Tare wt 109.2859 mg

Less acetone blank wt (Wa) 0.0002 mg

Weight of particulate in acetone rinse 14.9 mg

Filter(s) container no. #5 Comp 2

Date and time of wt 11/9/84 Gross wt _____ mg

Date and time of wt 11/10/84 Gross wt _____ mg

Average gross wt 0.6140 g

Tare wt 0.5970 g

Weight of particulate on filter(s) 16.6 mg

Weight of particulate in acetone rinse 14.9 mg

Total weight of particulate 31.5 mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks: _____

Signature of analyst _____

Signature of reviewer _____

KVB
A Research-Cottrell Company

METHOD 5 TRAIN ANALYTICAL PARTICULATE DATA

Plant LEHIGH-CEMENTON, NY Run No. Comp-3
Sample location KILN EXHAUST STACK
Relative humidity NOT REQUIRED - OVERCAST
Density of acetone (ρa) LAB GRADE g/ml

Sample type	Sample identifiable	Liquid level marked and/or container sealed
Acetone rinse	#4 Comp 3	191
filter(s)	#7 Comp 3	11/9/04

Acetone rinse container no. #4
Acetone rinse volume (Vaw) 191 ml
Acetone blank residue concentration (Ca) 0.2 MG/175 ML ~~mg/g~~
Wa = Ca Vaw ρa = ( )( )( ) = ——— mg
Date and time of wt 11/9/04 Gross wt _____ mg
Date and time of wt 11/10/04 Gross wt _____ mg
Average gross wt 83.6452 mg
Tare wt 83.6246 mg
Less acetone blank wt (Wa) 0.0002 mg
Weight of particulate in acetone rinse 20.4 mg
Filter(s) container no. #7 Comp 3
Date and time of wt 11/9/04 Gross wt _____ mg
Date and time of wt 11/10/04 Gross wt _____ mg
Average gross wt 0.6584 mg
Tare wt 0.6364 mg
Weight of particulate on filter(s) 21.6 mg
Weight of particulate in acetone rinse 20.4 mg
Total weight of particulate 42.0 mg

Note: In no case shall a blank residue greater than (.01 mg/g) or .001% of the weight of acetone used be subtracted from the sample weight.

Remarks: _____

Signature of analyst _____
Signature of reviewer _____

APPENDIX G

CALIBRATION DATA

Customer IET

Date 10/31/84 Box No. EN-513-1 Order No RAC Order No.

Pump ✓

Pump Oil ✓

Clean Quick Connects ✓ Valves ✓

Manometers ✓

Dry Test Meter ✓

Thermometers ✓

Lights — Buzzer —

Electrical Check--Amphenol —

Variac —

Vacuum Gauge ✓

Leak Check at 27" Hg.--Leakage 0 CFM

Remarks LEHIGH CONCRETE COMPLIANCE TESTING — Proj # 71500

Calibration--Orifice and Meter Box No. EN-513-1 Pb 30.09 Date 10/31/84

Man Orifice	CF_w	CF_d	T_w	IT_d	OT_d	Td avg.	Time t
0.5	5	4.979	68.5	74	62	69	13.4
1.0	5	5.013	62	75	58	65.5	9.2
2.0	10	10.011	63.5	85	65	75	13.5
4.0	10	9.968	63	87	64	75.5	9.7
6.0	10	9.950	63	90	68	79	7.25
8.0	10	10.080	63	90	68	79	6.7

Calculate Y & Hθ at man. 2.0

$$\frac{CF_w}{CF_d} \frac{P_b\ (T_{d\ avg.} + 460)}{(P_b + 0.147)\ (T_w + 460)}$$

$$H\theta = \frac{0.0634}{P_b\ (OT_d + 460)} \left[\frac{(T_w + 460)}{CF_w} \right]^2$$

Tolerances

0.99 - 1.00 - 1.01.

1.6 - 1.84 - 2.1

$\frac{0.0317 \text{ (Man. Orifice)}}{P_b (0T_d + 460)} \left(\frac{(T_W + 460)^t}{C_{F_W}} \right)^2$	Man. "H_2O	ΔH @	$\frac{C_{F_W} P_b (T_d \text{ Avg.} + 460)}{C_{F_d} (P_b + 13.6^{\text{Man. Orif.}})(T_W + 460)}$	Man.	Y
$\frac{0.01585}{30.09 (62 + 460)} \left(\frac{(63.5 + 460)\ 13.6}{5} \right)^2$	.5	2.00	$\frac{5 \times 30.09 (69 + 460)}{4.979 (30.09 + 0.0368)(63.5 + 460)}$	.5	1.006
$\frac{0.0317}{30.09 (58 + 460)} \left(\frac{(62 + 460)\ 9.2}{5} \right)^2$	1.0	1.876	$\frac{5 \times 30.09 (66.5 + 460)}{5.013 (30.09 + 0.0737)(62 + 460)}$	1.0	1.00
$\frac{0.0634}{30.09 (65 + 460)} \left(\frac{(63.5 + 460)\ 13.5}{10} \right)^2$	2.0	2.004	$\frac{10.0 \times 30.09 (75 + 460)}{10.01 (30.09 + 0.147)(63.5 + 460)}$	2.0	1.01
$\frac{0.1268}{30.09 (64 + 460)} \left(\frac{(63 + 460)\ 9.4}{10} \right)^2$	4.0	1.94	$\frac{10.0 \times 30.09 (75.5 + 460)}{9.968 (30.09 + 0.294)(63 + 460)}$	4.0	1.007
$\frac{0.1902}{30.09 (68 + 460)} \left(\frac{(63 + 460)\ 7.2}{10} \right)^2$	6.0	1.72	$\frac{10.0 \times 30.09 (79 + 460)}{9.95 (30.09 + 0.431)(63 + 460)}$	6.0	1.008
$\frac{0.2536}{30.09 (68 + 460)} \left(\frac{(63 + 460)\ 6.7}{10} \right)^2$	8.0	1.96	$\frac{10.0 \times 30.09 (79 + 460)}{10.08 (30.09 + 0.588)(63 + 460)}$	8.0	1.002
Avg. ΔH		1.916	Avg. Y		1.005

$\frac{0.0317 \text{ (Man. Orifice)}}{P_b (0T_d + 460)} \left(\frac{(T_W + 460)^t}{CF_W} \right)^2$	Man. "H_2O	ΔH @	$\frac{CF_W \, P_b \, (T_d \text{ Avg.} + 460)}{CF_d \left(P_b + 13.6^{\text{Man. Orif.}}\right)(T_W + 460)}$	M	Y
$\frac{0.01585}{30.09 \, (62 + 460)} \left(\frac{(63.5 + 460)\, 13.6}{5} \right)^2$	.5	2.00	$\frac{5 \times 30.09 \, (69 + 460)}{4.979 \, (30.09 + 0.0368)(63.5 + 460)}$	.5	1.006
$\frac{0.0317}{30.09 \, (58 + 460)} \left(\frac{(62 + 460)\, 9.2}{5} \right)^2$	1.0	1.876	$\frac{5 \times 30.09 \, (65.5 + 460)}{5013 \, (30.09 + 0.0737)(62 + 460)}$	1.0	1.00
$\frac{0.0634}{30.09 \, (65 + 460)} \left(\frac{(63.5 + 460)\, 13.5}{10} \right)^2$	2.0	2.004	$\frac{10.0 \times 30.09 \, (75 + 460)}{10.01 \, (30.09 + 0.147)(63.5 + 460)}$	2.0	1.01
$\frac{0.1268}{30.09 \, (64 + 460)} \left(\frac{(63 + 460)\, 9.4}{10} \right)^2$	4.0	1.94	$\frac{100 \times 30.09 \, (75.5 + 460)}{9.968 \, (30.09 + 0.294)(63 + 460)}$	4.0	1.007
$\frac{0.1902}{30.09 \, (68 + 460)} \left(\frac{(63 + 460)\, 7.2}{10} \right)^2$	6.0	1.72	$\frac{10.0 \times 30.09 \, (79 + 460)}{9.95 \, (30.09 + 0.43)(63 + 460)}$	6.0	1.008
$\frac{0.2536}{30.09 \, (68 + 460)} \left(\frac{(63 + 460)\, 6.7}{10} \right)^2$	8.0	1.96	$\frac{10.0 \times 30.09 \, (79 + 460)}{10.08 \, (30.09 + 0.588)(63 + 460)}$	8.0	1.002
Avg. ΔH		1.916	Avg. Y		1.005

