KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
352/377-5822 • FAX/377-7158

KA 187-00-09

July 14, 2000

Mr. Mort Benjamin
Florida Department of
Environmental Protection
7825 Baymeadows Way, Suite B-200
Jacksonville, FL 32256-7590

Subject: Florida Rock Industries, Inc.
Thompson S. Baker Cement Plant
Newberry, Florida
Permit No. AC01-267311/PSD-FL-228

Dear Mr. Benjamin:

Enclosed is a copy of our report describing the results of PM/PM10 testing conducted on the kiln/raw mill and clinker cooler on June 10-11, 2000, at the subject facility.

If you have any questions regarding this report, please do not hesitate to contact me.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E

JBK:wa
Enc.

c: Mr. Lalit Lalwani, FDEP, Gainesville
Mr. Martin Costello, FDEP, Tallahassee
Mr. Tim Atkinson, Oertel, Hoffman
Mr. George Townsend, FRI

PARTICULATE MATTER EMISSION MEASUREMENTS AND VISIBLE EMISSIONS OBSERVATIONS

KILN/RAW MILL AND
CLINKER COOLER

FLORIDA ROCK INDUSTRIES
THOMPSON S. BAKER CEMENT PLANT
NEWBERRY, FLORIDA

PERMIT NO. AC01-267311/PSD-FL-228

JULY 10-11, 2000

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
352/377-5822 • FAX 377-7158

PARTICULATE MATTER EMISSION MEASUREMENTS AND VISIBLE EMISSIONS OBSERVATIONS

KILN/RAW MILL AND
CLINKER COOLER

FLORIDA ROCK INDUSTRIES
THOMPSON S. BAKER CEMENT PLANT
NEWBERRY, FLORIDA

PERMIT NO. AC01-267311/PSD-FL-228

JULY 10-11, 2000

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 N.W. 13TH STREET
GAINESVILLE, FLORIDA 33609
(352) 377-5822

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

To the best of my knowledge, all applicable field and analytical procedures comply with the Florida Department of Environmental Protection requirements and all test data and plant operating data are true and correct.

John B. Koogler, Ph.D., P.E.

State of Florida
Registration No. 12925

7/14/00
Date

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

TABLE OF CONTENTS

1.0 INTRODUCTION

Florida Rock Industries owns and operates a dry process precalciner Portland cement plant located on CR 235, two miles north of Newberry, Florida. The Northeast District office of the Florida Department of Environmental Protection (FDEP) in Jacksonville, the Northeast District Branch Office in Gainesville, and FDEP in Tallahassee, Florida, were notified of the scheduled initial air emission performance tests and testing protocol at the cement plant.

On July 10-11, 2000, Koogler & Associates, Environmental Services of Gainesville, Florida, conducted particulate matter emission measurements and visible emissions observations on the kiln/raw mill stack and clinker cooler stack in accordance with Specific Condition No. 6 of FDEP Permit AC01-267311/PSD-FL-228 and EPA Methods 5 and 9 (40 CFR 60, Appendix A). Total particulate matter emissions were measured with EPA Method 5 with all PM presumed to be PM10. The purpose of the testing was to demonstrate compliance with the PM/PM10 emission limiting standards of Permit No. AC01-267311/PSD-FL-228.

During the kiln/raw mill test period, the plant was operating at a preheater feed rate of 155.1 tons per hour. This corresponds to a kiln feed rate of about 143.3 tons per hour and a clinker production rate of 94.2 tons per hour. During the clinker cooler test period, the clinker production rate averaged 94.2 tons per hour. Permit AC01-

267311 limits the preheater feed rate to 149.9 tons per hour, which approximately corresponds to a permitted clinker production rate of 95.8 tons per hour.

The coal feed rate to the kiln during the kiln/raw mill test period averaged 6.73 tons per hour (nominally 12,900 Btu/lb). Heat input to the kiln for the test period was 173.6 MMBtu per hour. The permit limits the coal feed rate to 14.0 tons per hour and the heat input rate to 364 MMBtu per hour.

The permit for the plant limits particulate matter emissions from the kiln/raw mill and clinker cooler to rates established by Best Available Control Technology. The permitted particulate matter (PM10) emission rates from the kiln/raw mill and clinker cooler are 0.17 pounds per ton of preheater feed and 0.13 pounds per ton of clinker, respectively. This is equivalent to 25.5 pounds of PM10 per hour from the kiln/raw mill and 12.2 pounds of PM10 per hour from the clinker cooler. The permit also limits the opacity of emissions from the kiln/raw mill and clinker cooler to 10 percent or less, each emission point.

The exhaust gases from the kiln/raw mill and clinker cooler discharge through separate stacks with particulate matter from both controlled by electrostatic precipitators (ESPs). The measured mass emission rate of PM10 from the kiln/raw mill averaged 6.84 pounds per hour which is well below the permit PM10 limit of 25.5 pounds per hour. PM10 emissions from the clinker cooler averaged 1.42

~25 lb std.

~10 lb std.

pounds per hour, also well below the permitted PM10 emission limit of 12.2 pounds per hour.

Visible emissions observations were conducted for 60-minute periods on both stacks. During the observation periods, no visible emissions were detected from either stack. The permit limits the opacity of emissions to 10 percent from each source.

Based upon the data presented herein, it can be concluded that during the periods of testing on July 10-11, 2000, the PM/PM10 emissions from both the kiln/raw mill and clinker cooler were well below limits set forth in Permit AC01-267311/PSD-FL-228.

2.0 SAMPLING POINT LOCATIONS

Kiln/Raw Mill Stack

Four sample ports are located in the 112-inch diameter, 241-foot high stack exhausting the kiln/raw mill. The ports are 50.6 feet (5.4 stack diameters) below the top of the stack and 146.8 feet (15.7 diameters) above the point where the kiln/raw mill gases enter the stack. Based on the requirements of EPA Method 1 (40 CFR 60, Appendix A), 12 sample points were selected; three points through each of the four ports.

Clinker Cooler

Four sample ports are also located in the 68-inch diameter, 191-foot high stack exhausting the clinker cooler. The ports are 86 feet (13.2 diameters) below the top of the stack and 73 feet (11.2 diameters) above the point where the cooler gases enter the stack. Based on the requirements of EPA Method 1 (40 CFR 60, Appendix A), 24 sample points were selected; six points through each of the four ports.

3.0 FIELD AND ANALYTICAL PROCEDURES

Particulate matter emission measurements (PM and PM10) were made on the kiln/raw mill and clinker cooler stacks using EPA Method 5 with all particulate matter presumed to be PM10 particles. For the kiln/raw mill testing, the sample train was supported by monorails and the train was assembled as specified in EPA Method 5 without exception. For the cooler testing, the heated filter holder was separated from the impingers with a flexible sample line as provided for in Rule 62.297.330(5), F.A.C.

The sampling point locations for the EPA Method 5 tests were established in accordance with EPA Method 1. Stack gas velocity measurements and stack gas moisture measurements were made in conjunction with the EPA Method 5 tests in accordance with EPA Methods 2 and 4. Measurements to determine the dry molecular weight of the stack gas were made in accordance with EPA Method 3. Opacity observations were made in accordance with EPA Method 9. All EPA test methods are described in 40 CFR 60, Appendix A, and have been adopted by reference by FDEP by Rule 62-297.401, F.A.C.

There were no variations or exceptions to any of the referenced test methods. The diagram of the sampling train for the particulate matter sampling can be found in 40 CFR 60, Appendix A.

4.0 SUMMARY OF RESULTS

The particulate matter emission measurements made on July 10 and 11, 2000, are summarized in Tables 1 and 2. Total particulate matter emissions were measured with EPA Method 5 on both sources with all particulate matter presumed to be PM10 particles.

The PM/PM10 emission rate from the kiln/raw mill ranged from 5.79 to 8.35 pounds per hour and averaged 6.84 pounds per hour compared to a permit limit of 25.5 pounds per hour. The measured mass emission rate of PM10 corresponds to a unit emission rate of 0.044 pounds per ton of preheater feed at the preheater feed rate of 155.1 tons per hour and to a PM10 concentration in the stack gas of 0.0056 grains per dry standard cubic foot. The permit limits the unit emission rate of PM10 from the kiln/raw mill to 0.17 pounds per ton of feed. The stack gas flow rate from the kiln/raw mill averaged 124,422 standard cubic feet per minute, dry (186,656 acfm). The stack gas temperature averaged 211°F and the moisture content averaged 15.7 percent.

The PM/PM10 emission rate from the clinker cooler ranged from 0.81 to 2.40 pounds per hour and averaged 1.42 pounds per hour. The permit limit for PM10 from the cooler is 12.25 pounds per hour at a clinker production rate of 94.2 tons per hour. The permitted unit emission limit is 0.13 pounds of PM10 per ton of

clinker. The corresponding unit emission rate was 0.015 pounds of PM10 per ton of clinker and the PM10 concentration in the stack gas was 0.0042 grains per dry standard cubic foot. The stack gas flow rate from the cooler averaged 38,704 dry standard cubic feet per minute (61,989 acfm), the stack gas temperature averaged 367°F and the stack gas moisture averaged 3.1 percent.

Visible emissions observations were conducted for 60-minute periods on both emission points. During the observation period, no visible emissions were detected from either the kiln/raw mill or clinker cooler. The permit limits the opacity of emissions to 10 percent from both emission points.

Based upon the data presented herein, it can be concluded that during the periods of testing on July 10-11, 2000, the kiln/raw mill and clinker cooler were operating in compliance with the emission limiting standards set forth in Permit AC01-267311.

Calculations, field and analytical data sheets, plant operating information, equipment calibration sheets and a list of project participants are included in the Appendix of this report.

TABLE 1

SUMMARY OF SOURCE EMISSION TEST DATA

Florida Rock Industries
KILN/RAW MILL
July 10, 2000

Run No.	Process Weight Rate (Tons/hr)	Stack Gas Flow Rate (SCFMD)	Stack Gas Temperature (F)	Stack Gas Moisture (%)	Particulate Matter Conc. (gr/dscf)	Particulate Matter Emission Rate (Lbs/Hr)
1	156.0	124,935	208	15.3	0.0078	8.35
2	155.0	125,577	207	15.9	0.0059	6.37
3	155.0	122,754	218	15.7	0.0055	5.79
Average	155.3	124,422	211	15.7	0.0064	6.84

Allowable Particulate Matter Emission Rate = 25.5 lbs/Hr

TABLE 2

SUMMARY OF SOURCE EMISSION TEST DATA

Florida Rock Industries, Newberry Fl.
Clinker Cooler
July 11, 2000

Run No.	Process Weight Rate (Tons/hr)	Stack Gas Flow Rate (SCFMD)	Stack Gas Temperature (F)	Stack Gas Moisture (%)	Particulate Matter Conc. (gr/dscf)	Particulate Matter Emission Rate (Lbs/Hr)
1	94.5	40,661	360	2.8	0.0069	2.40
2	93.3	39,345	367	3.2	0.0031	1.05
3	94.5	36,105	372	3.3	0.0026	0.81
Average	94.1	38,704	367	3.1	0.0042	1.42

Allowable Particulate Matter Emission Rate = 12.25 lbs/Hr

APPENDIX

KILN/RAW MILL
CALCULATIONS AND FIELD DATA SHEETS

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

GENERAL DATA

DATA FILE NAME: KILN_00

Company	: Florida Rock Industries				**********
Source/Unit	: Cement Kiln				04:02 PM
Date	: July 10, 2000		Cp	: 0.840	
Stack dia.	: 112.00 inch	OR :	Duct Length	: 0.00	inch
Oxygen Corr.	: 0.0 percent		Duct Width	: 0.00	inch
CO2 Corr.	: 0.0 percent		Std. Temp.	: 68	F

FUEL ANALYSIS DATA, (By F Factor or Fuel Use)

F Factor = F, Fuel Use = U F Process Wt.

Hydrogen,wt%	: 0.00	Run 1	: 156	Tons/hr
Carbon, wt%	: 0.00	Run 2	: 155	
Sulfur, wt%	: 0.00	Run 3	: 155	
Nitrogen,wt%	: 0.00			
Oxygen, wt%	: 0.00			
Btu/lb	: 0			

Type of Flow Meter : (1=Meter Box 2=Mass Flow Meter) 1

F-Factor : dscf/MMBtu;

FIELD DATA ------- METHOD 5	RUN 1	RUN 2	RUN 3
Meter Temp., Tm (F)	95	100	102
Stack Temp., Ts (F)	208	207	218
Sq.Rt. dP	0.72	0.73	0.72
dH (in. H2O)	1.43	1.58	1.55
Meter Vol.,Vm (ft3)	41.431	43.268	43.212
Meter Y	1.000	1.000	1.000
Bar. Press.,Pb (in.Hg.)	30.08	30.08	30.08
Vol. H2O, Vlc (ml)	153	166	162
Static Press.,Ps (in.H2O)	-0.42	-0.42	-0.42
Test Time (min.)	60.0	60.0	60.0
Nozzle Dia.,Dn (in.)	0.266	0.266	0.266
Oxygen, O2 (%)	8.1	11.1	10.1
Carbon Dioxide, CO2 (%)	17.6	16.6	16.5
Carbon Monoxide, CO (%)	0.0	0.0	0.0

Report Emission Criteria in ? 1 = lb/hr g = gr/dscf : L

Process Rate Units ? T = Ton/hr, L = Lbs/hr, C = Cans/min: T

Allowable Particulate Matter Emission Rate .....:

LABORATORY RESULTS	RUN 1	RUN 2	RUN 3	
GRAVIMETRIC ANALYSIS METHOD 5 :				
Front Half Wash (FHW)	0.01370	0.01210	0.00840	grams
Filterable Sample (MF)	0.00640	0.00370	0.00620	
Condensible Sample (BHW)	0.00000	0.00000	0.00000	

SOURCE TEST CALCULATIONS

PLANT : Florida Rock Industries
Cement Kiln

RUN NO.: 1
DATE : July 10, 2000

STD.TEMP, Tstd	=	68 F	STATIC PRESS.,Ps	=	-0.42 in. H2O
METER TEMP, Tm	=	94.9166 F	PITOT COFF., Cp	=	0.840
STACK TEMP, Ts	=	208.3 F	STACK I.D.	=	112.00 inch
AVG.VEL.HEAD,dP	=	0.521 in. H2O	DUCT LENGTH	=	inch
METER ORIFICE,dH	=	1.43 in. H2O	DUCT WIDTH	=	inch
METER VOL., Vm	=	41.431 Cu.Ft.	STACK AREA, As	=	68.417 Sq.Ft.
METER COFF., Y	=	1.000	TEST TIME	=	60.00 min.
BAR. PRESS., Pb	=	30.08 in.Hg	NOZZLE DIA.	=	0.266 inch
COND.(Vlc)	=	153.0 ml	NOZZLE DIA., An	=	3.9E-04 Sq.Ft.

GAS ANALYSIS = 8.10 % O2 0.00 % CO
17.60 % CO2 74.30 % N2

****

Vm(std) = [(T(std) + 460) / 29.92] x Vm x Y x (Pb + (dH / 13.6)) / (Tm + 460).....	=	39.771	dscf
Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc	=	7.202	scf
Bws = Vw(std) / (Vm(std) + Vw(std)).....	=	0.153	Lower Bws value used.
Bws @ Saturated Conditions = Vapor Press. of H2O @ Dew Point Temp. / (Ps, in.Hg.)	=	0.919	
%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100	=	70.34	
Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]	=	31.14	
Ms = (Md x (1-Bws)) + (18.0 x Bws).....	=	29.13	
P(stack) = Pbar + (Ps / 13.6)	=	30.05	in. Hg
vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460) / (Ms x P(stack))]	=	45.30	ft/sec
Qs = vs x As x 60	=	185,975	acf/min
Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460)) x (P(stack)/29.92)	=	124,935	dscf/min
I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) / (T(std) + 460) / 29.92] x 100 / [Time x P(stack) x An x vs x 60]	=	94.07	%

SOURCE TEST CALCULATIONS

PLANT : Florida Rock Industries
Cement Kiln

RUN NO.: 2
DATE : July 10, 2000

STD.TEMP, Tstd	=	68 F	STATIC PRESS.,Ps	=	-0.42 in. H2O
METER TEMP, Tm	=	99.83 F	PITOT COFF., Cp	=	0.840
STACK TEMP, Ts	=	207.0 F	STACK I.D.	=	112.00 inch
AVG.VEL.HEAD,dP	=	0.531 in. H2O	DUCT LENGTH	=	inch
METER ORIFICE,dH	=	1.58 in. H2O	DUCT WIDTH	=	inch
METER VOL., Vm	=	43.268 Cu.Ft.	STACK AREA, As	=	68.417 Sq.Ft.
METER COFF., Y	=	1.000 ← ?	TEST TIME	=	60.00 min.
BAR. PRESS., Pb	=	30.08 in.Hg	NOZZLE DIA.	=	0.266 inch
COND.(Vlc)	=	166.0 ml	NOZZLE DIA., An	=	3.9E-04 Sq.Ft.

GAS ANALYSIS = 11.10 % O2 0.00 % CO
16.60 % CO2 72.30 % N2

****

Vm(std) = [T(std) + 460 / 29.92] x Vm x Y x (Pb + (dH / 13.6)) / (Tm + 460).....	=	41.184	dscf
Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc	=	7.814	scf
Bws = Vw(std) / (Vm(std) + Vw(std)).....	=	0.159	Lower Bws value used.
Bws @ Saturated Conditions = Vapor Press. of H2O @ Dew Point Temp. / (Ps, in.Hg.)	=	0.901	
%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100	=	138.97	
Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]	=	31.10	
Ms = (Md x (1-Bws)) + (18.0 x Bws).....	=	29.01	
P(stack) = Pbar + (Ps / 13.6)	=	30.05	in. Hg
vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460) / (Ms x P(stack))]	=	45.78	ft/sec
Qs = vs x As x 60	=	187,923	acf/min
Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460)) x (P(stack)/29.92)	=	125,577	dscf/min
I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) / (T(std) + 460) / 29.92] x 100 / [Time x P(stack) x An x vs x 60]	=	96.91	%

$50 \$/hr \times 720$

$\$3,450$

720

($4.80)

SOURCE TEST CALCULATIONS

PLANT : Florida Rock Industries
Cement Kiln

RUN NO.: 3
DATE : July 10, 2000

STD.TEMP, Tstd	=	68 F	STATIC PRESS.,Ps	=	-0.42 in. H2O
METER TEMP, Tm	=	102.00 F	PITOT COFF., Cp	=	0.840
STACK TEMP, Ts	=	217.7 F	STACK I.D.	=	112.00 inch
AVG.VEL.HEAD,dP	=	0.512 in. H2O	DUCT LENGTH	=	inch
METER ORIFICE,dH	=	1.55 in. H2O	DUCT WIDTH	=	inch
METER VOL., Vm	=	43.212 Cu.Ft.	STACK AREA, As	=	68.417 Sq.Ft.
METER COFF., Y	=	1.000	TEST TIME	=	60.00 min.
BAR. PRESS., Pb	=	30.08 in.Hg	NOZZLE DIA.	=	0.266 inch
COND.(Vlc)	=	162.0 ml	NOZZLE DIA., An	=	3.9E-04 Sq.Ft.

GAS ANALYSIS = 10.12 % O2 0.00 % CO
16.50 % CO2 73.38 % N2

****

Vm(std) = [T(std) + 460 / 29.92] x Vm x Y x (Pb + (dH / 13.6)) / (Tm + 460)..... = 40.969 dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc = 7.625 scf

Bws = Vw(std) / (Vm(std) + Vw(std))..... = 0.157 | Lower Bws value used.

Bws @ Saturated Conditions = Vapor Press. of H2O @ Dew Point Temp. / (Ps, in.Hg.) ..... = 1.000 | Lower Bws value used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 = 109.38

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)] = 31.04

Ms = (Md x (1-Bws)) + (18.0 x Bws)..... = 29.00

P(stack) = Pbar + (Ps / 13.6) ..... = 30.05 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460) / (Ms x P(stack))] ..... = 45.33 ft/sec

Qs = vs x As x 60 ..... = 186,070 acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460)) x (P(stack)/29.92) ..... = 122,754 dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) / (T(std) + 460) / 29.92] x 100 / [Time x P(stack) x An x vs x 60] ..... = 98.63 %

A. FIELD DATA SUMMARY

PLANT : Florida Rock Industries
Cement Kiln
DATE : July 10, 2000

	RUN 1	RUN 2	RUN 3
Vlc = Vol water collected in train, ml	153.0	166.0	162.0
Vm = Sample gas vol, meter cond., acf	41.431	43.268	43.212
Y = Meter calibration factor	1.0000	1.0000	1.0000
Pbar = Barometric pressure, in. Hg	30.08	30.08	30.08
Pstatic = Stack static pressure, in. H2O	-0.42	-0.42	-0.42
dH = Avg meter pressure diff, in. H2O	1.43	1.58	1.55
Tm = Absolute meter temp., degrees R	554.9	559.8	562.0
Vm(std) = Sample gas vol, Std. cond., dscf	39.771	41.184	40.969
Bws = Water vapor in gas stream, fraction	0.153	0.159	0.157
MF = Moisture factor (1 - Bws)	0.847	0.841	0.843
CO2 = Carbon Dioxide, dry, volume %	17.60	16.60	16.50
O2 = Oxygen, dry, volume %	8.10	11.10	10.12
N2 = Nitrogen, dry volume %	74.30	72.30	73.38
Md = Molecular weight of stack gas, dry	31.14	31.10	31.04
Ms = Molecular weight of stack gas, wet	29.13	29.01	29.00
Cp = Pitot tube coefficient	0.84	0.84	0.84
Sq.Rt. dP = Avg. square root of each dP	0.7219	0.7288	0.7157
Ts = Absolute stack temp., degrees R	668.3	667.0	677.7
A = Area of stack, ft2	68.42	68.42	68.42
Qstd = Volumetric flowrate, dscfm	124,935	125,577	122,754
An = Nozzle area, ft2	3.86E-04	3.86E-04	3.86E-04
O = Sample time, minutes	60.00	60.00	60.00
%I = Isokinetic variation, percent	94.07	96.91	98.63

B. PARTICULATE DATA SUMMARY

PLANT : Florida Rock Industries
Cement Kiln
DATE : July 10, 2000

	RUN 1	RUN 2	RUN 3
Sample Weight (FHW + MF + BHW), mg	20.10	15.80	14.60
Meter Volume, standard cond., Vm(std)	39.771	41.184	40.969
Carbon Dioxide, percent	17.60	16.60	16.50
Oxygen, percent	8.10	11.10	10.12
Sample Concentration :			
gr/scf	0.0066	0.0050	0.0046
gr/dscf	0.0078	0.0059	0.0055
gr/dscf @ 0 % CO2	0.0053	0.0043	0.0040
gr/dscf @ 0 % O2	0.0127	0.0126	0.0107
ppm * MW (dry gas).....	429.0	325.6	302.5
ppm * MW @ 0% CO2	0.0	0.0	0.0
ppm * MW @ 0% O2	700.4	694.4	586.4

EMISSION RATE CALCULATIONS

PLANT :Florida Rock Industries
Cement Kiln

RUN NO.: 1
STANDARD TEMP. : 68 F DATE : July 10, 2000

Front Half Wash (FHW)	0.01370 grams	Vm(std)	39.771 ft3
Mass Filter (MF)	0.00640 grams	Vw(std)	7.202 ft3
Back Half Wash (BHW)	0.00000 grams	Qs(std)	124,935 dscfm
Vm(std) SO2	dscf	Bws	0.153
CO2 CORR 0.0 %		CO2	17.60 %
O2 CORR. 0.0 %		O2	8.10 %

F-FACTOR

10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) - 0.46(%O2)] / (Btu/lb) x [(Tstd + 460)/528] ..... dscf/MMBtu

FUEL USE

Use Rate (gal/ton) * Process Wt. (ton/hr) ..... gal/hr

Heat Input = (Process Weight (ton/hr) x Heating .... MMBtu/hr
Value (Btu/gal) x Fuel Use Rate (gal/ton) / 1E6

TOTAL PARTICULATE

15.432 x (FHW + MF + BHW) / [(Vm(std) + Vw(std)] ...	0.0066	gr/scf
15.432 x (FHW + MF + BHW) / (Vm(std)	0.0078	gr/dscf
gr/dscf x (12 / %CO2)	0.0053	@ 0% CO2
gr/dscf x [(20.9 - Oxygen corr.) / (20.9 - %O2)] ...	0.0127	@ 0% O2
0.00857 x Qs(std) x gr/dscf	8.35	lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..		lb/MMBtu
Particulate (lb/hr) / Heat Input (MMBtu/hr)		lb/MMBtu

TOTAL ACID MIST

[1.0811E-4 x (Vt - Vtb) x N x Vsol] / Vol(aloq)	lb Acid Mist
[Acid Mist (lb) / Vm std (ft^3)] x Qs std x 60 ...	lb/hr
[Acid Mist (lb) / Vm std (ft^3)] x F-Factor	lb/MMBtu

SULFUR DIOXIDE (SO2)

[7.061E-5 x (Vt - Vtb) x N x Vsol] / Vol(aloq)	lb SO2
[SO2 (lb) / Vm std (ft^3)] x Qs std (ft^3/min) x 60	lb/hr
[SO2 (lb) / Vm std (ft^3)] x F	lb/MMBtu
[Mass SO2 (lb) x 385 / 64E+6 (ft^3/lb)] / Vm (std)	ppm
ppm x 0.0 % Corr. / 17.6 % CO2 in Stack	ppm @ 0% CO2
ppm x (20.9% - 0.0% O2 Corr)/(20.9% - 8.1% O2 Stack)	ppm @ 0% O2
SO2 (lb/hr / Heat Input)	lb/MMBtu

HYDROGEN CHLORIDE DATA SUMMARY

[Mass HCl(mg) x 385 x 1E6] / [453600 x 36.5 x Vm(std	ppm
ppm x 0.0 % Corr. / 17.6 % CO2 in Stack	ppm @ 0% CO2
ppm x (20.9% - 0.0% O2 Corr)/(20.9% - 17.6% O2 Stack	ppm @ 0% O2
[Mass HCl(mg) x 60 x Qs / (Vm(std) x 453,600)]...	lb/hr

EMISSION RATE CALCULATIONS

PLANT :Florida Rock Industries
Cement Kiln

RUN NO.: 2
STANDARD TEMP. : 68 F DATE : July 10, 2000

Front Half Wash (FHW)	0.01210	grams	Vm(std)	41.184	ft3
Mass Filter (MF)	0.00370	grams	Vw(std)	7.814	ft3
Back Half Wash (BHW)	0.00000	grams	Qs(std)	125,577	dscfm
Vm(std) SO2		dscf	Bws	0.159	
CO2 CORR 0.0 %			CO2	16.60	%
O2 CORR. 0.0 %			O2	11.10	%

F-FACTOR

10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) - 0.46(%O2)] / (Btu/lb) x [(Tstd + 460)/528] ..... dscf/MMBtu

FUEL USE

Use Rate (gal/ton) * Process Wt. (ton/hr) ..... gal/hr

Heat Input = (Process Weight (ton/hr) x Heating .... MMBtu/hr
Value (Btu/gal) x Fuel Use Rate (gal/ton) / 1E6

TOTAL PARTICULATE

15.432 x (FHW + MF + BHW) / [(Vm(std) + Vw(std)] ...	0.0050	gr/scf
15.432 x (FHW + MF + BHW) / (Vm(std)	0.0059	gr/dscf
gr/dscf x (12 / %CO2)	0.0043	@ 0% CO2
gr/dscf x [(20.9 - Oxygen corr.) / (20.9 - %O2)] ...	0.0126	@ 0% O2
0.00857 x Qs(std) x gr/dscf	6.37	lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..		lb/MMBtu
Particulate (lb/hr) / Heat Input (MMBtu/hr)		lb/MMBtu

TOTAL ACID MIST

[1.0811E-4 x (Vt - Vtb) x N x Vsol] / Vol(aloq)	lb Acid Mist
[Acid Mist (lb) / Vm std (ft^3)] x Qs std x 60 ...	lb/hr
[Acid Mist (lb) / Vm std (ft^3)] x F-Factor	lb/MMBtu

SULFUR DIOXIDE (SO2)

[7.061E-5 x (Vt - Vtb) x N x Vsol] / Vol(aloq) .	lb SO2
[SO2 (lb) / Vm std (ft^3)] x Qs std (ft^3/min) x 60	lb/hr
[SO2 (lb) / Vm std (ft^3)] x F	lb/MMBtu
[Mass SO2 (lb) x 385 / 64E+6 (ft^3/lb)] / Vm (std)	ppm
ppm x 0.0 % Corr. / 17.6 % CO2 in Stack	ppm @ 0% CO2
ppm x (20.9% - 0.0% O2 Corr)/(20.9% - 17.6% O2 Stack	ppm @ 0% O2
SO2 (lb/hr / Heat Input)	lb/MMBtu

HYDROGEN CHLORIDE DATA SUMMARY

[Mass HCl(mg) x 385 x 1E6] / [453600 x 36.5 x Vm(std	ppm
ppm x 0.0 % Corr. / 16.6 % CO2 in Stack	ppm @ 0% CO2
ppm x (20.9% - 0.0% O2 Corr)/(20.9% - 16.6% O2 Stack	ppm @ 0% O2
[Mass HCl(mg) x 60 x Qs / (Vm(std) x 453,600)]...	lb/hr

EMISSION RATE CALCULATIONS

PLANT :Florida Rock Industries
Cement Kiln

RUN NO.: 3
STANDARD TEMP. : 68 F DATE : July 10, 2000

Front Half Wash (FHW)	0.00840	grams	Vm(std)	40.969	ft3
Mass Filter (MF)	0.00620	grams	Vw(std)	7.625	ft3
Back Half Wash (BHW)	0.00000	grams	Qs(std)	122,754	dscfm
Vm(std) SO2		dscf	Bws	0.157	
CO2 CORR 0.0 %			CO2	16.50	%
O2 CORR. 0.0 %			O2	10.12	%

F-FACTOR

10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) - 0.46(%O2)] / (Btu/lb) x [(Tstd + 460)/528] ..... dscf/MMBtu

FUEL USE

Use Rate (gal/ton) * Process Wt. (ton/hr) ..... gal/hr

Heat Input = (Process Weight (ton/hr) x Heating .... MMBtu/hr
Value (Btu/gal) x Fuel Use Rate (gal/ton) / 1E6

TOTAL PARTICULATE

15.432 x (FHW + MF + BHW) / [(Vm(std) + Vw(std)] ...	0.0046	gr/scf
15.432 x (FHW + MF + BHW) / (Vm(std)	0.0055	gr/dscf
gr/dscf x (12 / %CO2)	0.0040	@ 0% CO2
gr/dscf x [(20.9 - Oxygen corr.) / (20.9 - %O2)] ...	0.0107	@ 0% O2
0.00857 x Qs(std) x gr/dscf	5.79	lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..		lb/MMBtu
Particulate (lb/hr) / Heat Input (MMBtu/hr)		lb/MMBtu