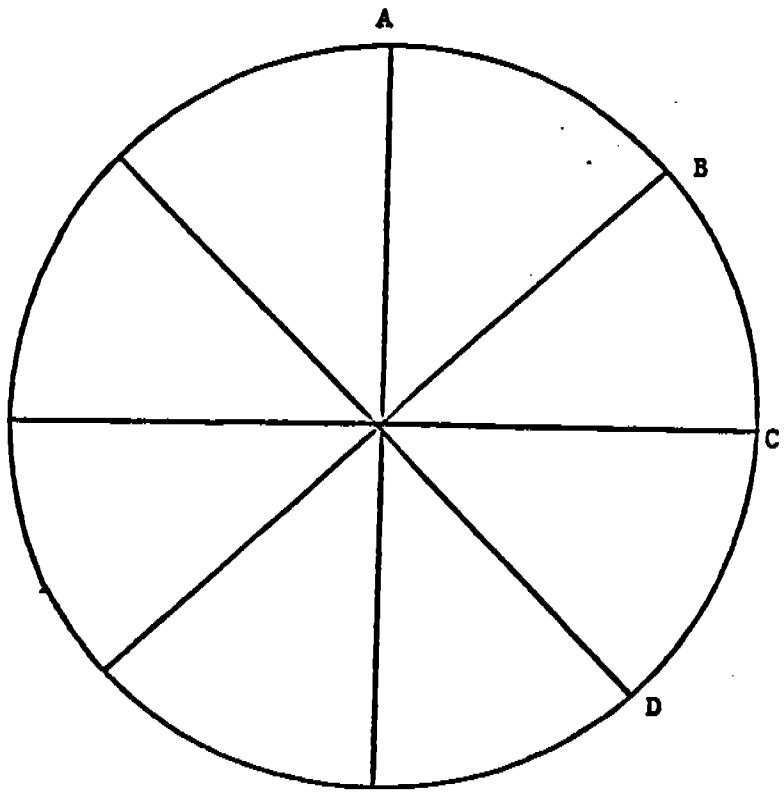
DATE: 11/7/04

COMPANY: LEHIGH - PORTLAND

PLANT: CEMENTON, NY

UNIT NO.: KILN

NOZZLE CALIBRATION



MEASUREMENTS: A 0.376

B 0.375

C 0.376

D 0.377

AVERAGE DIAMETER: 0.376

PITOT TUBE SN # 046 COEFFICIENT = 0.84

POST TEST METER CALIBRATION

Date 11-26-84

Barometric pressure, P_b = 30.29 "Hg

Meter Box No. EN 513-1

Dry Gas Meter No. _____

Plant Lehigh Council Co.

P/M _____

Project Manager Ron Ruhl

Pretest Y 1.01 @ 2.0 ΔH

Test No.	Orifice manometer setting, $\Delta H_@$, in H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet test Meter t_w, °F	Temperature: Dry gas meter Inlet t_{di}, °F	Temperature: Dry gas meter Outlet t_{do}, °F	Temperature: Dry gas meter Average[a] t_d, °F	Time θ, min.	Vacuum setting in Hg	Yi	Yi: $\frac{V_w P_b (t_d + 460)}{V_d\left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$
1	1.9	10	9.72	65	81	69	75	13.6	6.0	1.04	$\frac{10 \times 30.29 \times (75+460)}{9.72 \times 30.29 + \frac{1.9}{13.6} \times (65+460)}$
2	1.9	10	9.66	65	88	72	80	14.5	6.0	1.06	$\frac{10 \times 30.29 \times (80+460)}{9.66 \times 30.29 + \frac{1.9}{13.6} \times (65+460)}$
3	1.9	10	9.775	65	88	74	81	13.8	6.0	1.03	$\frac{10 \times 30.29 \times (81+460)}{9.775 \times 30.29 + \frac{1.9}{13.6} \times (65+460)}$

Post-test y = 1.04

Calibrated by R. Nicole Cerami
Signature

[a] If there is only one thermometer on the dry gas meter record the temperature under t_d.

where:

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry test meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry test meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry test meter, °F.

t_d = Average temperature of the gas in the dry test meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in H_2O.

Y_i = Ratio of accuracy of wet test meter to dry test meter for each run.

Y = Average ratio of accuracy of wet test meter to dry test meter for all three runs. Tolerance = Pretest Y ±0.05 Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, minutes.

G-6

KVB71-71500-2007 D304

Calibration--Orifice and Meter

Date 10/[illegible]/84 Box No. ED-513-1 Pb 30.09

Man Orifice	CF_w	CF_d	T_W	IT_d	OT_d	Td avg.	Time t
0.5	5	4.979	63.5	74	62	69	13.6
1.0	5	5.013	62	75	58	65.5	9.2
2.0	10	10.011	63.5	85	65	75	13.5
4.0	10	9.968	63	87	64	75.5	9.7
6.0	10	9.980	63	90	68	79	7.25
8.0	10	10.080	63	90	68	79	6.7

Calculate Y & H@ at man. 2.0

$$Y = \frac{CF_w \; P_b \; (T_{d\ avg.} + 460)}{CF_d \; (P_b + 0.147) \; (T_w + 460)}$$

$$H@ = \frac{0.0634}{P_b \; (OT_d + 460)} \left(\frac{(T_w + 460)}{CF_w} \right)^2$$

olerances

= 0.99 - 1.00 - 1.01

= 1.6 - 1.84 - 2.1

Customer EET

Date 10/[illegible]/84 Box No. ED-513-1 RAC Order No. Order No

Pump [illegible]

Pump Oil

Clean Quick Connects

Manometers Valves

Dry Test Meter

Thermometers

Lights

Electrical Check--Amphenol Buzzer

Variac

Vacuum Gauge

Leak Check at 27" Hg.--Leakage 0 CFM

Remarks

$\frac{0.0317 \text{ (Man. Orifice)}}{P_b (0T_d + 460)} \left(\frac{(TW + 460)^t}{CF_W} \right)^2$	Man. "H_2O	ΔH @	$\frac{CF_W \; P_b \; (T_{d\,Avg.} + 460)}{CF_d \left(P_b + 13.6^{\text{Man. Orif.}}\right)(T_w + 460)}$	Man.	Y
$\frac{0.01585}{30.09 (62 + 460)} \left(\frac{(63.5 + 460)\, 13.6}{5} \right)^2$	.5	2.00	$\frac{5 \times 30.09 \; (69 + 460)}{4.979 \; (30.09 + 0.0368)(63.5 + 460)}$	.5	1.006
$\frac{0.0317}{30.09 (58 + 460)} \left(\frac{(62 + 460)\, 9.2}{5} \right)^2$	1.0	1.876	$\frac{5 \times 30.09 \; (65.5 + 460)}{5013 \; (30.09 + 0.0737)(62 + 460)}$	1.0	1.00
$\frac{0.0634}{30.09 (65 + 460)} \left(\frac{(63.5 + 460)\, 13.5}{10} \right)^2$	2.0	2.004	$\frac{10.0 \times 30.09 \; (75 + 460)}{10.01 \; (30.09 + 0.147)(63.5 + 460)}$	2.0	1.01
$\frac{0.1268}{30.09 (64 + 460)} \left(\frac{(63 + 460)\, 9.4}{10} \right)^2$	4.0	1.94	$\frac{10.0 \times 30.09 \; (75.5 + 460)}{9.968 \; (30.09 + 0.294)(63 + 460)}$	4.0	1.007
$\frac{0.1902}{30.09 (66 + 460)} \left(\frac{(63 + 460)\, 7.2}{10} \right)^2$	6.0	1.72	$\frac{10.0 \times 30.09 \; (79 + 460)}{9.95 \; (30.09 + 0.431)(63 + 460)}$	6.0	1.008
$\frac{0.2536}{30.09 (68 + 460)} \left(\frac{(63 + 460)\, 6.7}{10} \right)^2$	8.0	1.96	$\frac{10.0 \times 30.09 \; (79 + 460)}{10.08 \; (30.09 + 0.588)(63 + 460)}$	8.0	1.002
Avg. ΔH		1.9"			