TOTAL ACID MIST

[1.0811E-4 x (Vt - Vtb) x N x Vsol] / Vol(aloq)	lb Acid Mist
[Acid Mist (lb) / Vm std (ft^3)] x Qs std x 60 ...	lb/hr
[Acid Mist (lb) / Vm std (ft^3)] x F-Factor	lb/MMBtu

SULFUR DIOXIDE (SO2)

[7.061E-5 x (Vt - Vtb) x N x Vsol] / Vol(aloq) .	lb SO2
[SO2 (lb) / Vm std (ft^3)] x Qs std (ft^3/min) x 60	lb/hr
[SO2 (lb) / Vm std (ft^3)] x F	lb/MMBtu
[Mass SO2 (lb) x 385 / 64E+6 (ft^3/lb)] / Vm (std)	ppm
ppm x 0.0 % Corr. / 17.6 % CO2 in Stack	ppm @ 0% CO2
ppm x (20.9% - 0.0% O2 Corr)/(20.9% - 17.6% O2 Stack	ppm @ 0% O2
SO2 (lb/hr / Heat Input)	lb/MMBtu

HYDROGEN CHLORIDE DATA SUMMARY

[Mass HCl(mg) x 385 x 1E6] / [453600 x 36.5 x Vm(std	ppm
ppm x 0.0 % Corr. / 16.5 % CO2 in Stack	ppm @ 0% CO2
ppm x (20.9% - 0.0% O2 Corr)/(20.9% - 16.5% O2 Stack	ppm @ 0% O2
[Mass HCl(mg) x 60 x Qs / (Vm(std) x 453,600)]...	lb/hr

KOOGLER AND ASSOCIATES, ENVIRONMENTAL SERVICES
SUMMARY OF VISIBLE EMISSIONS
FOR 60-MINUTES

PLANT : FLORIDA ROCK / NEWBERRY, FL.
SOURCE: CEMENT KILN
DATE : JULY 10, 2000
TIME : 13:43 TO 14:43

	SECONDS /	0	15	30	45
			OPACITY (%)		
MINUTES /	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	0	0	0	0
	5	0	0	0	0
	6	0	0	0	0
	7	0	0	0	0
	8	0	0	0	0
	9	0	0	0	0
	10	0	0	0	0
	11	0	0	0	0
	12	0	0	0	0
	13	0	0	0	0
	14	0	0	0	0
	15	0	0	0	0
	16	0	0	0	0
	17	0	0	0	0
	18	0	0	0	0
	19	0	0	0	0
	20	0	0	0	0
	21	0	0	0	0
	22	0	0	0	0
	23	0	0	0	0
	24	0	0	0	0
	25	0	0	0	0
	26	0	0	0	0
	27	0	0	0	0
	28	0	0	0	0
	29	0	0	0	0
	30	0	0	0	0

KOOGLER AND ASSOCIATES, ENVIRONMENTAL SERVICES
SUMMARY OF VISIBLE EMISSIONS
FOR 60-MINUTES

PLANT : FLORIDA ROCK / NEWBERRY, FL.
SOURCE: CEMENT KILN
DATE : JULY 10, 2000
TIME : 13:43 TO 14:43

SECONDS /	0	15	30	45
		OPACITY (%)		
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0
60	5	0	5	5

AVERAGE OPACITY: 0.1 %

MAXIMUM OPACITY: 5 %

KOOGLER AND ASSOCIATES, ENVIRONMENTAL SERVICES
SIX-MINUTE AVERAGES OF VISIBLE EMISSIONS
FOR 60-MINUTES

PLANT : FLORIDA ROCK / NEWBERRY, FL.
SOURCE: CEMENT KILN
DATE : JULY 10, 2000
TIME : 13:43 TO 14:43

MINUTES	--- SIX-MINUTE ROLLING AVERAGES --- OPACITY (%)			
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0

KOOGLER AND ASSOCIATES, ENVIRONMENTAL SERVICES
SIX-MINUTE AVERAGES OF VISIBLE EMISSIONS
FOR 60-MINUTES

PLANT : FLORIDA ROCK / NEWBERRY, FL.
SOURCE: CEMENT KILN
DATE : JULY 10, 2000
TIME : 13:43 TO 14:43

MINUTES	--- SIX-MINUTE ROLLING AVERAGES --- OPACITY (%)			
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0
55	0.0	0.0	0.0	0.0
56	0.0	0.0	0.0	0.0
57	0.0	0.0	0.0	0.0
58	0.0	0.0	0.0	0.0
59	0.0	0.0	0.0	0.0
60	0.2	0.2	0.4	0.6

HIGHEST SIX-MINUTE ROLLING AVERAGE: 0.6 %

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Stephen S. Bell

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

278545	Jacksonville, Florida	June 7, 2000
Certificate Number	Location	Date of Issue

President

Director of Training

Plant: Florida Rock Industries Newberry, FL
Sample Loc.: Cement Kiln
Control Type: ESP
Sample Type: Particulate
Date: 7/10/00 Run No: 1
Time Start: 10:46 Time End: 11:55
Sample Time: 5/3/4 min/port 60 total min.
Dry Bulb: °F Wet Bulb: °F VP @ DP:
Bar. Pressure 30.08 "Hg Stack Press.: "Hg Ps: 0.42 "H2O
Moisture: 20 % FDA: Gas Density Factor:
Temperature: 88 °F Wind Dir.: East Wind Speed: 0-3
Weather: Clear Thermocouple Readout: KA-1
Sample Box #: Mune-1 Meter Box No.: KA-1
Meter Y: 1.000 @ Delta H: ~~1.538~~ Pitot Corr.: 0.84
Nozzle Diameter: 0.266 in. 1.539 Probe Length: 455 ft
Probe Heater Setting: 250° F Nomograph Cs ~~2.69~~ 2.74
Stack Dimensions : 112" in
Stack Area: ft²
Effective Stack Area: ft²
Stack Height: ≥ 250' ft

Stack Dimensions
Umbilical: 260°
Thermocouple
Probe No.: KA-39
Pitot Tube: KA-55II

Material Processing Rate:
Final Gas Meter Reading: 614.432 ft³
Initial Gas Meter Reading: 573.001 ft³
Total Metered Gas Volume: 41.431 ft³
Condensate Gain in Impingers: 144 mL
Weight Gain in Silica Gel: 9 g
Total Moisture Gain: 153 mL
Silica Gel Container No.: 28
Filter Number:

Leak Check – Meter Box
Initial: 0.010 cfm @ 15 In. H2O
Final: 0.007 cfm @ 7 In. H2O
Leak Check – Pitot Tubes
Impact 3 "H2O for 15 sec: (Stable) Leak
Static 3 "H2O for 15 sec: (Stable) Leak

KOOGLER & ASSOCIATES

Test Conducted By: G. Haven, S. Bell
Stack Test Observers: O_2 = 8.1% CO_2 = 12.6%
George Townsend

Port and Traverse Point No.	Distance from Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H2O)	Meter Orifice Pressure Difference ("H2O) Calculated	Meter Orifice Pressure Difference ("H2O) Actual	Stack Gas Temperature (°F)	Sample Box Temperature (°F)	Last Impinger Temperature (°F)	Meter Temperature (°F)	Vacuum on Sample Train ("Hg)	Oxygen Meter Reading (% O2)
AVERAGE												
1-1			73.0	0.48	1.32	1.32	205	237	90	86	5	
2			76.5	0.53	1.45	1.45	208	237	67	87	5	
3			80.0	0.44	1.21	1.21	206	233	63	89	4	
2-1			83.1	0.56	1.53	1.53	205	254	70	95	5	
2			86.6	0.54	1.48	1.48	210	234	60	94	5	
3			90.0	0.48	1.32	1.32	209	227	60	95	4	
3-1			93.4	0.59	1.62	1.62	209	228	64	97	5	
2			97.0	0.55	1.51	1.51						

Port and Traverse Point No.	Distance from Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H2O)	Meter Orifice Pressure Difference ("H2O)		Stack Gas Temperature (°F)	Sample Box Temperature (°F)	Last Impinger Temperature (°F)	Meter Temperature (°F)	Vacuum on Sample Train ("Hg)	Oxygen Meter Reading (% O2)
					Calculated	Actual						
3-3			600.5	0.50	1.37	1.37	211	248	57	99	4	
4-1			4.0	0.68	1.64	1.64	209	235	65	100	5	
2			7.6	0.56	1.93	1.53	209	244	58	100	5	
3			11.2	0.44	1.21	1.21	207	244	59	101	4	

Plant: FRI Newberry, FL Cement Plant
Sample Loc.:
Control Type: ESP
Sample Type: Particulate
Date: 7/10/00 Run No.: 2
Time Start: 12:19 Time End: 13:23
Sample Time: 5/3/4 min/port 60 total min.
Dry Bulb: °F Wet Bulb: °F VP @ DP:
Bar. Pressure 30.68 "Hg Stack Press.: "Hg Ps: "H2O
Moisture: 17 % FDA: Gas Density Factor:
Temperature: °F Wind Dir.: East Wind Speed: 1-3
Weather: Clear Thermocouple Readout: KA-1
Sample Box #: Meter Box No.: KA1
Meter Y: 1.000 @ Delta H: 1.539 Pitot Corr.: 0.84
Nozzle Diameter: 0.266 in. Probe Length: 4.55 ft
Probe Heater Setting: 250°F Nomograph Cf: 2.96
Stack Dimensions: 142" in
Stack Area: ft²
Effective Stack Area: ft²
Stack Height: ≥ 250' ft

Stack Dimensions

Umbilical: 20.6'
Thermocouple
Probe No.: KA-39
Pitot Tube: KA-55ft

Material Processing Rate:
Final Gas Meter Reading: 658.068 ft³
Initial Gas Meter Reading: 614.800 ft³
Total Metered Gas Volume: 43.268 ft³
Condensate Gain in Impingers: 156 mL
Weight Gain in Silica Gel: 10 g
Total Moisture Gain: 166 mL
Silica Gel Container No.: 3
Filter Number:

Leak Check – Meter Box
Initial: 0.009 cfm @ 15 in. H2O
Final: 0.006 cfm @ 6 in. H2O
Leak Check – Pitot Tubes
Impact 3 "H2O for 15 sec: (Stable), Leak
Static 3 "H2O for 15 sec: (Stable), Leak

KOOGLER & ASSOCIATES

Test Conducted By: G. Haven, S. Bell
Stack Test Observers:
O_2 = 11.1 %
CO_2 = 16.6 %

Port and Traverse Point No.	Distance from Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H2O)	Meter Orifice Pressure Difference ("H2O) Calculated	Meter Orifice Pressure Difference ("H2O) Actual	Stack Gas Temperature (°F)	Sample Box Temperature (°F)	Last Impinger Temperature (°F)	Meter Temperature (°F)	Vacuum on Sample Train ("Hg)	Oxygen Meter Reading (% O2)
Average:												
1-1			14.8	0.61	1.81	1.81	206	254	75	99	5	
2			18.9	0.56	1.66	1.66	206	249	59	99	4	
3			22.6	0.48	1.42	1.42	204	237	59	99	4	
2-1			26.0	0.60	1.78	1.78	206	230	64	99	4	
2			29.7	0.57	1.69	1.49	208	236	61	100	4	
3			33.5	0.48	1.42	1.42	205	242	60	100	4	
3-1			36.9	0.56	1.66	1.66	205	257	62	100	4	
2			40.6	0.56	1.66	1.61	209	11.17				

Port and Traverse Point No.	Distance from Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head (in H2O)	Meter Orifice Pressure Difference (in H2O)		Stack Gas Temperature (°F)	Sample Box Temperature (°F)	Last Impinger Temperature (°F)	Meter Temperature (°F)	Vacuum on Sample Train (in Hg)	Oxygen Meter Reading (% O2)
					Calculated	Actual						
3-3			44.2	0.46	1.36	1.36	207	257	62	100	4	
4-1			47.6	0.52	1.54	1.54	205	240	62	100	4	
2			51.1	0.55	1.63	1.63	213	238	59	101	4	
3			54.8	0.44	1.30	1.30	210	237	59	101	4	

Plant: FPL Cement Kiln
Sample Loc.: Newberry, FL
Control Type: ESP
Sample Type: Particulate
Date: 7/10/00 Run No.: 3
Time Start: 13:40 Time End: 14:46
Sample Time: 5/3/4 min/port 60 total min.
Dry Bulb: °F Wet Bulb: °F VP @ DP:
Bar. Pressure 30.02 "Hg Stack Press.: "Hg Ps: "H2O
Moisture: 15 % FDA: Gas Density Factor:
Temperature: 88 °F Wind Dir.: East Wind Speed: 3-5
Weather: Sc Cl. Thermocouple Readout: KA-1
Sample Box #: Mono-1 Meter Box No.: KA-1
Meter Y: 1.000 @ Delta H: 1.539 Pitot Corr.: 0.84
Nozzle Diameter: 0.266 in. Probe Length: 4 ft
Probe Heater Setting: Nomograph Cf: 301
Stack Dimensions: 112" in
Stack Area: ft²
Effective Stack Area: ft²
Stack Height: ≥ 250' ft

Stack Dimensions

Umbilical: 260'
Thermocouple
Probe No.: KA-38
Pitot Tube: KA-55 II

Material Processing Rate:
Final Gas Meter Reading: 701.612 ft³
Initial Gas Meter Reading: 658.400 ft³
Total Metered Gas Volume: 43.212 ft³
Condensate Gain in Impingers: 152 mL
Weight Gain in Silica Gel: 10 g
Total Moisture Gain: 162 mL
Silica Gel Container No.: 25
Filter Number:

Leak Check – Meter Box
Initial: 0.012 cfm @ 15 in. H2O
Final: 0.008 cfm @ 6 in. H2O
Leak Check – Pitot Tubes
Impact 3 "H2O for 15 sec: Stable, Leak
Static 3 "H2O for 15 sec: Stable, Leak

KOOGLER & ASSOCIATES

Test Conducted By: G. Haven S. Ball
Stack Test Observers: George Townsend
O_2 = 10.1 % CO_2 = 16.5 %

Port and Traverse Point No.	Distance from Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H2O)	Meter Orifice Pressure Difference ("H2O) Calculated	Meter Orifice Pressure Difference ("H2O) Actual	Stack Gas Temperature (°F)	Sample Box Temperature (°F)	Last Impinger Temperature (°F)	Meter Temperature (°F)	Vacuum on Sample Train ("Hg)	Oxygen Meter Reading (% O2)
Average												
1-1			58.4	0.54	1.63	1.63	208	253	80	100	4	
2			62.3	0.54	1.63	1.63	216	232	63	100	4	
3			66.1	0.43	1.29	1.29	213	240	61	100	3	
2-1			69.4	0.59	1.78	1.78	219	241	64	101	4	
2			73.1	0.54	1.63	1.63	220	232	58	101	4	
3			76.8	0.47	1.41	1.41	218	231	58	102	4	
3-1		80.2	0.58	0.58	1.75	1.75	219	238	63	102	4	
2			84.0	0.54	1.63	1.63	219					

Port and Traverse Point No.	Distance from Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H2O)	Meter Orifice Pressure Difference ("H2O)		Stack Gas Temperature (°F)	Sample Box Temperature (°F)	Last Impinger Temperature (°F)	Meter Temperature (°F)	Vacuum on Sample Train ("Hg)	Oxygen Meter Reading (% O2)
					Calculated	Actual						
3-3			87.7	0.45	1.35	1.35	216	244	59	105	3	
4-1			91.1	0.55	1.66	1.66	221	238	64	104	4	
2			94.8	0.55	1.66	1.66	223	237	61	104	4	
3			98.5	0.39	1.17	1.17	220	246	61	104	3	

SAMPLING RATE CALCULATIONS

Date 7/10/00

Plant Name FRI

Location Newberry, FL

Source Cement Kiln

ΔH = Orifice Reading (Inches H_2O)
Dn = Nozzle Diameter (Inches)
ΔHθ = Meter Box Constant
Bw = Moisture Fraction
Tm = Meter Temperature (°F)
Ts = Stack Temperature (°F)
Ms = Wet Molecular Weight of Stack Gas (From Table)
ΔP = Pitot Reading (Inches H_2O)

$$\left[\frac{Tm + 460}{Ms(Ts+460)} (1 - Bw)^2 \; \Delta H\theta \; (Dn)^4 \; 17741\right] \cdot \Delta P = \Delta H$$

Moisture Fraction	Ms
0.0	29.0
0.05	28.5
0.10	27.9
0.15	27.4
0.20	26.8
0.25	26.2
0.30	25.7
0.35	25.2
0.40	24.6

555 / 26.8(660

560 / 18358

565 / 27.0

	Run 1		Run 2		Run 3
$\frac{Tm + 460}{Ms\ (Ts + 460)}$ =	0.0314		0.0315		0.0305
× $(1 - Bw)^2$ =	0.64		0.6889		0.7225
× ΔHθ =	~~1.508~~	1.539 / 0.0050	1.539		1.539
× $(Dn)^4$ =	0.0037	~~0.0041~~	0.0050		0.0056
× 17741 =	17741		17741		17741
× ΔP =	0.5				
	1.99	~~2.65~~ ~~2.69~~	0.266	2.96	3.01

2.74

CHAIN OF CUSTODY RECORD

Project Number _____

Project Name Florida Rock Industries

Sample Location : Cement Kiln
Newberry, FL

Sample Identification	Remarks
FR1 FR1	Filter Run #1 Florida Rock Ind.
FR2	" " #2
FR3	" " #3
PW R1	Probe Wash Run #1
PW R2	" " " #2
PW R3	" " " #3
SG #28	Silica Gel # 28
SG #3	" " # 3
SG #	" " #

Sampled By: (Signature) John A. Haven Date: 7/10/00 Time: See DATA SHEETS

Relinquished By: (Sign) _____ Date: _____ Time: _____

Received By: (Sign) _____ Date: _____ Time: _____

Relinquished By: (Sign) _____ Date: _____ Time: _____

Received By: (Sign) _____ Date: _____ Time: _____

Relinquished By: (Sign) _____ Date: _____ Time: _____

Received By Lab: (Sign) John A. Haven Date: 7/10/00 Time: 19:00

Sample Shipped VIA: _____ UPS _____ Fed Express _____ Bus

Shipping Bill Number: _____

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 • FAX 377-7158

PARTICULATE LAB DATA SHEET

TEST DATE 7/10/00

PLANT NAME FRI

SOURCE Cement Kiln

	Run 1	Run 2	Run 3	Blank
Container No.	KA-14	56	101	701
Total Volume (ml)	175	175	175	150
Aliquot Evaporated (ml)	175	175	175	150
Final Weight (g)	99.1150	116.7056	115.8898	100.1589
Tare Weight (g)	99.1013	116.6935	115.8814	100.1588
Gross Weight Gained (g)	0.0137	0.0121	0.0084	0.0001
Average Blank (g)	—	—	—	—
Net Weight (g)	0.0137	0.0121	0.0084	—
Aliquot Factor	x 10	x 10	x 10	x —
Total Net Weight (mg)	13.7	12.1	8.4	—
Container No.	1A	2A	3A	BL2
Filter No.	2586	2587	2588	2563
Final Weight (g)	0.4216	0.4188	0.4225	0.4157
Tare Weight (g)	0.4152	0.4151	0.4163	0.4150
Gross Weight Gained (g)	0.0064	0.0037	0.0062	—
Average Blank (g)	—	—	—	—
Total Net Weight (mg)	6.4	3.7	6.2	—

Tare Balance Check

0.0	✓	10.0	✓
1.0	✓	50.0	✓
5.0	✓	100.0	✓

T/H 28/42

By [signature]

Date 7/12/00

Final Balance Check

0.0		10.0	
1.0		50.0	
5.0		100.0	✓

T/H 7743

By [signature]

Date 7-13-00

ENVIRONMENTAL SERVICES
4011 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 - FAX 377-7158

CONTINUED ON VEO FORM NUMBER

SOURCE NAME: FTL.

ADDRESS:

CITY: New Cement | STATE: Florida | ZIP:

PHONE: | SOURCE ID NUMBER:

PROCESS EQUIPMENT: Cement Kiln | OPERATING MODE: 155 TPH

CONTROL EQUIPMENT: E.S.P. | OPERATING MODE:

DESCRIBE EMISSION POINT: On NE Corner of Process Building

START: Ground Level Stack STOP: SAME

HEIGHT ABOVE GROUND LEVEL: START 250 FT STOP 250 FT | HEIGHT RELATIVE TO OBSERVER: START 16 FT STOP 16 FT

DISTANCE FROM OBSERVER: START 25 FT STOP 25 FT | DIRECTION FROM OBSERVER: START 360° m STOP 360° m

DESCRIBE EMISSIONS: START Clear STOP Clear

EMISSION COLOR: START Clear STOP Clear | PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐

WATER DROPLETS PRESENT: NO ☒ YES ☐ | IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: START At The Outlet STOP SAME

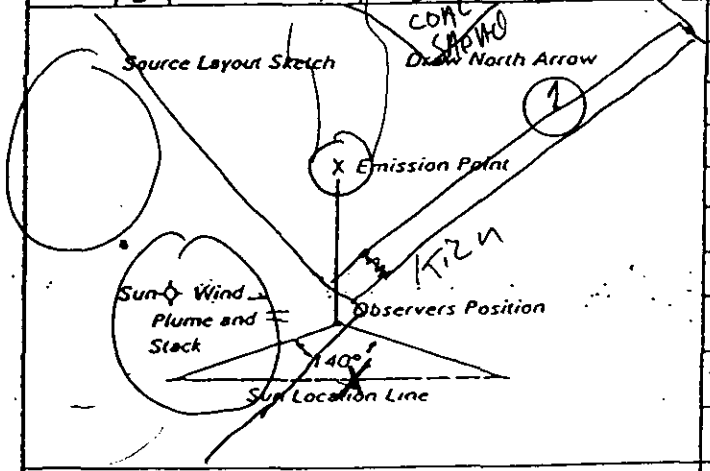
DESCRIBE BACKGROUND: START Clear Sky STOP SAME

BACKGROUND COLOR: START Blue STOP Blue | SKY CONDITIONS: START Clear STOP Clear

WIND SPEED: START 1-3 MPH STOP CALM | WIND DIRECTION: START 95° m STOP NA.

AMBIENT TEMP.: START 93°F STOP 94°F | WET BULB TEMP.: 75°F | RH percent: 43

Source Layout Sketch — Draw North Arrow



COMMENTS: ATS 30°, Observer on Level 6, S.E. Corner. Concurrent with Run 3 P.M.

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE:
TITLE: | DATE:

OBSERVATION DATE: 7/10/00 | START TIME: 13:43 | STOP TIME: 14:43

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

AVERAGE OPACITY FOR HIGHEST PERIOD: | NUMBER OF READINGS ABOVE % WERE:

RANGE OF OPACITY READINGS: MINIMUM: | MAXIMUM:

OBSERVER'S NAME (PRINT): STEPHEN S. BELL

OBSERVER'S SIGNATURE: Stephen S Bell | DATE: 7/10/00

ORGANIZATION: Roogla and Associates

CERTIFIED BY: E.T.A. | DATE: 6/7/00

VERIFIED BY: NA. | DATE: N.A.

No Secondary Plume Observed

CLINKER COOLER
CALCULATIONS AND FIELD DATA SHEETS

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

GENERAL DATA — DATA FILE NAME: CL_KOLER

Company	: Florida Rock Industries, Newberry Fl.				**********
Source/Unit	: Clinker Cooler				03:52 PM
Date	: July 11, 2000		Cp	: 0.840	
Stack dia.	: 78.00 inch	OR :	Duct Length	: 0.00	inch
Oxygen Corr.	: 0.0 percent		Duct Width	: 0.00	inch
CO2 Corr.	: 0.0 percent		Std. Temp.	: 68	F

FUEL ANALYSIS DATA, (By F Factor or Fuel Use)
F Factor = F, Fuel Use = U — F — Process Wt.

Hydrogen,wt%	: 0.00	Run 1	: 94.5 Tons/hr
Carbon, wt%	: 0.00	Run 2	: 93.3
Sulfur, wt%	: 0.00	Run 3	: 94.5
Nitrogen,wt%	: 0.00		
Oxygen, wt%	: 0.00		
Btu/lb	: 0		

Type of Flow Meter : (1=Meter Box 2=Mass Flow Meter) 1
F-Factor : dscf/MMBtu;

FIELD DATA ------- METHOD 5	RUN 1	RUN 2	RUN 3
Meter Temp., Tm (F)	89	98	104
Stack Temp., Ts (F)	360	367	372
Sq.Rt. dP	0.46	0.45	0.41
dH (in. H2O)	1.10	1.10	0.94
Meter Vol.,Vm (ft3)	40.589	41.405	38.222
Meter Y	0.997	0.997	0.997
Bar. Press.,Pb (in.Hg.)	30.21	30.21	30.21
Vol. H2O, Vlc (ml)	24	28	26
Static Press.,Ps (in.H2O)	-0.60	-0.60	-0.60
Test Time (min.)	60.0	60.0	60.0
Nozzle Dia.,Dn (in.)	0.315	0.315	0.315
Oxygen, O2 (%)	20.8	20.8	20.8
Carbon Dioxide, CO2 (%)	0.1	0.1	0.1
Carbon Monoxide, CO (%)	0.0	0.0	0.0

Report Emission Criteria in ? 1 = lb/hr g = gr/dscf : L
Process Rate Units ? T = Ton/hr, L = Lbs/hr, C = Cans/min: T
Allowable Particulate Matter Emission Rate .....:

LABORATORY RESULTS	RUN 1	RUN 2	RUN 3	
GRAVIMETRIC ANALYSIS METHOD 5 :				
Front Half Wash (FHW)	0.01390	0.00720	0.00560	grams
Filterable Sample (MF)	0.00370	0.00080	0.00050	
Condensible Sample (BHW)	0.00000	0.00000	0.00000	

SOURCE TEST CALCULATIONS

PLANT : Florida Rock Industries, Newberry Fl.
Clinker Cooler

RUN NO.: 1
DATE : July 11, 2000

STD.TEMP, Tstd	= 68 F	STATIC PRESS.,Ps	= -0.60 in. H2O
METER TEMP, Tm	=88.7916 F	PITOT COFF., Cp	= 0.840
STACK TEMP, Ts	= 359.8 F	STACK I.D.	= 78.00 inch
AVG.VEL.HEAD,dP	= 0.213 in. H2O	DUCT LENGTH	= inch
METER ORIFICE,dH	= 1.10 in. H2O	DUCT WIDTH	= inch
METER VOL., Vm	= 40.589 Cu.Ft.	STACK AREA, As	= 33.183 Sq.Ft.
METER COFF., Y	= 0.997	TEST TIME	= 60.00 min.
BAR. PRESS., Pb	= 30.21 in.Hg	NOZZLE DIA.	= 0.315 inch
COND.(Vlc)	= 24.0 ml	NOZZLE DIA., An	= 5.4E-04 Sq.Ft.

GAS ANALYSIS = 20.80 % O2 0.00 % CO
0.10 % CO2 79.10 % N2

****

Vm(std) = [(T(std) + 460) / 29.92] x Vm x Y x (Pb + (dH / 13.6)) / (Tm + 460)..... = 39.416 dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc = 1.130 scf

Bws = Vw(std) / (Vm(std) + Vw(std))..... = 0.028 | Lower Bws value used.

Bws @ Saturated Conditions = Vapor Press. of H2O @ Dew Point Temp. / (Ps, in.Hg.) ..... = 1.000 | Lower Bws value used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 = 25242.72

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)] = 28.85

Ms = (Md x (1-Bws)) + (18.0 x Bws)..... = 28.55

P(stack) = Pbar + (Ps / 13.6) ..... = 30.17 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460) / (Ms x P(stack))] ..... = 32.35 ft/sec

Qs = vs x As x 60 ..... = 64,412 acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460)) x (P(stack)/29.92) ..... = 40,661 dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) / (T(std) + 460) / 29.92] x 100 / [Time x P(stack) x An x vs x 60] ..... = 99.07 %

SOURCE TEST CALCULATIONS

PLANT : Florida Rock Industries, Newberry Fl.
Clinker Cooler

RUN NO.: 2
DATE : July 11, 2000

STD.TEMP, Tstd	=	68 F	STATIC PRESS.,Ps	=	-0.60 in. H2O
METER TEMP, Tm	=	98.38 F	PITOT COFF., Cp	=	0.840
STACK TEMP, Ts	=	367.5 F	STACK I.D.	=	78.00 inch
AVG.VEL.HEAD,dP	=	0.203 in. H2O	DUCT LENGTH	=	inch
METER ORIFICE,dH	=	1.10 in. H2O	DUCT WIDTH	=	inch
METER VOL., Vm	=	41.405 Cu.Ft.	STACK AREA, As	=	33.183 Sq.Ft.
METER COFF., Y	=	0.997	TEST TIME	=	60.00 min.
BAR. PRESS., Pb	=	30.21 in.Hg	NOZZLE DIA.	=	0.315 inch
COND.(Vlc)	=	28.0 ml	NOZZLE DIA., An	=	5.4E-04 Sq.Ft.

GAS ANALYSIS = 20.80 % O2 0.00 % CO
0.10 % CO2 79.10 % N2

****

Vm(std) = [T(std) + 460 / 29.92] x Vm x Y x (Pb + (dH / 13.6)) / (Tm + 460)..... = 39.519 dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc = 1.318 scf

Bws = Vw(std) / (Vm(std) + Vw(std))..... = 0.032 | Lower Bws value used.

Bws @ Saturated Conditions = Vapor Press. of H2O @ Dew Point Temp. / (Ps, in.Hg.) ..... = 1.000

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 = 25242.72

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)] = 28.85

Ms = (Md x (1-Bws)) + (18.0 x Bws)..... = 28.50

P(stack) = Pbar + (Ps / 13.6) ..... = 30.17 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460) / (Ms x P(stack))] ..... = 31.74 ft/sec

Qs = vs x As x 60 ..... = 63,197 acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460)) x (P(stack)/29.92) ..... = 39,345 dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) / (T(std) + 460) / 29.92] x 100 / [Time x P(stack) x An x vs x 60] ..... = 102.65 %

SOURCE TEST CALCULATIONS

PLANT : Florida Rock Industries, Newberry Fl.
Clinker Cooler

RUN NO.: 3
DATE : July 11, 2000

STD.TEMP, Tstd	= 68	F	STATIC PRESS.,Ps	= -0.60	in. H2O
METER TEMP, Tm	= 104.00	F	PITOT COFF., Cp	= 0.840	
STACK TEMP, Ts	= 372.3	F	STACK I.D.	= 78.00	inch
AVG.VEL.HEAD,dP	= 0.172	in. H2O	DUCT LENGTH	=	inch
METER ORIFICE,dH	= 0.94	in. H2O	DUCT WIDTH	=	inch
METER VOL., Vm	= 38.222	Cu.Ft.	STACK AREA, As	= 33.183	Sq.Ft.
METER COFF., Y	= 0.997		TEST TIME	= 60.00	min.
BAR. PRESS., Pb	= 30.21	in.Hg	NOZZLE DIA.	= 0.315	inch
COND.(Vlc)	= 26.0	ml	NOZZLE DIA., An	= 5.4E-04	Sq.Ft.