APPENDIX H

KVB DATA REDUCTION FORMULAE

DATA CONSTANTS

MW(1) = 44.0 Molecular Weight (lb/lbmole) CO_2

MW(2) = 32.0 Molecular Weight (lb/lbmole) O_2

MW(3) = 28.0 Molecular Weight (lb/lbmole) N_2

MW(4) = 64.0 Molecular Weight (lb/lbmole) SO_2

MW(5) = 12.0 Molecular Weight (lb/lbmole) C

MW(6) = 1.0 Molecular Weight (lb/lbmole) H

MW(7) = 32.0 Molecular Weight (lb/lbmole) S

PI = 3.141592654 = π

TSTD = 68 = Standard Temperature (Degrees F)

PSTD = 29.92 = Standard Pressure (Inches Hg)

Y = 1.0 = Dry Gas Calibration Factor

KP = 85.48 = Pitot Tube Constant $\frac{ft}{sec}\left[\frac{(lb/lbmole)(in\ Hg)}{(Deg\ R)(in\ H_2O)}\right]^{\frac{1}{2}}$

R1 = 1544.3 = Gas Law Constant (ft-lb/(lb-mole Deg R))

RW = 62.31 = Density of H_2O @ 68°F (lb/ft^3)

R = R1/7.0727E1 = conversion of Gas Law Constant to (ft^3-in Hg/(lb-mole Deg R))

RHO = RW/28.316 x 10^3= Conversion of H_2O density to (lb/ml)

MOIS = RHO x R x (TSTD + 460)/(18 x PSTD) = $\frac{ft^3\ H_2O\ Gas}{ml\ H_2O\ liquid}$ at standard conditions

K3 = RHO x R/18 = Moisture Content Conversion (ft^3 - in Hg/(ml Deg R))

STACK SAMPLING CALCULATIONS

SP = Stack Pressure [in Hg]

= Barometric Pressure [in Hg] + $\frac{\text{Stack Gas Static Pressure, [in } H_2O]}{13.6}$

Volume (DSCF) = meter volume (ft^3) corrected to standard conditions

= Meter volume x dry gas calibration factor x TSTD x (PBARO + ΔH/13.6)/ (PSTD x Stack Temp)

Stack Velocity [ft/sec] = KP x pitot tube coefficient x $\sqrt{(\text{Stack Temp} \times \Delta P)/(\text{Stack Pressure} \times \text{MW Wet})}$

Average ΔP for the stack = $\left(\frac{\text{Average Stack Velocity}}{\text{KP x Pitot Tube Coefficient}}\right)^2$ x Stack Pressure x MW Wet/Stack Temp.

Isokinetics = $\frac{\text{Sampling Velocity}}{\text{Stack Velocity}}$ x 100

= $\frac{100 \times \text{stack temp } [K3 \times \text{vol. } H_2O + \left(\frac{\text{meter volume}}{\text{meter temp}}\right)(\text{Baro. Press} + \Delta H/13.6)]}{(60)\ (\text{sampling time})\ (\text{stack velocity})\ (\text{stack pressure})\ (\text{area of nozzle})}$

Volumetric Flow Rate Based On Stack Velocity (ACFM) = average stack velocity x area of stack

EMISSIONS CALCULATIONS

E = lb/MBTU based on combustion chemistry

$$= \frac{\text{Particulate [mg]} \times F\left[\frac{\text{DSCF}}{\text{MBTU}}\right]}{\text{Volume (DSCF)} \times 453.59\text{E}3\left[\frac{\text{mg}}{\text{lb}}\right]} \times \left(\frac{20.9}{20.9 - O_2}\right)$$

Where $\frac{20.9}{20.9 - O_2}$ is a correction of $\frac{1}{\text{Volume (DSCF)}}$ to 0% excess air.

E1 = lb/DSCF

$$= \frac{\text{Particulates [mg]}}{\text{Volume (DSCF)} \times 453.59\text{E}3\left[\frac{\text{mg}}{\text{lb}}\right]}$$

E2 = Grains/ACF

$$= \frac{\text{Particulates [mg]} \times 1.5432\text{E}-2\left[\frac{\text{grains}}{\text{mg}}\right]}{[\text{Volume (DSCF)} + \text{Volume } H_2O]} \times \left[\frac{\text{TSTD} \times \text{Stack Pressure}}{\text{PSTD} \times \text{Stack Temp.}}\right]$$

E3 = lb/hr based on Stack Velocity

$$= \text{Stack Velocity} \times \text{Stack Area} \times \text{E1}\left[\frac{\text{lb}}{\text{DSCF}}\right] \times (1\text{-BWO}) \times \frac{\text{TSTD} \times \text{Stack Press.}}{\text{PSTD} \times \text{Stack Temp.}}$$

E4 = Grains/DSCF at 77°F and 50% excess air (State of Maryland)

$$= \text{E1}\left[\frac{\text{lb}}{\text{DSCF}}\right] \times 7000\left[\frac{\text{grains}}{\text{lb}}\right] \times \frac{\text{TSTD}}{537°\text{R}} \times \left(\frac{20.9 - \text{M2}}{20.9 - O_2}\right)$$

Where $\frac{20.9 - \text{M2}}{20.9 - O_2}$ is a correction of $\frac{1}{\text{Volume (DSCF)}}$ to 50% excess air.

EMISSIONS CALCULATIONS

E5 = E3 or Optionally

E5 = lb/hr based on combustion chemistry

$$= E\left[\frac{\text{lb}}{\text{MBTU}} \text{ (based on combustion chemistry)}\right] \times HI\left[\frac{\text{KBTU}}{\text{hour}}\right] \times \frac{10^3 \text{ KBTU}}{\text{MBTU}}$$

EE = lb/MBTU based on stack velocity and fuel flow

$$= \frac{E3\left[\frac{\text{lb}}{\text{hr}} \text{ based on stack velocity and fuel flow}\right] \times 10^3\left[\frac{\text{KBTU}}{\text{MBTU}}\right]}{HI\left[\frac{\text{KBTU}}{\text{hour}}\right]}$$

CONVERSION OF CEMENT KILN EMISSIONS DATA

Conversion of cement kiln emission concentrations to $lb/10^6$ Btu using the F factor method (according to the Federal NSPS for utility boilers) requires correction for the CO_2 content evolved from the cement feed.