GAS ANALYSIS = 20.80 % O2 0.00 % CO
0.10 % CO2 79.10 % N2

****

Vm(std) = [T(std) + 460 / 29.92] x Vm x Y x (Pb + (dH / 13.6)) / (Tm + 460)..... = 36.103 dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc = 1.224 scf

Bws = Vw(std) / (Vm(std) + Vw(std))..... = 0.033 | Lower Bws value used.

Bws @ Saturated Conditions = Vapor Press. of H2O @ Dew Point Temp. / (Ps, in.Hg.) ..... = 1.000 | Lower Bws value used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 = 25242.72

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)] = 28.85

Ms = (Md x (1-Bws)) + (18.0 x Bws)..... = 28.49

P(stack) = Pbar + (Ps / 13.6) ..... = 30.17 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460) / (Ms x P(stack))] ..... = 29.31 ft/sec

Qs = vs x As x 60 ..... = 58,359 acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460)) x (P(stack)/29.92) ..... = 36,105 dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) / (T(std) + 460) / 29.92] x 100 / [Time x P(stack) x An x vs x 60] ..... = 102.19 %

A. FIELD DATA SUMMARY

PLANT : Florida Rock Industries, Newberry Fl.
Clinker Cooler
DATE : July 11, 2000

	RUN 1	RUN 2	RUN 3
Vlc = Vol water collected in train, ml	24.0	28.0	26.0
Vm = Sample gas vol, meter cond., acf	40.589	41.405	38.222
Y = Meter calibration factor	0.9970	0.9970	0.9970
Pbar = Barometric pressure, in. Hg	30.21	30.21	30.21
Pstatic = Stack static pressure, in. H2O	-0.60	-0.60	-0.60
dH = Avg meter pressure diff, in. H2O	1.10	1.10	0.94
Tm = Absolute meter temp., degrees R	548.8	558.4	564.0
Vm(std) = Sample gas vol, Std. cond., dscf	39.416	39.519	36.103
Bws = Water vapor in gas stream, fraction	0.028	0.032	0.033
MF = Moisture factor (1 - Bws)	0.972	0.968	0.967
CO2 = Carbon Dioxide, dry, volume %	0.10	0.10	0.10
O2 = Oxygen, dry, volume %	20.80	20.80	20.80
N2 = Nitrogen, dry volume %	79.10	79.10	79.10
Md = Molecular weight of stack gas, dry	28.85	28.85	28.85
Ms = Molecular weight of stack gas, wet	28.55	28.50	28.49
Cp = Pitot tube coefficient	0.84	0.84	0.84
Sq.Rt. dP = Avg. square root of each dP	0.4617	0.4505	0.4148
Ts = Absolute stack temp., degrees R	819.8	827.5	832.3
A = Area of stack, ft2	33.18	33.18	33.18
Qstd = Volumetric flowrate, dscfm	40,661	39,345	36,105
An = Nozzle area, ft2	5.41E-04	5.41E-04	5.41E-04
O = Sample time, minutes	60.00	60.00	60.00
%I = Isokinetic variation, percent	99.07	102.65	102.19

B. PARTICULATE DATA SUMMARY

PLANT : Florida Rock Industries, Newberry Fl.
Clinker Cooler
DATE : July 11, 2000

	RUN 1	RUN 2	RUN 3
Sample Weight (FHW + MF + BHW), mg	17.60	8.00	6.10
Meter Volume, standard cond., Vm(std)	39.416	39.519	36.103
Carbon Dioxide, percent	0.10	0.10	0.10
Oxygen, percent	20.80	20.80	20.80
Sample Concentration :			
gr/scf	0.0067	0.0030	0.0025
gr/dscf	0.0069	0.0031	0.0026
gr/dscf @ 0 % CO2	0.8269	0.3749	0.3129
gr/dscf @ 0 % O2	1.4401	0.6529	0.5449
ppm * MW (dry gas).....	379.0	171.8	143.4
ppm * MW @ 0% CO2	0.0	0.0	0.0
ppm * MW @ 0% O2	79208.2	35909.8	29972.0

EMISSION RATE CALCULATIONS

PLANT :Florida Rock Industries, Newberry Fl.
Clinker Cooler

RUN NO.: 1
STANDARD TEMP. : 68 F DATE : July 11, 2000

Front Half Wash (FHW)	0.01390 grams	Vm(std)	39.416 ft3
Mass Filter (MF)	0.00370 grams	Vw(std)	1.130 ft3
Back Half Wash (BHW)	0.00000 grams	Qs(std)	40,661 dscfm
Vm(std) SO2	dscf	Bws	0.028
CO2 CORR 0.0 %		CO2	0.10 %
O2 CORR. 0.0 %		O2	20.80 %

F-FACTOR

10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) - 0.46(%O2)] / (Btu/lb) x [(Tstd + 460)/528] ..... dscf/MMBtu

FUEL USE

Use Rate (gal/ton) * Process Wt. (ton/hr) ..... gal/hr
Heat Input = (Process Weight (ton/hr) x Heating .... MMBtu/hr
Value (Btu/gal) x Fuel Use Rate (gal/ton) / 1E6

TOTAL PARTICULATE

15.432 x (FHW + MF + BHW) / [(Vm(std) + Vw(std)] ...	0.0067	gr/scf
15.432 x (FHW + MF + BHW) / (Vm(std)	0.0069	gr/dscf
gr/dscf x (12 / %CO2)	0.8269	@ 0% CO2
gr/dscf x [(20.9 - Oxygen corr.) / (20.9 - %O2)] ...	1.4401	@ 0% O2
0.00857 x Qs(std) x gr/dscf	2.40	lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..		lb/MMBtu
Particulate (lb/hr) / Heat Input (MMBtu/hr)		lb/MMBtu

TOTAL ACID MIST

[1.0811E-4 x (Vt - Vtb) x N x Vsol] / Vol(aloq)	lb Acid Mist
[Acid Mist (lb) / Vm std (ft^3)] x Qs std x 60 ...	lb/hr
[Acid Mist (lb) / Vm std (ft^3)] x F-Factor	lb/MMBtu

SULFUR DIOXIDE (SO2)

[7.061E-5 x (Vt - Vtb) x N x Vsol] / Vol(aloq)	lb SO2
[SO2 (lb) / Vm std (ft^3)] x Qs std (ft^3/min) x 60	lb/hr
[SO2 (lb) / Vm std (ft^3)] x F	lb/MMBtu
[Mass SO2 (lb) x 385 / 64E+6 (ft^3/lb)] / Vm (std)	ppm
ppm x 0.0 % Corr. / 0.1 % CO2 in Stack	ppm @ 0% CO2
ppm x (20.9% - 0.0% O2 Corr)/(20.9% - 20.8% O2 Stack	ppm @ 0% O2
SO2 (lb/hr / Heat Input)	lb/MMBtu

HYDROGEN CHLORIDE DATA SUMMARY

[Mass HCl(mg) x 385 x 1E6] / [453600 x 36.5 x Vm(std	ppm
ppm x 0.0 % Corr. / 0.1 % CO2 in Stack	ppm @ 0% CO2
ppm x (20.9% - 0.0% O2 Corr)/(20.9% - 0.1% O2 Stack)	ppm @ 0% O2
[Mass HCl(mg) x 60 x Qs / (Vm(std) x 453,600)]...	lb/hr

EMISSION RATE CALCULATIONS

PLANT :Florida Rock Industries, Newberry Fl.
Clinker Cooler

RUN NO.: 2
STANDARD TEMP. : 68 F DATE : July 11, 2000

Front Half Wash (FHW)	0.00720 grams	Vm(std)	39.519 ft3
Mass Filter (MF)	0.00080 grams	Vw(std)	1.318 ft3
Back Half Wash (BHW)	0.00000 grams	Qs(std)	39,345 dscfm
Vm(std) SO2	dscf	Bws	0.032
CO2 CORR 0.0 %		CO2	0.10 %
O2 CORR. 0.0 %		O2	20.80 %

F-FACTOR

10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) - 0.46(%O2)] / (Btu/lb) x [(Tstd + 460)/528] ..... dscf/MMBtu

FUEL USE

Use Rate (gal/ton) * Process Wt. (ton/hr) ..... gal/hr
Heat Input = (Process Weight (ton/hr) x Heating .... MMBtu/hr
Value (Btu/gal) x Fuel Use Rate (gal/ton) / 1E6

TOTAL PARTICULATE

15.432 x (FHW + MF + BHW) / [(Vm(std) + Vw(std)] ...	0.0030	gr/scf
15.432 x (FHW + MF + BHW) / (Vm(std)	0.0031	gr/dscf
gr/dscf x (12 / %CO2)	0.3749	@ 0% CO2
gr/dscf x [(20.9 - Oxygen corr.) / (20.9 - %O2)] ...	0.6529	@ 0% O2
0.00857 x Qs(std) x gr/dscf	1.05	lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..		lb/MMBtu
Particulate (lb/hr) / Heat Input (MMBtu/hr)		lb/MMBtu

TOTAL ACID MIST

[1.0811E-4 x (Vt - Vtb) x N x Vsol] / Vol(aloq)	lb Acid Mist
[Acid Mist (lb) / Vm std (ft^3)] x Qs std x 60 ...	lb/hr
[Acid Mist (lb) / Vm std (ft^3)] x F-Factor	lb/MMBtu

SULFUR DIOXIDE (SO2)

[7.061E-5 x (Vt - Vtb) x N x Vsol] / Vol(aloq) .	lb SO2
[SO2 (lb) / Vm std (ft^3)] x Qs std (ft^3/min) x 60	lb/hr
[SO2 (lb) / Vm std (ft^3)] x F	lb/MMBtu
[Mass SO2 (lb) x 385 / 64E+6 (ft^3/lb)] / Vm (std)	ppm
ppm x 0.0 % Corr. / 0.1 % CO2 in Stack	ppm @ 0% CO2
ppm x (20.9% - 0.0% O2 Corr)/(20.9% - 0.1% O2 Stack)	ppm @ 0% O2
SO2 (lb/hr / Heat Input)	lb/MMBtu

HYDROGEN CHLORIDE DATA SUMMARY

[Mass HCl(mg) x 385 x 1E6] / [453600 x 36.5 x Vm(std	ppm
ppm x 0.0 % Corr. / 0.1 % CO2 in Stack	ppm @ 0% CO2
ppm x (20.9% - 0.0% O2 Corr)/(20.9% - 0.1% O2 Stack)	ppm @ 0% O2
[Mass HCl(mg) x 60 x Qs / (Vm(std) x 453,600)]...	lb/hr

EMISSION RATE CALCULATIONS

PLANT :Florida Rock Industries, Newberry Fl.
Clinker Cooler

RUN NO.: 3
STANDARD TEMP. : 68 F DATE : July 11, 2000

Front Half Wash (FHW)	0.00560 grams	Vm(std)	36.103 ft3
Mass Filter (MF)	0.00050 grams	Vw(std)	1.224 ft3
Back Half Wash (BHW)	0.00000 grams	Qs(std)	36,105 dscfm
Vm(std) SO2	dscf	Bws	0.033
CO2 CORR 0.0 %		CO2	0.10 %
O2 CORR. 0.0 %		O2	20.80 %

F-FACTOR

10E6 x [3.64(%H) + 1.53(%C) + 0.57(%S) + 0.14(%N) - 0.46(%O2)] / (Btu/lb) x [(Tstd + 460)/528] ..... dscf/MMBtu

FUEL USE

Use Rate (gal/ton) * Process Wt. (ton/hr) ..... gal/hr
Heat Input = (Process Weight (ton/hr) x Heating .... MMBtu/hr
Value (Btu/gal) x Fuel Use Rate (gal/ton) / 1E6

TOTAL PARTICULATE

15.432 x (FHW + MF + BHW) / [(Vm(std) + Vw(std)] ...	0.0025	gr/scf
15.432 x (FHW + MF + BHW) / (Vm(std)	0.0026	gr/dscf
gr/dscf x (12 / %CO2)	0.3129	@ 0% CO2
gr/dscf x [(20.9 - Oxygen corr.) / (20.9 - %O2)] ...	0.5449	@ 0% O2
0.00857 x Qs(std) x gr/dscf	0.81	lb/hr
F-Fac x 1.4286E-4 x [20.9 / (20.9-%O2)] x gr/dscf ..		lb/MMBtu
Particulate (lb/hr) / Heat Input (MMBtu/hr)		lb/MMBtu

TOTAL ACID MIST

[1.0811E-4 x (Vt - Vtb) x N x Vsol] / Vol(aloq)	lb Acid Mist
[Acid Mist (lb) / Vm std (ft^3)] x Qs std x 60 ...	lb/hr
[Acid Mist (lb) / Vm std (ft^3)] x F-Factor	lb/MMBtu

SULFUR DIOXIDE (SO2)

[7.061E-5 x (Vt - Vtb) x N x Vsol] / Vol(aloq) .	lb SO2
[SO2 (lb) / Vm std (ft^3)] x Qs std (ft^3/min) x 60	lb/hr
[SO2 (lb) / Vm std (ft^3)] x F	lb/MMBtu
[Mass SO2 (lb) x 385 / 64E+6 (ft^3/lb)] / Vm (std)	ppm
ppm x 0.0 % Corr. / 0.1 % CO2 in Stack	ppm @ 0% CO2
ppm x (20.9% - 0.0% O2 Corr)/(20.9% - 0.1% O2 Stack)	ppm @ 0% O2
SO2 (lb/hr / Heat Input)	lb/MMBtu

HYDROGEN CHLORIDE DATA SUMMARY

[Mass HCl(mg) x 385 x 1E6] / [453600 x 36.5 x Vm(std	ppm
ppm x 0.0 % Corr. / 0.1 % CO2 in Stack	ppm @ 0% CO2
ppm x (20.9% - 0.0% O2 Corr)/(20.9% - 0.1% O2 Stack)	ppm @ 0% O2
[Mass HCl(mg) x 60 x Qs / (Vm(std) x 453,600)]...	lb/hr

KOOGLER AND ASSOCIATES, ENVIRONMENTAL SERVICES
SUMMARY OF VISIBLE EMISSIONS
FOR 60-MINUTES

PLANT : FLORIDA ROCK / NEWBERRY, FL.
SOURCE: CLINKER COOLER
DATE : JULY 7, 2000
TIME : 15:00 TO 16:00

SECONDS / MINUTES	0	15	30	45
	OPACITY (%)			
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0
25	0	0	0	0
26	0	0	0	0
27	0	0	0	0
28	0	0	0	0
29	0	0	0	0
30	0	0	0	0

KOOGLER AND ASSOCIATES, ENVIRONMENTAL SERVICES
SUMMARY OF VISIBLE EMISSIONS
FOR 60-MINUTES

PLANT : FLORIDA ROCK / NEWBERRY, FL.
SOURCE: CLINKER COOLER
DATE : JULY 7, 2000
TIME : 15:00 TO 16:00

SECONDS /	0	15	30	45
		OPACITY (%)		
31	0	0	0	0
32	0	0	0	0
33	0	0	0	0
34	0	0	0	0
35	0	0	0	0
36	0	0	0	0
37	0	0	0	0
38	0	0	0	0
39	0	0	0	0
40	0	0	0	0
41	0	0	0	0
42	0	0	0	0
43	0	0	0	0
44	0	0	0	0
45	0	0	0	0
46	0	0	0	0
47	0	0	0	0
48	0	0	0	0
49	0	0	0	0
50	0	0	0	0
51	0	0	0	0
52	0	0	0	0
53	0	0	0	0
54	0	0	0	0
55	0	0	0	0
56	0	0	0	0
57	0	0	0	0
58	0	0	0	0
59	0	0	0	0
60	0	0	0	0