The standard dry basis NSPS procedure is:

$$E = C_d \, F_d \, \frac{20.9}{20.9 - \%O_{2_d}}$$

where

E = pollutant emission rate, ng/J ($lb/10^6$ Btu)

C_d = pollutant concentration, ng/scm (lb/scf)

F_d = F factor, scm/J ($scf/10^6$ Btu)

Standard "default" F_d factors are tabulated in the NSPS for various fuels, such as:

$F_{d_{natural\ gas}}$ = 8740 $dscf/10^6$ Btu

$F_{d_{oil}}$ = 9220 $dscf/10^6$ Btu

$F_{d_{coal}}$* = 9820 $dscf/10^6$ Btu

*for bituminous and subbituminous coals.

For cement kilns (or any other process where feed material is evolved as gases into the stack gas) the F factor must be corrected for the evolved gas, i.e.,

$$F_d = F_{d_{fuel}} + F_{d_{process}}$$

For CO_2 from $CaCO_3$ in the cement feed:

$$F_{d_{CO_2}} = \frac{386.8 \text{ scf/mole}}{44 \text{ lb } CO_2\text{/mole}} \times \frac{\text{lb } CO_2}{\text{lb dry feed}} \times \frac{\text{lb dry feed}}{10^6 \text{ Btu}} = \frac{\text{scf } CO_2}{10^6 \text{ Btu}}$$

NOTE: 1 mole $CaCO_3$ = 1 mole CaO + 1 mole CO_2

100 lb $CaCO_3$ = 56 lb CaO + 44 lb CO_2

lb CO_2/lb dry feed can be taken as the "ignition loss" from the dry feed analysis, typically 0.35.

lb dry feed/10^6 Btu must be obtained from feed rate and fuel firing rate. This can be estimated roughly as:

$$\frac{\text{lb}_{df}}{10^6 \text{ Btu}} = \frac{2000}{B \frac{10^6 \text{ Btu}}{\text{Ton clinker}} \times (1 - \text{I.L.})}$$

where

B = 3-3.5 x 10^6 Btu/Ton clinker for precalciner kilns

5-5.4 x 10^6 Btu/Ton clinker for long kilns

I.L. = Ignition loss, dry feed

APPENDIX I

SAMPLE EMISSIONS CALCULATIONS

STACK GAS VELOCITY

DATE 11/8/84 TEST NUMBER COMP 1

LOCATION LEHIGH CEMENT - CEMENTON

UNIT KILN FUEL COAL

$$V_s = 85.48\ (C_{pitot}) \left(\frac{(T_s)\ (\Delta P)}{(P_s)\ (MW_s)}\right)^{1/2} = 85.48\ (.84) \left(\frac{(825)\ (.20)}{(29.81)\ (27.4)}\right)^{1/2} = \boxed{32.2}$$

Where:
- C_{pitot} = Pitot tube correction factor
- T_s = Absolute average stack gas temperature °R.
- ΔP = Average stack ΔP, inches H_2O.
- P_s = Absolute stack gas pressure, inches H_g.
- MW_s = Stack gas molecular weight

ISOKINETIC CALCULATION

$$I = \frac{123.76\ (V_m)}{(D^2)(T_m)\ (\theta)} \left(\frac{T_s}{\Delta P}\right)^{1/2} \left[\frac{100}{100 - \%\ \text{Moisture}}\right]$$

$$I = \frac{123.76\ (51.227)}{(0.376)^2 (528)(72)} \left(\frac{828}{.20}\right)^{1/2} \left[\frac{100}{(71.74)}\right] = \boxed{105.3\ \%}$$

Where:
- I = Percent of isokinetic sampling
- V_l = Total volume of liquid collected in impingers and silica gel, ml.
- V_m = Volume of gas sample through the dry gas meter (meter conditions), cu.ft.
- T_m = Absolute average dry gas meter temperature °R
- P_{bar} = Barometric pressure at sampling site, inches H_g.
- ΔH Average pressure drop across the orifice, inches H_2O.
- θ = Total sampling time, min.

PARTICULATE CALCULATIONS

$$V_{DSCF} = \left(\frac{T_{Std}}{P_{Std}}\right)\left(\frac{V_m}{T_m}\right)\left[P_b + \left(\frac{\Delta H}{13.6}\right)\right] = \quad @\ 528\ °R,\ 29.92\ "Hg$$

$$= 17.65 \left(\frac{51.227}{528}\right)\left[29.85 + \frac{(1.89)}{13.6}\right] = 51.491$$

$$V_{H_2O} = 0.047\ (V_l) = 0.047\ (430.5) = 20.23$$

$$\%\ \text{Moisture} = \frac{(V_{H_2O})}{(V_{H_2O} + V_{DSCF})} \times 100 = \frac{(20.23)}{(20.23 + 51.491)} \times 100 = \boxed{28.26\ \%}$$

$$E\left[GR/DSCF\right] = \left[\frac{Mg\ Samp}{V_{DSCF}}\right]\left[\frac{15.43\ GR/GM}{1000\ Mg/GM}\right] = \left[\frac{30.5}{51.491}\right] 0.01543 = \boxed{0.0091}$$

$$E\left[lb/hr\right] = \left[GR/DSCF\right]\left[Vs \times A_{STK}\right]\left[\frac{528}{Ts}\right]\left[\frac{Ps}{29.92}\right]\left[\frac{1\ lb}{7000\ GR}\right]\left[\frac{3600\ sec}{hr}\right]\left[\frac{100 - \%\ M}{100}\right]$$

$$= \left[0.0091\right]\left[(32.2)(122.7)\right]\left[\frac{528}{828}\right]\left[\frac{29.88}{29.92}\right]\left[\frac{3600}{7000}\right]\left[\frac{100-(28.26)}{100}\right] = 8.4$$

STACK GAS VELOCITY

LOCATION: LEHIGH CEMENT - CEMENTON

UNIT KILN FUEL COAL

$$V_s = 85.48\ (C_{pitot}) \left(\frac{(T_s)\ (\Delta P)}{(P_s)\ (MW_s)}\right)^{1/2} = 85.48\ (.84) \left(\frac{(831.4)\ (0.17)}{(29.74)\ (27.12)}\right)^{1/2} = \boxed{30.4}$$

Where:
- C_{pitot} = Pitot tube correction factor
- T_s = Absolute average stack gas temperature °R.
- ΔP = Average stack ΔP, inches H_2O.
- P_s = Absolute stack gas pressure, inches H_g.
- MW_s = Stack gas molecular weight

ISOKINETIC CALCULATION

$$I = \frac{123.76\ (V_m)}{(D^2)(T_m)\ (\theta)} \left(\frac{T_s}{\Delta P}\right)^{1/2} \left[\frac{100}{100 - \%\ \text{Moisture}}\right]$$

$$I = \frac{123.76\ (\ 48.174\ )}{(0.376)^2\ (531.6)(72)} \left(\frac{831.4}{0.17}\right)^{1/2} \left[\frac{100}{(71.20)}\right] = \boxed{104.73\ \%}$$

Where:
- I = Percent of isokinetic sampling
- V_l = Total volume of liquid collected in impingers and silica gel, ml.
- V_m = Volume of gas sample through the dry gas meter (meter conditions), cu.ft.
- T_m = Absolute average dry gas meter temperature °R
- P_{bar} = Barometric pressure at sampling site, inches H_g.
- ΔH Average pressure drop across the orifice, inches H_2O.
- θ = Total sampling time, min.

PARTICULATE CALCULATIONS

$$V_{DSCF} = \left(\frac{T_{Std}}{P_{Std}}\right)\left(\frac{V_m}{T_m}\right)\left[P_b + \left(\frac{\Delta H}{13.6}\right)\right] = \quad @\ 528\ °R,\ 29.92\ "Hg$$

$$= 17.65 \left(\frac{48.174}{531.6}\right)\left[29.79 + \frac{(1.65)}{13.6}\right] = 47.825$$

$$V_{H_2O} = 0.047\ (V_l) = 0.047\ (431.00) = 20.26$$

$$\%\ \text{Moisture} = \frac{(V_{H_2O})}{(V_{H_2O} + V_{DSCF})} \times 100 = \frac{(20.26)}{(20.26 + 47.825)} \times 100 = \boxed{29.80\ \%}$$

$$E\left[GR/DSCF\right] = \left[\frac{Mg\ Samp}{V_{DSCF}}\right]\left[\frac{15.43\ GR/GM}{1000\ Mg/GM}\right] = \left[\frac{31.5}{47.825}\right] 0.01543 = \boxed{0.0102}$$

$$E\ \left[lb/hr\right] = \left[GR/DSCF\right]\left[Vs \times A_{STK}\right]\left[\frac{528}{Ts}\right]\left[\frac{Ps}{29.92}\right]\left[\frac{1\ lb}{7000\ GR}\right]\left[\frac{3600\ sec}{hr}\right]\left[\frac{100 - \%\ M}{100}\right]$$

$$= \left[0.0102\right]\left[(30.4)\ (122.7)\right]\left[\frac{531.6}{831.4}\right]\left[\frac{29.74}{29.92}\right]\left[\frac{3600}{7000}\right]\left[\frac{100 - (29.80)}{100}\right] = 8.7$$

STACK GAS VELOCITY

KVB

Date: 11/7/04

LOCATION: LEHIGH CEMENT - CEMENTON

UNIT KILN FUEL COAL

$$V_s = 85.48\ (C_{pitot}) \left(\frac{(T_s)\ (\Delta P)}{(P_s)\ (MW_s)}\right)^{1/2} = 85.48\ (.84) \left(\frac{(826.5)\ (.21)}{(29.73)\ (29.49)}\right)^{1/2} = \boxed{33.0}$$

Where:
- C_{pitot} = Pitot tube correction factor
- T_s = Absolute average stack gas temperature °R.
- ΔP = Average stack ΔP, inches H_2O.
- P_s = Absolute stack gas pressure, inches H_g.
- MW_s = Stack gas molecular weight

ISOKINETIC CALCULATION

$$I = \frac{123.76\ (V_m)}{(D^2)(T_m)\ (\theta)} \left(\frac{T_s}{\Delta P}\right)^{1/2} \left[\frac{100}{100 - \%\ \text{Moisture}}\right]$$

$$I = \frac{123.76\ (50.783)}{(0.376)^2 (537.1)(72)} \left(\frac{826.5}{29.73}\right)^{1/2} \left[\frac{100}{(69.90)}\right] = \boxed{102.31\ \%}$$

Where:
- I = Percent of isokinetic sampling
- V_l = Total volume of liquid collected in impingers and silica gel, ml.
- V_m = Volume of gas sample through the dry gas meter (meter conditions), cu.ft.
- T_m = Absolute average dry gas meter temperature °R
- P_{bar} = Barometric pressure at sampling site, inches H_g.
- ΔH Average pressure drop across the orifice, inches H_2O.
- θ = Total sampling time, min.

PARTICULATE CALCULATIONS

$$V_{DSCF} = \left(\frac{T_{Std}}{P_{Std}}\right)\left(\frac{V_m}{T_m}\right)\left[P_b + \left(\frac{\Delta H}{13.6}\right)\right] = \quad @\ 528\ °R,\ 29.92\ "Hg$$

$$= 17.65 \left(\frac{50.783}{537.1}\right)\left[29.79 + \frac{(1.86)}{13.6}\right] = 49.948$$

$$V_{H_2O} = 0.047\ (V_l) = 0.047\ (456.5) = 21.46$$

$$\%\ \text{Moisture} = \frac{(V\ H_2O)}{(V_{H_2O} + V_{DSCF})} \times 100 = \frac{(21.46)}{(21.46 + 49.948)} \times 100 = \boxed{30.10\ \%}$$

$$E\left[GR/DSCF\right] = \left[\frac{Mg\ Samp}{V_{DSCF}}\right]\left[\frac{15.43\ GR/GM}{1000\ Mg/GM}\right] = \left[\frac{42.0}{49.948}\right]\ 0.01543 = \boxed{0.0130}$$

$$E\ \left[lb/hr\right] = \left[GR/DSCF\right]\ \left[Vs \times A_{STK}\right]\left[\frac{528}{Ts}\right]\left[\frac{Ps}{29.92}\right]\left[\frac{1\ lb}{7000\ GR}\right]\left[\frac{3600\ sec}{1\ hr}\right]\left[\frac{100 - \%\ M}{100}\right]$$

$$= \left[0.0130\right]\ \left[(33.0)\ (122.7)\right]\left[\frac{528}{826.5}\right]\left[\frac{29.73}{29.92}\right]\left[\frac{3600}{7000}\right]\left[\frac{100 - (30.10)}{100}\right] = 12.0$$

APPENDIX J

FUEL ANALYSIS

WARNER LABORATORIES, INC.

EST. 1923

P.O. BOX 214 CRESSON, PA. 16630

PHONE (814) 886-7400

DATE 11-16-84

WARNER NO. 827088

LEHIGH PORTLAND CEMENT CO.
P. O. BOX 117
CEMENTON, NEW YOR 12415 SAMPLE ID: COAL PIPE

OPERATING CO.:
SAMPLED BY: CUSTOMER PROVIDED
MINE:
LOCATION:

DATE SAMPLED: 11/8/84 DATE RECEIVED: 11/15/84

WEATHER:
GROSS WEIGHT:

OTHER ID: SAMPLE DRIED AND PULVERIZED WHEN SUBMITTED

CERTIFICATE OF ANALYSIS

	AS RECEIVED	DRY BASIS	
MOISTURE	1.22%	XXX	
VOLATILE MATTER	32.62%	33.02%	
FIXED CARBON	50.21%	50.83%	
ASH	15.95%	15.15%	
SULFUR	2.63%	2.66%	
CARBON	68.55%	69.39%	
HYDROGEN	4.67%	4.73%	
NITROGEN	1.24%	1.26%	
OXYGEN	5.74%	5.81%	
BTU/LB	12452	12606	
MAF BTU/LB			15034

APPROVED BY

WARNER LABORATORIES, INC.

EST. 1923

P.O. BOX 214 CRESSON, PA. 16630

PHONE (814) 886-7400

DATE: 11-16-84
WARNER NO. 827089

LEHIGH PORTLAND CEMENT CO.
P O. BOX 117
CEMENTON, NEW YOR 12415 SAMPLE ID: COAL PIPE

OPERATING CO.:
SAMPLED BY: CUSTOMER PROVIDED
MINE:
LOCATION:

DATE SAMPLED: 11/9/84 DATE RECEIVED: 11/13/84

WEATHER:
GROSS WEIGHT:

OTHER ID: SAMPLE DRIED AND PULVERIZED WHEN SUBMITTED

CERTIFICATE OF ANALYSIS

	AS RECEIVED	DRY BASIS
MOISTURE	1.05%	XXX
VOLATILE MATTER	33.52%	33.88%
FIXED CARBON	50.33%	50.86%
ASH	15.10%	15.26%
SULFUR	2.36%	2.40%
CARBON	69.94%	70.68%
HYDROGEN	4.78%	4.83%
NITROGEN	1.29%	1.30%
OXYGEN	5.46%	5.53%
BTU/LB	12678	12812
MAF BTU/LB		15118

APPROVED BY: [signature]

PAGE 1 OF 1

APPENDIX K

CHAIN OF CUSTODY FORMS

KVB
A Research-Cottrell Company

METHOD 5

PARTICULATE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant: LEHIGH - CEMENTON Sample date: 11/8/84
Sample location: KILN EXHAUST STACK Run no.: COMP 1
Sample recovery person: P. COVIELLO Recovery date: 11/8/84
Filter(s) no.: #4