AVERAGE OPACITY: 0.0 %

MAXIMUM OPACITY: 0 %

KOOGLER AND ASSOCIATES, ENVIRONMENTAL SERVICES
SIX-MINUTE AVERAGES OF VISIBLE EMISSIONS
FOR 60-MINUTES

PLANT : FLORIDA ROCK / NEWBERRY, FL.
SOURCE: CLINKER COOLER
DATE : JULY 7, 2000
TIME : 15:00 TO 16:00

MINUTES	--- SIX-MINUTE ROLLING AVERAGES --- OPACITY (%)			
1	-	-	-	-
2	-	-	-	-
3	-	-	-	-
4	-	-	-	-
5	-	-	-	-
6	-	-	-	0.0
7	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0

KOOGLER AND ASSOCIATES, ENVIRONMENTAL SERVICES
SIX-MINUTE AVERAGES OF VISIBLE EMISSIONS
FOR 60-MINUTES

PLANT : FLORIDA ROCK / NEWBERRY, FL.
SOURCE: CLINKER COOLER
DATE : JULY 7, 2000
TIME : 15:00 TO 16:00

MINUTES	--- SIX-MINUTE ROLLING AVERAGES --- OPACITY (%) ---			
31	0.0	0.0	0.0	0.0
32	0.0	0.0	0.0	0.0
33	0.0	0.0	0.0	0.0
34	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0
36	0.0	0.0	0.0	0.0
37	0.0	0.0	0.0	0.0
38	0.0	0.0	0.0	0.0
39	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.0
41	0.0	0.0	0.0	0.0
42	0.0	0.0	0.0	0.0
43	0.0	0.0	0.0	0.0
44	0.0	0.0	0.0	0.0
45	0.0	0.0	0.0	0.0
46	0.0	0.0	0.0	0.0
47	0.0	0.0	0.0	0.0
48	0.0	0.0	0.0	0.0
49	0.0	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0
55	0.0	0.0	0.0	0.0
56	0.0	0.0	0.0	0.0
57	0.0	0.0	0.0	0.0
58	0.0	0.0	0.0	0.0
59	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0

HIGHEST SIX-MINUTE ROLLING AVERAGE: 0.0 %

VISIBLE EMISSIONS EVALUATOR

This is to certify that

Glen Haven

met the specifications of Federal Reference Method 9 and qualified as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, North Carolina. This certificate is valid for six months from date of issue.

278546	Jacksonville, Florida	June 7, 2000
Certificate Number	Location	Date of Issue

President

Director of Training

Plant: Florida Rock Industries Clinker Cooler
Sample Loc.: Newberry, FL
Control Type: ESP
Sample Type: Particulate
Date: 7/11/00 Run No.: 1
Time Start: 10:02 Time End: 11:09
Sample Time: 2.5/6/4 min/port 60 total min.
Dry Bulb: °F Wet Bulb: °F VP @ DP:
Bar. Pressure 30.21 "Hg Stack Press.: "Hg Ps: 0.60 "H2O
Moisture: 5 % FDA: Gas Density Factor:
Temperature: 80 °F Wind Dir.: East Wind Speed: 3-5
Weather: Clear Thermocouple Readout: KAK-1
Sample Box #: KA-2 Meter Box No.: KA-4
Meter Y: 0.997 @ Delta H: 1.376 Pitot Corr.: 0.84
Nozzle Diameter: 0.315 in. Probe Length: 4.55 ft
Probe Heater Setting: Nomograph Cf: 5.1
Stack Dimensions: 78" in
Stack Area: ft²
Effective Stack Area: ft²
Stack Height: ≥ 150' ft

Stack Dimensions

Umbilical: 200'
Thermocouple
Probe No.: KAK-38
Pitot Tube: KA-S811

Material Processing Rate:
Final Gas Meter Reading: 176.589 ft³
Initial Gas Meter Reading: 136.000 ft³
Total Metered Gas Volume: 40.589 ft³
Condensate Gain in Impingers: 17 mL
Weight Gain in Silica Gel: 7 g
Total Moisture Gain: mL
Silica Gel Container No.: 8
Filter Number:

Leak Check – Meter Box
Initial: 0.015 cfm @ 15 in. H2O
Final: 0.005 cfm @ 5 in. H2O
Leak Check – Pitot Tubes
Impact 3 "H2O for 15 sec: (Stable) Leak
Static 3 "H2O for 15 sec: (Stable) Leak

KOGLER & ASSOCIATES

Test Conducted By: G. Haven S. Bell
Stack Test Observers: O_2 = 20.8% CO_2 = 0.1%

Port and Traverse Point No.	Distance from Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H2O)	Meter Orifice Pressure Difference ("H2O) Calculated	Meter Orifice Pressure Difference ("H2O) Actual	Stack Gas Temperature (°F)	Sample Box Temperature (°F)	Last Impinger Temperature (°F)	Meter Temperature (°F)	Vacuum on Sample Train ("Hg)	Oxygen Meter Reading (% O2)
AVG/SS												
1-1			36.0	0.26	1.33	1.33	347	250	86	83	4	
2			37.8	0.26	1.33	1.33	354	288	66	83	4	
3			39.6	0.22	1.12	1.12	357	250	61	84	4	
4			41.4	0.14	0.82	0.82	357	269	62	84	3	
5			42.8	0.20	1.02	1.02	348	312	62	85	4	
6			44.5	0.14	0.71	0.71	323	278	60	85	3	
2-1			45.8	0.25	1.28	1.28	350	275	66	81	4	
2			47.5	0.26	1.37							

Port and Traverse Point No.	Distance from Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H20)	Meter Orifice Pressure Difference ("H20)		Stack Gas Temperature (°F)	Sample Box Temperature (°F)	Last Impinger Temperature (°F)	Meter Temperature (°F)	Vacuum on Sample Train ("Hg)	Oxygen Meter Reading (% O2)
					Calculated	Actual						
2-3			49.4	0.23	1.17	1.17	362	272	61	87	4	
4			51.2	0.21	1.07	1.07	369	264	63	88	4	
5			52.9	0.19	0.97	0.97	371	255	62	89	4	
6			54.5	0.19	0.97	0.97	346	243	62	89	4	
3-1			56.1	0.25	1.28	1.28	361	227	67	90	4	
2			58.0	0.25	1.28	1.28	368	236	64	90	4	
3			59.7	0.24	1.22	1.22	368	225	61	90	4	
4			61.6	0.21	1.07	1.07	370	235	61	91	4	
5			63.2	0.21	1.07	1.07	369	272	60	91	4	
6			64.9	0.18	0.92	0.92	364	269	60	92	4	
4-1			66.4	0.26	1.33	1.33	367	260	66	92	4	
2			68.3	0.26	1.33	1.33	374	256	62	92	4	
3			70.2	0.22	1.12	1.12	370	252	61	93	4	
4			72.0	0.18	0.92	0.92	373	247	61	93	4	
5			73.4	0.20	1.02	1.02	345	243	62	93	4	
6			75.2	0.13	0.65	0.65	364	236	63	94	3	

Plant: Florida Rock Ind. Clinker Cooler
Sample Loc.: Newberry, FL
Control Type: ESP
Sample Type: Particulate
Date: 7/11/00 Run No.: 2
Time Start: 11:50 Time End: 12:56
Sample Time: 7.5/6/4 min/port 60 total min.
Dry Bulb: °F Wet Bulb: °F VP @ DP:
Bar. Pressure: 30.21 "Hg Stack Press.: "Hg Ps: 0.60 "H2O
Moisture: 3 % FDA: Gas Density Factor:
Temperature: 86 °F Wind Dir.: VAR. Wind Speed: 3-5
Weather: Scatt Thermocouple Readout: KAK-2
Sample Box #: KA-7 Meter Box No.: KA-4
Meter Y: 0.997 @ Delta H: 1.376 Pitot Corr.: 0.84
Nozzle Diameter: 0.375 in. Probe Length: 4.55 ft
Probe Heater Setting: 250 °F Nomograph Cf: 5.4
Stack Dimensions: 78" in
Stack Area: ft²
Effective Stack Area: ft²
Stack Height: ~150' ft

Stack Dimensions
Umbilical: 200'
Thermocouple
Probe No.: KAK-38
Pitot Tube: KA-5 II

Material Processing Rate:
Final Gas Meter Reading: 218,705 ft³
Initial Gas Meter Reading: 172,300 ft³
Total Metered Gas Volume: 46,405 ft³
Condensate Gain in Impingers: 21 mL
Weight Gain in Silica Gel: 7 g
Total Moisture Gain: mL
Silica Gel Container No.: 10
Filter Number:

Leak Check – Meter Box
Initial: 0.014 cfm @ 15 in. H2O
Final: 0.008 cfm @ 5 in. H2O
Leak Check – Pitot Tubes
Impact 3 "H2O for 15 sec: (Stable) Leak
Static 3 "H2O for 15 sec: (Stable) Leak

KOOGLER & ASSOCIATES

Test Conducted By: G. Haven, S. Ball
Stack Test Observers: O_2 = 20.8% CO_2 = 0.1%

Port and Traverse Point No.	Distance from Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H2O)	Meter Orifice Pressure Difference ("H2O) Calculated	Meter Orifice Pressure Difference ("H2O) Actual	Stack Gas Temperature (°F)	Sample Box Temperature (°F)	Last Impinger Temperature (°F)	Meter Temperature (°F)	Vacuum on Sample Train ("Hg)	Oxygen Meter Reading (% O2)
Average												
1-1			77.3	0.23	1.24	1.24	350	232	63	93	4	
2			79.1	0.22	1.18	1.18	368	246	66	93	4	
3			80.9	0.24	1.3	1.3	370	253	57	93	4	
4			82.8	0.21	1.13	1.13	364	258	56	93	4	
5			84.5	0.20	1.08	1.08	368	256	56	93	4	
6			86.2	0.14	0.86	0.84	350	252	55	94	4	
2-1			87.7	0.25	1.35	1.35	362	243	59	94	5	
2			89.7	0.26	1.4	1.4	371					

Port and Traverse Point No.	Distance from Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H20)	Meter Orifice Pressure Difference ("H20)		Stack Gas Temperature (°F)	Sample Box Temperature (°F)	Last Impinger Temperature (°F)	Meter Temperature (°F)	Vacuum on Sample Train ("Hg)	Oxygen Meter Reading (% O2)
					Calculated	Actual						
2-5			91.6	0.24	1.3	1.3	376	233	55	95	5	
4			93.5	0.22	1.19	1.19	374	232	55	96	4	
5			95.3	0.17	0.92	0.92	369	236	54	97	4	
6			96.9	0.16	0.86	0.86	351	232	56	98	4	
3-1			98.4	0.23	1.24	1.24	363	260	60	99	4	
2			200.2	0.24	1.13	1.13	369	258	56	100	4	
3			2.0	0.22	1.19	1.19	371	253	58	101	4	
4			3.8	0.20	1.08	1.08	373	238	58	101	4	
5			5.5	0.16	0.86	0.86	370	233	56	102	4	
6			7.0	0.13	0.7	0.7	367	237	58	103	3	
4-1			8.4	0.25	1.35	1.35	370	256	61	103	4	
2			10.3	0.24	1.3	1.3	375	256	58	103	4	
3			12.2	0.20	1.08	1.08	377	249	58	103	4	
4			13.9	0.19	1.03	1.03	375	243	59	104	4	
5			15.6	0.16	0.86	0.86	373	242	58	104	4	
6			17.2	0.16	0.86	0.86	362	249	60	104	4	

Plant: Florida Rock Ind. - Clinker Cooler
Sample Loc.: Newberry, FL
Control Type: ESP
Sample Type: Particulate
Date: 7/11/00 Run No.: 3
Time Start: 13:23 Time End: 14:30
Sample Time: 25/6/4 min/port 60 total min.
Dry Bulb: °F Wet Bulb: °F VP @ DP:
Bar. Pressure 30.21 "Hg Stack Press.: "Hg Ps: 0.60 "H2O
Moisture: 3 % FDA: Gas Density Factor:
Temperature: 83 °F Wind Dir.: VAR Wind Speed: 3-5
Weather: SCATT. Thermocouple Readout: KAK-2
Sample Box #: KA-2 Meter Box No.: KA-4
Meter Y: 0.997 @ Delta H: 1.376 Pitot Corr.: 0.84
Nozzle Diameter: 0.315 in. Probe Length: 4.55 ft
Probe Heater Setting: Nomograph Cf: 5.4
Stack Dimensions: 78" in
Stack Area: ft²
Effective Stack Area: ft²
Stack Height: ≈150' ft

Stack Dimensions
Umbilical: 200'
Thermocouple
Probe No.: KAK-38
Pitot Tube: KA-554

Material Processing Rate:
Final Gas Meter Reading: 257,322 ft³
Initial Gas Meter Reading: 219,100 ft³
Total Metered Gas Volume: 38,222 ft³
Condensate Gain in Impingers: 20 mL
Weight Gain in Silica Gel: 6 g
Total Moisture Gain: mL
Silica Gel Container No.: 21
Filter Number:

Leak Check – Meter Box
Initial: 0.010 cfm @ 15 in. H2O
Final: 0.002 cfm @ 5 in. H2O
Leak Check – Pitot Tubes
Impact 3 "H2O for 15 sec: Stable, Leak
Static 3 "H2O for 15 sec: Stable, Leak

KOGLER & ASSOCIATES

Test Conducted By: G. Haven S. Bell
Stack Test Observers: O_2 = 20.8% CO_2 = 0.1%

Port and Traverse Point No.	Distance from Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H2O)	Meter Orifice Pressure Difference ("H2O) Calculated	Meter Orifice Pressure Difference ("H2O) Actual	Stack Gas Temperature (°F)	Sample Box Temperature (°F)	Last Impinger Temperature (°F)	Meter Temperature (°F)	Vacuum on Sample Train ("Hg)	Oxygen Meter Reading (% O2)
Average												
1-1			19.1	0.19	1.03	1.03	362	231	94	101	4	
2			20.8	0.21	1.13	1.13	379	249	66	101	4	
3			22.5	0.16	0.86	0.84	381	262	65	101	4	
4			24.0	0.21	1.13	1.13	381	265	65	101	4	
5			25.8	0.17	0.92	0.92	374	260	45	101	4	
6			22.3	0.12	0.65	0.65	360	274	41	101	3	
2-1			28.7	0.21	1.13	1.13	357	261	68	101	4	
2			30.5	0.20	1.08	1.08						