MOISTURE

Impingers			Silica gel		
Final volume (wt)	714	ml(gm)	Final wt.	216.5 g	g
Initial volume (wt)	300	ml(gm)	Initial wt.	200.0 g	g
Net volume (wt)	414	ml(gm)	Net wt.	16.5 g	g

Total moisture 430.5 g
Color of silica gel BLUE / PINK
Description of impinger water CLEAR - MINIMUM RESIDUE

RECOVERED SAMPLE

Filter container no. #4 sealed 11/8/84 AT RI
Description of particulate on filter CREAM / CHALKY

Acetone rinse container no. #16 Liquid level marked 173 ML
Acetone blank container no. #44 Liquid level marked 175 ML
Samples stored and locked 11/9/84
Remarks: EVAPORATED ON SITE - VENT HOOD

Date of laboratory custody 11/8/84
Laboratory personnel taking custody L. BAKER KLB
Remarks: 24 HR. - DESICCATED

KVB
A Research-Cottrell Company

METHOD 5

PARTICULATE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant: LEHIGH-CEMENTON Sample date: 11/9/84
Sample location: KILN EXHAUST STACK Run no.: COMP 3
Sample recovery person: P. COVIELLO Recovery date: 11/9/84
Filter(s) no.: #7

MOISTURE

Impingers			Silica gel		
Final volume (wt)	742	ml(gm)	Final wt.	214.5 g	____ g
Initial volume (wt)	300	ml(gm)	Initial wt.	200.0 g	____ g
Net volume (wt)	442	ml(gm)	Net wt.	14.5 g	____ g

Total moisture 456.5 g
Color of silica gel BLUE/PINK
Description of impinger water CLEAR - SLIGHTLY CLOUDY @ BOTTOM - SOME VISIBLE SEDIMENT

RECOVERED SAMPLE

Filter container no. #7 sealed 11/9/84
Description of particulate on filter CREAM - CHALKY

Acetone rinse container no. #4 Liquid level marked 186
Acetone blank container no. #44 Liquid level marked 175
Samples stored and locked 11/9/84
Remarks: EVAPORATED ON SITE - HEAT BOOK

Date of laboratory custody 11/9/84
Laboratory personnel taking custody R. BAKER RLB
Remarks: 24 HR DESICCATED

KVB
A Research-Cottrell Company

METHOD 5

PARTICULATE SAMPLE RECOVERY AND INTEGRITY SHEET

Plant: LEHIGH - CEMENTON Sample date: 11/9/84
Sample location: KILN EXHAUST STACK Run no.: CAMP 2
Sample recovery person: P. COVIELLO Recovery date: 11/9/84
Filter(s) no.: #5

MOISTURE

Impingers		Silica gel	
Final volume (wt)	718 ml(gm)	Final wt.	213.0 g ____ g
Initial volume (wt)	300 ml(gm)	Initial wt.	200.0 g ____ g
Net volume (wt)	418 ml(gm)	Net wt.	13.0 g ____ g

Total moisture 431 g
Color of silica gel BLUE / PINK
Description of impinger water CLEAR - SLIGHTLY CLOUDY AT BOTTOM - NO DETECTABLE SEDIMENT

RECOVERED SAMPLE

Filter container no. #5 sealed 11/9/84 PETRI
Description of particulate on filter CREAM / CHALKY

Acetone rinse container no. #6 Liquid level marked 193
Acetone blank container no. #44 Liquid level marked 175
Samples stored and locked 11/10/84
Remarks: EVAPORATED ON-SITE - VENT HOOD

Date of laboratory custody 11/9/84
Laboratory personnel taking custody R. BAKER RLB
Remarks: 24 HR DESICCATED

KVB
A Research-Cottrell Company

METHOD 6 SAMPLE RECOVERY AND INTEGRITY DATA

PLANT LEHIGH CEMENT - CEMENTON SAMPLE LOCATION STACK (KILN)

FIELD DATA CHECKS

SAMPLE RECOVERY PERSONNEL R.A. PARKER, P.C. COVIELLO

PERSON WITH DIRECT RESPONSIBILITY FOR RECOVERED SAMPLES R.L. BAKER

Sample no.	Sample identification no.	Date of recovery	Liquid level marked	Stored in locked container	
1	LC - COMP-1	11/8/84	280 ML	11/8/84	RLB
2	LC - COMP-2	11/9/84	275 ML	11/9/84	RLB
3	LC - COMP-3	11/9/84	290 ML	11/9/84	RLB
4	———				
5	———				
6	———				
Blank	LC-BLANK	11/8/84	250 ML	11/9/84	RLB

REMARKS

SIGNATURE OF FIELD SAMPLE TRUSTEE

LABORATORY DATA CHECKS

LAB PERSON WITH DIRECT RESPONSIBILITY FOR RECOVERED SAMPLES R.A. PARKER

DATE RECOVERED SAMPLES RECEIVED ANALYZED ON-SITE 11/8 - 11/10/84

ANALYST R.A. PARKER

Sample no.	Sample identification no.	Date of analysis	Liquid at marked level	Sample identified
1	LC-COMP-1	11/8/84	280	R.A.P
2	LC-COMP-2	11/9/84	275	R.A.P
3	LC-COMP-3	11/10/84	290	R.A.P
4	———			
5	———			
6	———			
Blank	LC BLANK	11/10/84	250	R.A.P.

REMARKS

SIGNATURE OF LAB SAMPLE TRUSTEE

APPENDIX L

COMMUNICATIONS WITH NYS-DEC

KVB
A Research-Cottrell Company

18006 Skypark Blvd., P.O. Box 19518, Irvine, California 92714 (714) 250-6200

November 1, 1984

Mr. Richard Forgea
Senior Engineer
New York State -
Department of Environmental Conservation
Region IV
2176 Guilderland Avenue
Schenectady, New York 12306

Subject: Compliance Test Protocol - Particulate and Sulfur Oxide Emissions -Lehigh Portland Cement - Cementon, NY

Dear Mr. Forgea:

At the request of Lehigh Portland Cement, I am forwarding four (4) copies of the test protocol prepared for the compliance series at Lehigh Cement's Cementon, New York portland cement facility. As we discussed during our telephone conversation last month, the testing will consist of a series of three Environmental Protection Agency method 5 particulate tests and a concurrent series of three method 6 sulfur oxide (SO2) tests conducted at the kiln exhaust stack.

It appears that the tentative compliance testing schedule of November 8th and 9th remains most appropriate. I will await your review of this protocol. KVB will be on site at the plant the entire week of November 5th should you care to schedule a meeting with Mr. Sandbrook, plant manager, Mr. John Jones, Asst plant manager, and I to discuss the test program.

In any event, I will contact your office on Monday to confirm receipt of this test protocol. Perhaps a meeting can be scheduled then.

Thank you for your cooperation. KVB looks forward to again working with the State of New York.

Sincerely,
KVB Inc.