Port and Traverse Point No.	Distance from Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft³)	Stack Velocity Head ("H20)	Meter Orifice Pressure Difference ("H20)		Stack Gas Temperature (°F)	Sample Box Temperature (°F)	Last Impinger Temperature (°F)	Meter Temperature (°F)	Vacuum on Sample Train ("Hg)	Oxygen Meter Reading (% O2)
					Calculated	Actual						
2-3			32.2	0.20	1.08	1.08	380	242	52	101	4	
4			34.0	0.18	0.97	0.97	378	235	50	102	4	
5			35.6	0.16	0.86	0.84	378	245	50	102	4	
6			37.1	0.12	0.65	0.65	328	250	52	103	3	
3-1			38.5	0.19	1.03	1.03	351	243	52	104	4	
2			40.1	0.22	1.19	1.19	382	239	51	104	4	
3			41.9	0.20	1.08	1.08	380	241	50	105	4	
4			43.6	0.19	1.03	1.03	382	241	50	106	4	
5			45.2	0.16	0.86	0.86	376	236	50	106	4	
6			46.8	0.12	0.65	0.65	373	238	51	107	3	
4-1			48.2	0.21	1.13	1.13	376	248	53	107	4	
2			49.9	0.20	1.08	1.08	385	248	51	108	4	
3			51.6	0.19	1.03	1.03	382	243	50	108	4	
4			53.3	0.16	0.86	0.86	380	237	50	108	4	
5			54.8	0.16	0.86	0.86	359	247	52	108	4	
6			56.3	0.06	0.32	0.32	368	253	51	109	3	

SAMPLING RATE CALCULATIONS

Date 7/11/00

Plant Name FR1

Location Newberry, FL

Source Clinker Cooler

ΔH = Orifice Reading (Inches H_2O)
Dn = Nozzle Diameter (Inches)
ΔHθ = Meter Box Constant
Bw = Moisture Fraction
Tm = Meter Temperature (°F)
Ts = Stack Temperature (°F)
Ms = Wet Molecular Weight of Stack Gas (From Table)
ΔP = Pitot Reading. (Inches H_2O)

$$\left[\frac{Tm + 460}{Ms(Ts+460)}\ (1 - Bw)^2\ \Delta H\theta\ (Dn)^4\ 17741\right] \cdot \Delta P = \Delta H$$

ΔP's

0.30 to 0.25

Ts 550 °F

Moisture Fraction	Ms
0.0	29.0
0.05	28.5
0.10	27.9
0.15	27.4
0.20	26.8
0.25	26.2
0.30	25.7
0.35	25.2
0.40	24.6

545

28.5(

23085

560

	Run 1		Run 2		Run 3
$\frac{Tm + 460}{Ms\ (Ts + 460)}$ =	0.0236		0.024		0.024
× $(1 - Bw)^2$ =	0.9025		0.9409		0.9409
× ΔHθ =	1.376		1.376		1.376
× $(Dn)^4$ =	0.0050	0.0098	0.0098		0.0098
× 17741 =	17741		17741		17741
× ΔP =					
	2.58	5.1	5.4		5.4

CHAIN OF CUSTODY RECORD

Project Number _____

Project Name Florida Rock Industries

Sample Location Lime Clinker Cooler
Newberry, FL

Sample Identification	Remarks
FR1 FRLCC	Filter Run #1
FR2	" " #2
FR2	" " #3
PW Run #1	Probe Wash Run #1
PW Run 2	" " #2
PW Run 3	" " #3
SG 8	Silica Gell #8
SG 10	" " #10
SG 21	" #21

Sampled By: (Signature) Glen A Hans Date: 7/11/00 Time: SEE DATA SHEETS

Relinquished By: (Sign) _____ Date: _____ Time: _____

Received By: (Sign) _____ Date: _____ Time: _____

Relinquished By: (Sign) _____ Date: _____ Time: _____

Received By: (Sign) _____ Date: _____ Time: _____

Relinquished By: (Sign) _____ Date: _____ Time: _____

Received By Lab: (Sign) Glen A Hans Date: 7/11/00 Time: 18:30

Sample Shipped VIA: _____ UPS _____ Fed Express _____ Bus

Shipping Bill Number: _____

KOGGLER & ASSOCIATES

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 • FAX 377-7158

PARTICULATE LAB DATA SHEET

TEST DATE 7/11/00

PLANT NAME FRI

SOURCE Clinker Cooler

	Run 1	Run 2 (602)	Run 3	Blank
Container No.	264	~~98-9~~	801	701
Total Volume (ml)	150	150	150	150
Aliquot Evaporated (ml)	150	150	150	150
Final Weight (g)	98.9557	98.9950	100.5225	100.1589
Tare Weight (g)	98.9412	98.9878	100.5169	100.1588
Gross Weight Gained (g)	0.0139	0.0072	0.0056	0.0001
Average Blank (g)	—	—	—	—
Net Weight (g)	0.0139	0.0072	0.0056	—
Aliquot Factor	x 1.0	x 1.0	x 1.0	x —
Total Net Weight (mg)	13.9	7.2	5.6	—
Container No.	1C	2C	3C	BL2
Filter No.	2592	2593	2594	2563
Final Weight (g)	0.4156	0.4126	0.4093	0.4152
Tare Weight (g)	0.4119	0.4118	0.4088	0.4150
Gross Weight Gained (g)	0.0037	0.0008	0.0005	—
Average Blank (g)	—	—	—	—
Total Net Weight (mg)	3.7	0.8	0.5	—

Tare Balance Check

0.0	✓	10.0	✓
1.0	✓	50.0	✓
5.0	✓	100.0	✓

T/H 78/42

By John A. Hare

Date 7/12/00

Final Balance Check

0.0	✓	10.0	✓
1.0	✓	50.0	✓
5.0	✓	100.0	✓

T/H 77-43

By R Paul

Date 7-13-00

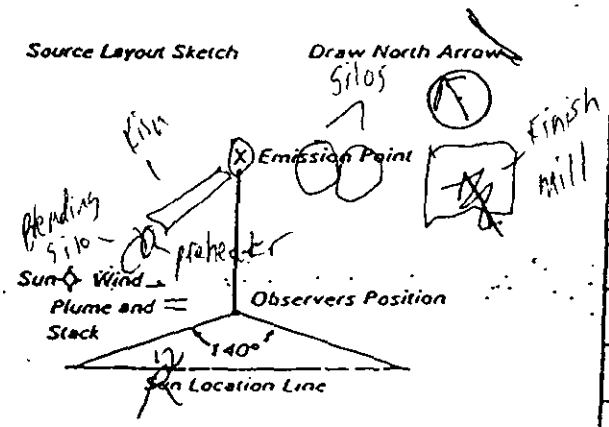
KATTERS ASSOCIATES
ENVIRONMENTAL SERVICES
4011 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 - FAX 377-7158

CONTINUED ON VEO FORM NUMBER 1 of 1

SOURCE NAME: Florida Rock Industries		OBSERVATION DATE: 7/11/00	START TIME: 15:00
ADDRESS: Baker - Cement Plant			STOP TIME: 16:00
CITY: Newberry	STATE: FL	ZIP:	
PHONE:	SOURCE ID NUMBER:		
PROCESS EQUIPMENT: Clinker Coolers	OPERATING MODE:		
CONTROL EQUIPMENT: ESP	OPERATING MODE:		
DESCRIBE EMISSION POINT: START Round Tar Stack on NE end of Kiln/Mill STOP Same			
HEIGHT ABOVE GROUND LEVEL: START 700' STOP 200'	HEIGHT RELATIVE TO OBSERVER: START 200' STOP 206'		
DISTANCE FROM OBSERVER: START 400' STOP 400'	DIRECTION FROM OBSERVER: START 30° STOP 30°		
DESCRIBE EMISSIONS: START Thermal Plume STOP Same			
EMISSION COLOR: START Clear STOP Clear	PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐		
WATER DROPLETS PRESENT: NO ☒ YES ☐	IF WATER DROPLET PLUME: ATTACHED ☐ DETACHED ☐		
POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED: START Stack outlet STOP Same			
DESCRIBE BACKGROUND: START Sky STOP Sky			
BACKGROUND COLOR: START Blue/white STOP Same	SKY CONDITIONS: START Scatt. STOP Scatt.		
WIND SPEED: START 3-5 STOP 3-5	WIND DIRECTION: START NW STOP		
AMBIENT TEMP.: START 94 STOP 95	WET BULB TEMP.: 77	RH percent: 50%	

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

Source Layout Sketch — Draw North Arrow



AVERAGE OPACITY FOR HIGHEST PERIOD	NUMBER OF READINGS ABOVE % WERE
RANGE OF OPACITY READINGS: MINIMUM	MAXIMUM
OBSERVER'S NAME (PRINT): Glen A. Haven	
OBSERVER'S SIGNATURE: Glen A. Haven	DATE: 7/11/00
ORGANIZATION: K+A	
CERTIFIED BY: ETA	DATE: 6/00
VERIFIED BY	DATE

COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE
TITLE | DATE

PLANT INFORMATION

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

POLCID NT **Production Overview** **Daily Report** ***Florida Rock Industries Inc.***
ROCKFA

Raw Mill, Kiln, Cooler, Cement and Coal Mill Production

Kiln Feed

Date	Raw Mill [T/H] E1\G14\D1F04_C	POLDOS [T/H] K1\RPV\COUNTER\H05AL11	Clinker [T/H] K1\RPV\COUNTER\CLK_PROD_L	Cement [T/H] N1\PID\M1F04_C	Coal to Kiln [T/H] L1\RPV\S1F05_C	Raw Coal Feed [T/H] L1\RPV\S1F04_C		
10-Jul-2000 07	0.0	21.0	13.3	0.0	2.2	0.0		
10-Jul-2000 08	0.0	103.0	63.0	0.0	4.9	0.0		
10-Jul-2000 09	6.6	129.0	78.2	0.0	5.4	0.0		
10-Jul-2000 10	124.8	147.0	89.1	24.4	6.1	27.8		
10-Jul-2000 11	175.6	156.0	94.5	121.1	6.5	0.0		
10-Jul-2000 12	169.5	155.0	93.9	130.8	6.8	0.0		
10-Jul-2000 13	158.0	155.0	94.5	130.0	6.8	0.0		
10-Jul-2000 14	159.3	155.0	93.9	132.5	6.8	11.5		
10-Jul-2000 15	174.5	155.0	94.5	128.5	6.8	20.1		
10-Jul-2000 16	164.1	155.0	93.9	122.6	6.8	0.0		
10-Jul-2000 17	157.2	156.0	94.5	125.7	6.8	0.0		
10-Jul-2000 18	166.7	154.0	93.9	119.8	6.8	15.6		
10-Jul-2000 19	156.6	139.0	84.2	120.4	6.7	0.0		
10-Jul-2000 20	165.1	120.0	72.7	115.2	6.1	0.0		
10-Jul-2000 21	156.5	120.0	73.3	114.3	5.8	9.7		
10-Jul-2000 22	159.3	120.0	72.7	113.3	4.7	22.2		
10-Jul-2000 23	177.3	120.0	73.3	111.6	4.8	0.0		
11-Jul-2000 00	148.5	120.0	72.7	109.6	4.8	0.0		
11-Jul-2000 01	169.4	120.0	73.3	109.8	4.9	0.0		
11-Jul-2000 02	151.6	120.0	73.3	107.6	5.0	13.8		
11-Jul-2000 03	39.2	130.0	78.8	107.1	5.1	24.1		
11-Jul-2000 04	0.0	139.0	84.8	96.0	5.3	0.0		
11-Jul-2000 05	0.0	148.0	89.7	0.0	5.3	8.7		
11-Jul-2000 06	31.9	154.0	93.9	0.0	5.4	9.5		
Sum	2811.8	3191.0	1940.6	2140.1	136.6	162.9		
Average	140.6	132.9	80.8	112.6	5.7	14.8		

Run 1 Run 2 Run 3

POLCID NT

Production Overview

Daily Report

Florida Rock Industries Inc.
ROCKFA

Raw Mill, Kiln, Cooler, Cement and Coal Mill Production

Date	Raw Mill [T/H] E1\G14\D1F04_C	POLDOS [T/H] K1\RPV\COUNTER\H05AL11	Clinker [T/H] K1\RPV\COUNTER\CLK_PROD_L	Cement [T/H] N1\PID\M1F04_C	Coal to Kiln [T/H] L1\RPV\S1F05_C	Raw Coal Feed [T/H] L1\RPV\S1F04_C		
11-Jul-2000 07	162.4	154.0	93.9	0.0	5.3	0.0		
11-Jul-2000 08	142.0	155.0	94.5	69.2	5.3	0.0		
11-Jul-2000 09	163.3	155.0	93.9	115.5	4.9	0.0		
11-Jul-2000 10	177.3	156.0	94.5	112.0	4.9	21.5		
11-Jul-2000 11	160.1	156.0	94.5	109.8	4.9	0.0		
11-Jul-2000 12	172.5	156.0	93.3	102.2	4.8	0.0		
11-Jul-2000 13	178.0	156.0	94.5	103.3	4.9	14.9		
11-Jul-2000 14	172.0	155.0	94.5	102.0	4.9	0.0		
11-Jul-2000 15	169.0	155.0	93.9	102.4	5.3	0.0		
11-Jul-2000 16	165.2	155.0	93.9	100.3	5.4	0.0		
11-Jul-2000 17	162.4	156.0	94.5	99.6	5.5	21.2		
11-Jul-2000 18	178.8	155.0	94.5	101.1	5.7	0.0		
11-Jul-2000 19	156.3	137.0	83.6	100.6	5.4	-0.1		
11-Jul-2000 20	182.9	121.0	73.3	102.5	5.0	31.4		
11-Jul-2000 21	131.7	121.0	73.3	102.1	4.9	0.0		
11-Jul-2000 22	0.0	120.0	72.7	102.3	5.0	0.0		
11-Jul-2000 23	2.6	120.0	72.7	101.6	5.2	0.0		
12-Jul-2000 00	0.0	120.0	73.3	100.8	5.5	0.0		
12-Jul-2000 01	0.0	119.0	72.7	100.3	5.6	5.4		
12-Jul-2000 02	0.0	120.0	72.7	100.4	5.7	6.5		
12-Jul-2000 03	0.0	121.0	73.3	99.4	5.7	0.0		
12-Jul-2000 04	0.0	120.0	73.3	95.6	5.7	0.0		
12-Jul-2000 05	0.0	125.0	75.8	96.6	5.4	0.0		
12-Jul-2000 06	0.0	125.0	75.8	96.1	5.3	0.0		
Sum	2476.6	3333.0	2023.7	2315.9	126.1	100.8		
Average	154.8	138.9	84.3	100.7	5.3	14.4		

Run 1
Run 2
Run 3

Wednesday, July 12, 2000

Automatically created and printed

EQUIPMENT CALIBRATIONS

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

NOZZLE CALIBRATION

DATE 7/10/00

PLANT NAME FRI

LOCATION Newberry, FL

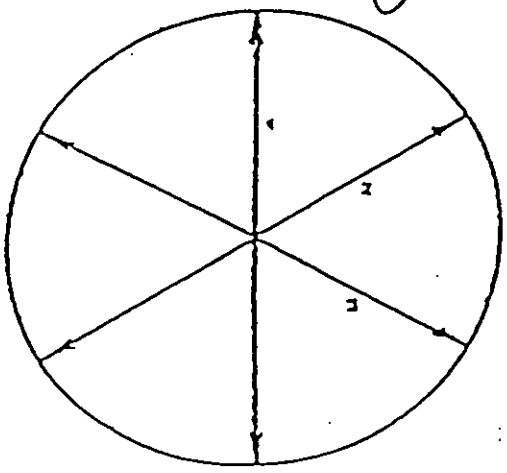
SOURCE Cement Kiln

Measurement No.	Inside Diameter (inches)
1	0.267
2	0.265
3	0.266

Average 0.266

Area of Nozzle 0.000386 ft²

Calibrated by: [signature]



Nozzle X-Section

KOHLER & ASSOCIATES

PITOT TUBE CALIBRATION MEASUREMENTS

PITOT TUBE IDENTIFICATION NO. KA SS II

DATE CALIBRATED 7-2-99

PITOT TUBE ASSEMBLY LEVEL ? ✓ YES _____ NO

PITOT TUBE OPENINGS DAMAGED ? ____ YES (EXPLAIN BELOW) ✓ NO

α_1= 1.5 ° (<10°) α_2= 2.0 ° (<10°)

β_1= 2.0 ° (<5°) β_2= 1.5 ° (<5°)

Y= 2.0 °, θ= 1.0 °, A= 0.948 IN. = (PA+PB)

Z = A SIN Y = 0.0331 IN. (<0.125 IN.)