Ronald Baker

cy: D. Sandbrook - Lehigh
J. Jones - Lehigh
S. Hunter - KVB
ATT: Compliance Test Protocol

APPENDIX M

SULFUR ANALYSIS DATA

KVB
A Research-Cottrell Company

METHOD 6

SULFUR DIOXIDE ANALYTICAL DATA

PLANT LEHIGH - CEMENTON, NY DATE 11/8/84
SAMPLE LOCATION STACK (KILN) ANALYST R.A. PARKER

NORMALITY OF BARIUM PERCHLORATE
1 6.2 ml 0.0161 N
2 6.3 ml 0.0159 N 0.016 N
3 6.2 ml 0.0161 N

Run No.	Sample No.	Total* Volume of Sample	Sample Aliquot	Volume of Titrant V_t, ml: 1st Titration	2nd Titration	~~3rd Average~~	AVG.
1	LC-COMP-1	280 ml	1.0 ml	6.8	6.7	6.8	6.8
2	LC-COMP2	275 ml	1.0 ml	6.6	6.5	6.5	6.5
3	LC-COMP3	290 ml	1.0 ml	6.7	6.6	6.7	6.7
4	—						
5	—						
6	—						

* STANDARDIZED TO 1000 ml

Blank Analysis - Volume of titrant 1st titration < 0.1 ml
2nd titration < 0.1 ml
Average < 0.1 ml

$\frac{\text{1st titration}}{\text{2nd titration}}$ = 0.99 to 1.01 or 1st titration - 2nd titration = 0.2

Signature of Analyst R. Parker
Signature of Reviewer or Supervisor

SO_2 EMISSIONS CALCULATION

Test # LC-CAMP-1

Station LEHIGH - CEMENTON, NY

Test Location STACK (KILN)

Date 11/8/84

N_{BaCl}	0.016	eq/l
V_{BaCl}	8.8, 8.7, 8.8	ml
Vsample	1000	ml
Valiquot	1.0	ml
Vdry gas	51.227	ft^3
ΔH	1.88	$"H_2O$
T meter	528	°R
O_2	7.3	%
$P_{bar.}$	29.85	"Hg
V_{H2O}	430.5	ml
Duct Area	122.7	ft^2

3% H_2O_2 can absorb: 50 mg SO_2 / ml 3% H_2O_2

$$\left(\frac{\text{g-moles } SO_2}{2 \text{ eq}}\right)\left(0.016 \frac{\text{eq.}}{\text{l.}}\right)\left(8.8 \text{ ml}\right)\left(\frac{1000}{1.0}\right)\left(\frac{1.}{1000 \text{ ml}}\right) = \frac{0.0704}{\text{g-moles S}}$$

(normality of BaCl) (Volume of BaCl) (Aliquot Factor = Vsample / Valiquot)

$$\left(0.0704 \text{ g-moles } SO_2\right)\left(64.06 \frac{\text{g}}{\text{g-mole}}\right) = 4.510 \text{ grams } SO_2$$

$V_s = 2.42 \sqrt{Ts\ \Delta P} = 32.2$ ft/sec FROM METHOD 5 PRINT-OUT – APPENDIX A

$V_{SO_2 SCF} = (0.8497)(0.0704 \text{ g-moles } SO_2) = 0.0598 \ SCF_{SO_2}$

$$V_{DSCF} = (57.227^{ft.^3})\left(\frac{29.85 + \frac{1.88}{13.6}\ "H_2O}{29.92}\right)\frac{528}{528\ °R} = 51.343 \text{ DSCF}$$

$$ppm_{SO_2\ dry,\ 3\%\ O_2} = \left(\frac{0.0598\ SCF_{SO_2}}{51.343 \text{ DSCF} + 0.0598 SCF_{SO_2}}\right)\frac{1.8 \times 10^7}{21 - 7.3\ \%\ O_2} = 1540$$

$$\left(\frac{4.510 \text{ grams } SO_2}{DSCF + SO_{2scf} + H_2O_{scf}}\right)\left(\frac{528}{Ts\ °R}\right)\left(\frac{29.92}{P_{bar} + P_{stack}}\right)^{\frac{1}{2}}\left(V_s \frac{ft}{sec}\right)\left(\text{Duct Area } ft^2\right) = \frac{\text{grams}}{\text{second}}$$

$$\left(\frac{4.510}{51.343 + 0.0598 + 20.279}\right)\left(\frac{528}{528}\right)\left(\frac{29.92}{29.85 + .01}\right)^{\frac{1}{2}}\left(32.2\right)\left(122.7\right) = 157.9 \frac{\text{grams}}{\text{second}}$$

KVB

SO_2 EMISSIONS CALCULATION

Test # LC-Comp-2

Station LEHIGH CEMENTON, NY

Test Location STACK (KILN)

Date 11/8/84

N_{BaCl}	0.016	eq/l
V_{BaCl}	8.6, 8.5, 8.5	ml
Vsample	1000	ml
Valiquot	1.0	ml
Vdry gas	48.154	ft^3
ΔH	1.65	$"H_2O$
T meter	532	°R
O_2	6.75	%
$P_{bar.}$	29.79	"Hg
V_{H2O}	431	ml
Duct Area	122.7	ft^2

3% H_2O_2 can absorb: 50 mg SO_2 / ml 3% H_2O_2

$$\left(\frac{\text{g-moles } SO_2}{2 \text{ eq}}\right)\left(\frac{0.016 \text{ eq.}}{1 \text{ l.}}\right)\left(8.5 \text{ ml}\right)\left(\frac{1000}{1.0}\right)\left(\frac{1 \text{ l.}}{1000 \text{ ml}}\right) = 0.0680 \text{ g-moles } SO_2$$

normality of BaCl; Volume of Bacl; Aliquot Factor = Vsample / Valiquot

$$\left(0.0680 \text{ g-moles } SO_2\right)\left(64.06 \frac{\text{g}}{\text{g-mole}}\right) = 4.356 \text{ grams } SO_2$$

$V_s = 2.42\sqrt{Ts\ \Delta P} = 30.4$ ft/sec FROM METHOD 5 PRINTOUT - ATTACHED

$V_{SO_2 SCF} = (0.8497)(0.0680 \text{ g-moles } SO_2) = 0.0578 \ SCF_{SO_2}$

$$V_{DSCF} = (48.154 \text{ ft.}^3)\left(\frac{29.79 + \frac{1.65}{13.6} \text{ "H}_2O}{29.92}\right)\frac{528}{532 \text{ °R}} = 47.778 \text{ DSCF}$$

$$\text{ppm } SO_2 \text{ dry, 3\% } O_2 = \left(\frac{0.0578 \ SCF_{SO_2}}{47.778 \text{ DSCF} + 0.0578 \text{ SCF } SO_2}\right)\frac{1.8 \times 10^7}{21 - 6.75 \text{ \% } O_2} = 1537$$

$$\left(\frac{\text{grams } SO_2}{\text{DSCF} + SO_2{}_{scf} + H_2O_{scf}}\right)\left(\frac{528}{Ts \text{ °R}}\right)\left(\frac{29.92}{P_{bar} + P_{stack}}\right)^{-1}\left(V_s \frac{\text{ft}}{\text{sec}}\right)\left(\text{Duct Area ft}^2\right) = \text{\_\_\_\_ grams/second}$$

$$\left(\frac{4.356}{47.778 + 0.0578 + 20.302}\right)\left(\frac{528}{831}\right)\left(\frac{29.92}{29.79 + \frac{1.65}{13.6}}\right)^{-1}\left(30.4\right)\left(122.7\right) = 150.6 \text{ grams/second}$$

KVB

SO_2 EMISSIONS CALCULATION

Test # LC-COMP-3

Station LEHIGH-CEMENTON, NY

Test Location STACK (KILN)

Date 11/9/84

N_{BaCl}	0.016	eq/l
V_{BaCl}	6.7, 6.8, 6.7	ml
Vsample	1000	ml
Valiquot	1.0	ml
Vdry gas	50.763	ft^3
ΔH	1.86	$"H_2O$
T meter	537	°R
O_2	7.3	%
$P_{bar.}$	29.79	"Hg
V_{H2O}	156.5	ml
Duct Area	122.7	ft^2

3% H_2O_2 can absorb: 50 mg SO_2 / ml 3% H_2O_2

$$\left(\frac{\text{g-moles } SO_2}{2 \text{ eq}}\right)\left(0.016 \frac{\text{eq.}}{\text{l.}}\right)\left(6.7 \text{ ml}\right)\left(\frac{1000}{1.0}\right)\left(\frac{1 \text{ l.}}{1000 \text{ ml}}\right) = 0.0536 \text{ g-moles SO}$$

(normality of BaCl) (Volume of Bacl) (Aliquot Factor = Vsample / Valiquot)

$$\left(0.0536 \text{ g-moles } SO_2\right)\left(64.06 \frac{\text{g}}{\text{g-mole}}\right) = 3.434 \text{ grams } SO_2$$

$V_s = 2.42\sqrt{Ts\ \Delta P}$ = _____ ft/sec FROM METHOD 5 PRINTOUT - APPENDIX A

$V_{SO_2 SCF}$ = (0.8497) (0.0536 g-moles SO_2) = 0.0455 SCF_{SO_2}

$$V_{DSCF} = (50.763 \text{ ft.}^3)\left(\frac{29.79 + \frac{1.86}{13.6} \text{ "H}_2\text{O}}{29.92 \text{ "Hg} + 13.6}\right)\frac{528}{537 \text{ °R}} = 49.943 \text{ DSCF}$$

$$\text{ppm}_{SO_2\ \text{dry, 3\% } O_2} = \left(\frac{0.0455 \text{ SCF}_{SO_2}}{49.943 \text{ DSCF} + 0.0455 \text{ SCF}_{SO_2}}\right)\frac{1.8 \times 10^7}{21 - 7.3 \text{ \% } O_2} = 1205$$

$$\left(\frac{3.434 \text{ grams } SO_2}{DSCF + SO_{2\,scf} + H_2O_{scf}}\right)\left(\frac{528}{Ts\ °R}\right)\left(\frac{29.92}{P_{bar} + P_{stack}}\right)^{-1}\left(V_s \frac{\text{ft}}{\text{sec}}\right)\left(\text{Duct Area } ft^2\right) = \_\_\_\_ \frac{\text{grams}}{\text{second}}$$

$$\left(\frac{3.434}{49.943 + 0.0455 + 21.504}\right)\left(\frac{528}{826}\right)\left(\frac{29.92}{29.79 - \frac{0.80}{13.6}}\right)^{-1}\left(33.0\right)\left(122.7\right) = 123.5 \frac{\text{grams}}{\text{second}}$$

LEHIGH PORTLAND CEMENT COMPANY

LEHIGH
CEMENTON PLANT
BOX 117, CEMENTON, N. Y. 12415
315 943-5300

November 26, 1984

Mr. Ronald Baker
KVB, Engineering and Research Division
18006 Skypark Blvd.
P.O. Box 19518
Irvine, CA. 92714

Dear Mr. Baker,

Enclosed are the chemical results for the kiln feed, clinker, coal and dust samples taken during your kiln testing at the Cementon Plant November 8th and 9th. I have also enclosed the coal analyses from Warner Laboratories.

If you have any further questions, do not hesitate to contact us.

Yours truly,

Cheryl McElroy
Quality Control Supervisor

CM:cw

CHEMICAL ANALYSIS

Sample Date Nov. 9, 1984

	Clinker	Kiln Feed II	Return Dust 409 ✓	Waste Dust 420 ✓							
	23.08	23.46				Moist	Coal Pipe .58				
	4.61	4.17				Volt.	34.22				
	3.65	3.29				Ash	15.25				
	65.67	67.10				F.C.	49.95				
	1.73					S.	2.29				
	—	.16	3.75	1.95		BTU.	12558				
	.78	—	—	—							
			.64	.48							
			7.12	3.60							
		35.27	24.31	22.19							
			5.32	2.84							

O2
e2O3
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CHEMICAL ANALYSIS

Sample Date Nov 8, 1984

	II Clinker	Kiln II Feed	Return Dust 409 ✓	Waste Dust 420 ✓				Coal Pipe					
$_1O_2$	23.38	22.90					Moist.	.79					
$_2O_3$	4.98	4.48					Volt.	34.29					
$_2O_3$	3.70	3.38					Ash	16.02					
$_1O$	65.94	67.07					F.C.	48.90					
$_3O$	1.69	.88					S	2.58					
O_3	—	.14	2.86	3.75			BTU	12442					
O_3	.82	—	—	—									
$_2O$			.52	.64									
$_2O$			4.68	5.52									
oss		34.81	21.10	21.27									
otal													
otal Alk.			3.59	4.27									

SULFUR EMISSIONS RESULTS

TEST NUMBER	LC-COMP-1	LC-COMP-2	LC-COMP-3	AVERAGE
DATE OF TEST	11/8/84	11/9/84	11/9/84	
TEST TIME				
START	15:25	13:16	16:10	
STOP	16:57	15:15	17:53	
KILN OPERATION				
RAW FEED (GPM)	400.00	400.00	405.00	401.67
% MOISTURE	35.00	35.00	35.00	35.00
COAL FLOW (TPH)	16.80	16.40	16.40	16.53
HEAT VAL(BTU/LB)	12606.00	12812.00	12812.00	12743.33
RATE(10^6 BTU/HR)	423.56	420.23	420.23	421.34
DUST WASTED (TPH) ESTIM	21.00	21.00	21.00	21.00
KILN EXIT %O2	2.60	2.30	2.70	2.53
SAMPLING DATA				
TEST PERIOD (MIN)	72.00	72.00	72.00	72.00
VOLUME SAMPLED(DSCF)	51.49	47.83	49.95	49.75
STACK TEMP (F)	368.00	371.00	366.00	368.33
METER TEMP (F)	67.00	72.00	77.00	72.00
STACK %OXYGEN	7.30	6.80	7.30	7.13
STACK %MOISTURE	29.80	29.80	28.30	29.30
STACK PRES (IN HG)	29.81	29.74	29.73	29.76
MOLECULAR WT (WET)	27.76	27.12	27.49	27.46
MOLECULAR WT (DRY)	31.60	31.00	31.58	31.39
SULFUR DIOXIDE EMISSIONS				
STACK FLOW (ACFM)	237050.00	223460.00	243090.00	234533.33
(DSCFM)	105725.82	99071.60	110706.58	105168.00
SO2 - PPM @3% O2 EPA METHOD #6	1540.00	1537.00	1205.00	1427.33
SO2 RATE (GM/SEC)	157.90	150.60	123.50	144.00
(LB/HR)	1253.17	1195.24	980.16	1142.86
SULFUR RATE (GM/SEC)	78.95	75.30	61.75	72.00
(LB/HR)	626.59	597.62	490.08	571.43
(LB/10^6 BTU)	1.48	1.42	1.17	1.36
O2	2.60	2.30	2.70	2.53
CO	214.00	691.00	340.00	415.00
NOX	1486.00	1353.00	1454.00	1431.00
SO2	1276.00	1389.00	889.00	
	-1.82	-16.21	9.30	-2.91
SULFUR BALANCE				
RAW FEED %SO3	.14	.16	.16	
%S EQUIV	.06	.064	.064	.06
SULFUR (TPH DRY)	.16	.17	.17	
COAL %S	2.58	2.29	2.29	
SULFUR (TPH DRY)	.43	.38	.38	
TOTAL SULFUR IN -TPH	.59	.55	.55	
CLINKER %SO3	.82	.78	.78	
%S EQUIV	.33	.31	.31	
EST. PROD RATE (TPD)	1480.00	1480.00	1490.00	
SULFUR (TPH DRY)	.20	.19	.19	
ESP DUST %SO3	2.86	3.75	3.75	
%S EQUIV	1.14	1.50	1.50	
SULFUR (TPH DRY)	.24	.32	.32	
STACK SULFUR (TPH)	.31	.30	.25	
TOTAL SULFUR OUT-TPH	.75	.81	.76	
%S ABSORPTION	.52	.55	.45	

KVB®
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