W = A SIN θ = 0.0165 IN. (<0.031 IN.)

P_A 0.463 IN. P_b 0.466 IN.

D_t 0.378 IN. (≥ 0.1875 IN. ≤ 0.3750 IN.)

COMMENTS: Pitot tubes looked ok day of test

CALIBRATION REQUIRED? _____ YES ✓ NO

CALIBRATED BY: R Paul

KOOGLER & ASSOCIATES

POST TEST THERMOCOUPLE
CALIBRATION

DATE 7/10/00

PLANT NAME Florida Rock Industries

LOCATION Newberry, FL

SOURCE Cement Kiln

Thermocouple Readout # KA-1

Umbilical Cord # 200'

Switch Box # KA-1

Thermocouple # KA-39

Average Stack Temperature °F 211

*Observed Mercury in Glass (ASTM) °F 210

Observed Thermocouple Reading °F 210

Percent Difference $\frac{(\text{ASTM} + 460) - (\text{Thermo} + 460)}{(\text{ASTM} - 460)} \times 100 =$ 0%

Tolerance ≤ 1.5%

* Observed Temperature must be within ten percent of the average stack temperature.

Signature

KOGLER & ASSOCIATES

KOOGLER & ASSOCIATES, ENVIRONMENTAL SERVICES
ANNUAL THERMOCOUPLE CALIBRATION 12/27/99

KA70 RO/UMB		ICE (F)	ASTM (F)	AMB. (F)	ASTM (F)	212 (F)	ASTM (F)	400 (F)	ASTM (F)	KA70 RO/UMB	
KA1/100'	STACK	32	33	73	72	208	209	405	406	KA1/100'	STACK
	BOX	33	32	72	72	210	210	404	406		BOX
	IMP	32	32	73	73	211	212	400	401		IMP
KA2/200'	STACK	33	33	73	72	209	210	415	416	KA2/200'	STACK
	BOX	32	32	72	73	211	210	418	418		BOX
	IMP	32	33	71	72	212	212	409	410		IMP
KA3/25'	STACK	32	33	73	73	211	210	409	410	KA3/25'	STACK
SWBXKA3	BOX	33	32	72	73	215	215	415	416		BOX
	IMP	33	32	72	73	212	212	408	407		IMP
KA4/25'	STACK	32	32	73	74	205	205	420	420	KA4/25'	STACK
SWBXKA3	BOX	32	33	74	74	207	208	422	421		BOX
	IMP	32	33	72	73	211	212	425	425		IMP
KAK/200K	STACK	31	32	74	74	213	213	419	420	KAK/200K	STACK
KAK-38	BOX	32	32	72	73	215	216	422	422	KAK-38	BOX
SWBXKAK1	IMP	32	33	74	73	219	220	400	401		IMP
KA1/200'	STACK	33	33	73	73	211	210	422	422	KA1/200'	STACK
	BOX	33	33	73	72	214	214	419	418		BOX
	IMP	33	32	73	72	209	209	425	425		IMP
KA2/100'	STACK	33	33	73	72	209	210	422	423	KA2/100'	STACK
	BOX	33	32	73	74	212	211	425	425		BOX
	IMP	32	33	72	73	212	211	426	425		IMP

Signature [signature]

Date 12/27/99

KOOGLER & ASSOCIATES, ENVIRONMENTAL SERVICES
ANNUAL THERMOCOUPLE CALIBRATION 12/27/99

THERMOCOUPLE #	ICE (F)	ASTM (F)	AMB. (F)	ASTM (F)	212 (F)	ASTM (F)	400 (F)	ASTM (F)	THERMOCOUPLE #
KA-06	33	33	73	74	212	212	420	419	KA-06
KA-07	33	32	74	75	209	210	421	422	KA-07
KA-08	34	33	74	74	211	211	415	416	KA-08
KA-09	33	33	74	74	215	216	416	417	KA-09
KA-10	34	33	72	72	214	215	408	407	KA-10
KA-11	33	33	72	72	212	212	415	414	KA-11
KA-12	33	33	73	72	219	220	408	407	KA-12
KA-38	34	33	73	74	211	211	412	411	KA-38
KA-39	34	33	73	73	212	211	416	415	KA-39
KA-50	33	34	74	73	215	214	415	416	KA-50
KA-64	33	33	74	74	211	211	410	411	KA-64
KA-70	33	33	73	74	212	213	405	406	KA-70
KA-71	34	34	73	73	211	210	407	408	KA-71
KA-72	34	33	72	72	216	215	410	410	KA-72
KA-105	34	33	73	73	217	218	404	405	KA-105
KA-108	34	34	72	73	214	215	412	411	KA-108
KA-115	34	33	72	72	213	214	409	410	KA-115
KA-126	34	33	72	72	216	216	410	409	KA-126

THERMOCOUPLE #	ICE (F)	ASTM (F)	AMB. (F)	ASTM (F)	212 (F)	ASTM (F)	400 (F)	ASTM (F)	THERMOCOUPLE #
KAK-08	32	32	73	74	218	217	407	406	KAK-08
KAK-09	31	31	73	73	211	212	405	406	KAK-09
KAK-10	32	32	74	74	209	210	377	376	KAK-10
KAK-11	31	31	75	75	206	206	399	398	KAK-11
KAK-12	32	31	74	74	218	217	407	406	KAK-12
KAK-38	31	31	74	74	210	211	410	410	KAK-38
KAK-65	32	32	74	74	205	205	377	377	KAK-65
KAK-72	31	31	74	75	208	208	400	401	KAK-72
KAK-110	31	32	75	74	209	210	399	400	KAK-110
KAK-07	32	31	75	74	209	210	389	390	KAK-07

VOST SWITCH BOX	T.COUPLE				
CH#1	C-1	32	33	74	75
CH#2	C-1	33	32	74	74
CH#3	C-1	33	33	75	74

VOST SWITCH BOX					
CH#1	C-2	32	33	73	74
CH#2	C-2	33	33	74	75
CH#3	C-2	32	33	75	75

Signature Shirley S-Bee

Date 12/27/99

KOOGLER & ASSOCIATES, ENVIRONMENTAL SERVICES
ANNUAL THERMOCOUPLE CALIBRATION 12/27/99

Range (℉C)	Measured Voltage (mV)	Measured Voltage (V)	Calc. Temp. (℉C)	Readout Temp. (℉C)	Percent Difference (%)
KAK-12	28.7	0.029	690	693	-0.45023
	37.4	0.037	902	900	0.217654
KAK-38	28.9	0.029	694	698	-0.51192
	37.2	0.037	897	900	-0.33898
KAK-72	28.5	0.029	685	687	-0.30387
	37.5	0.038	904	908	-0.39058
KAK-65	28.2	0.028	678	680	-0.32666
	37.8	0.038	912	910	0.218082
KA-110	29	0.029	694	699	-0.65592
	37	0.037	894	899	-0.50758

EQUATIONS :

T (calc.)=(0.226584602+(24152.109*V)+(67233.4248*V^2)+(2210340.682*V^3)
-(860963914.9*V^4)+(48350600000*V^5)-(1184520000000*V^6)
+(13869000000000*V^7)-(63370800000000*V^8))

Where :

V = Measured Voltage (Volts)
T(calc.) = Temperature calculated based on voltage

Signature Stephen S Bell

Date 12/27/99

POST-TEST DRY GAS METER CALIBRATION FORM

COMPANY:	FLORIDA ROCK / NEWBERRY, FL.
SOURCE:	CEMENT KILN
DATE:	JULY 14, 2000
PRETEST Y:	1.000
TEST METER NUMBER:	KA-1
METER BOX NUMBER:	KA-1
BAROMETRIC PRESSURE (Pb):	29.88
DELTA H (dH):	1.5

	TEST METER READING (ft^3)	DRY GAS READING (ft^3)	TIME (min) ⏥	VACUUM SETTING (in. Hg)
INITIAL	138.204	12.111		
FIRST	143.406	17.348	7.0	7
SECOND	150.073	24.065	9	7
THIRD	157.845	31.921	10.5	7

DELTA H	TEST METER Vt (ft^3)	DRY GAS Vd (ft^3)	TEST METER TEMP. Tt (°F)	DRY GAS TEMP. Td (°F)
1.5	5.202	5.237	77	86
PB	6.667	6.717	77	87
29.88	7.772	7.856	77	88

$$Yi = \frac{Vt * Pb * (Td + 460)}{Vd * (Pb + dH/13.6) * (Tt + 460)}$$

	Yi	
RUN 1 (Yi)=	1.006250	84867.92 / 84340.77
RUN 2 (Yi)=	1.007321	108967.8 / 108175.8
RUN 3 (Yi)=	1.005859	127260.5 / 126519.2
AVG. Y =	1.006477	

PRETEST Y =	1
AVG. DETA Y =	0.006477
DELTA Y LIMIT =	• 0.05
IS TEST WITHIN 5%?	YES

Vt = Gas volume passing through the test meter, ft^3
Vd = Gas volume passing through the dry gas meter, ft^3
Tt = Temperature of the gas in the test meter, °F
Tdi = Temperature of the inlet gas of the dry gas meter, °F
Tdo = Temperature of the outlet gas of the dry gas meter, °F
Td = Average temperature of the gas in the dry gas meter, the average of Tdi and Tdo, °F
dH = Pressure difference accross the orifice, in, H2O
Yi = Ratio of test meter to dry gas meter for each run
Y = Average ratio of accuracy of test meter to dry gas meter for all three runs, tolerance = pretest • 0.05*Y
⏥ = Time of calibration run, min
Pb = Barometric pressure, in Hg.

DRY GAS METER AND ORIFICE CALIBRATION

CONTROL BOX NO. KA-1 BAROMETRIC PRESS. 29.96 IN. HG.

DATE March 20, 2000 PERFORMED BY ROC

	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5
VACUUM ("Hg)	0.0	0.0	0.0	0.0	0.0
dHw ("H2O)	-0.26	-0.27	-0.28	-0.31	-0.34
dHd ("H2O)	0.50	1.00	1.50	2.50	3.50
INITIAL WTM	328.620	333.828	321.902	342.155	349.330
FINAL WTM	333.828	342.155	328.620	349.330	355.830
INITIAL DGM	709.548	714.805	702.740	723.245	730.546
FINAL DGM	714.805	723.245	709.548	730.546	737.198
TEMP. WTM (F)	74.00	74.00	74.00	74.00	74.00
TEMP. DGM (F)	83.00	84.00	83.00	85.00	87.00
TEST TIME (MIN.)	12.00	14.00	9.00	7.50	6.00
NET VOLUME WTM	5.208	8.327	6.718	7.175	6.500
NET VOLUME DGM	5.257	8.440	6.808	7.301	6.652
Y	1.007	1.003	1.000	0.998	0.993
dH@	1.475	1.568	1.496	1.512	1.645

AVERAGE Y = 1.000

ACCEPTABLE Y RANGE = 0.980 TO 1.020 OK

AVERAGE dH@ = 1.539

$$Y = (Vw\ (Pb - (dHw / 13.6)) \times (Td + 460)) / (Vd\ (Pb + (dHd / 13.6)) \times (Tw + 460)$$

$$dH@ = 0.0317 \times dHd / (Pb\ (Td + 460)) \times ((Tw + 460) \times time) / Vw)^2$$

NOZZLE CALIBRATION

DATE 7/11/00

PLANT NAME FRI

LOCATION Newberry, FL

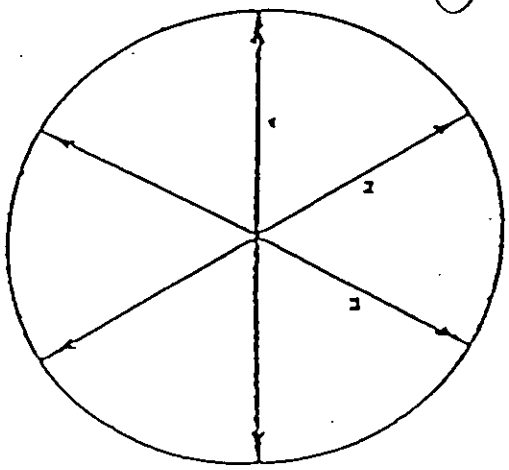
SOURCE Clinker Cooler

Measurement No.	Inside Diameter (inches)
1	0.315
2	0.314
3	0.316

Average 0.315

Area of Nozzle 0.00054 ft^2

Calibrated by: Glen A. Hansen



Nozzle X-Section

NOZZLER & ASSOCIATES

PITOT TUBE CALIBRATION MEASUREMENTS

PITOT TUBE IDENTIFICATION NO. KA SS II

DATE CALIBRATED 7-2-99

PITOT TUBE ASSEMBLY LEVEL ? ✓ YES _____ NO

PITOT TUBE OPENINGS DAMAGED ? ____ YES (EXPLAIN BELOW) ✓ NO

α_1= 1.5 ° (<10°) α_2= 2.0 ° (<10°)

β_1= 2.0 ° (<5°) β_2= 1.5 ° (<5°)

Y= 2.0 °, θ= 1.0 °, A= 0.948 IN. = (PA+PB)

Z = A SIN Y = 0.0331 IN. (<0.125 IN.)

W = A SIN θ = 0.0165 IN. (<0.031 IN.)

P_A 0.463 IN. P_b 0.466 IN.

D_t 0.378 IN. (≥ 0.1875 IN. ≤ 0.3750 IN.)

COMMENTS: Pitot tubes looked O.K. day of test
glc & dmm

CALIBRATION REQUIRED? _____ YES ✓ NO

CALIBRATED BY: RPaul

KOOGLER & ASSOCIATES

POST TEST THERMOCOUPLE
CALIBRATION

DATE 7/11/00

PLANT NAME FR1

LOCATION Newberry, FL

SOURCE Clinker Cooler

Thermocouple Readout # KAK2

Umbilical Cord # 200'

Switch Box # KAK-2

Thermocouple # KAK-38

Average Stack Temperature °F 566

*Observed Mercury in Glass (ASTM) °F 560

Observed Thermocouple Reading °F 561

Percent Difference $\frac{(\text{ASTM} + 460) - (\text{Thermo} + 460)}{(\text{ASTM} + 460)} \times 100 = \frac{820 - 821}{820} = -0.12\%$

Tolerance ≤ 1.5%

* Observed Temperature must be within ten percent of the average stack temperature.

Signature

KOGLER & ASSOCIATES

KOOGLER & ASSOCIATES, ENVIRONMENTAL SERVICES
ANNUAL THERMOCOUPLE CALIBRATION 12/27/99

KA70 RO/UMB		ICE (F)	ASTM (F)	AMB. (F)	ASTM (F)	212 (F)	ASTM (F)	400 (F)	ASTM (F)	KA70 RO/UMB	
KA1/100'	STACK	32	33	73	72	208	209	405	406	KA1/100'	STACK
	BOX	33	32	72	72	210	210	404	406		BOX
	IMP	32	32	73	73	211	212	400	401		IMP
KA2/200'	STACK	33	33	73	72	209	210	415	416	KA2/200'	STACK
	BOX	32	32	72	73	211	210	418	418		BOX
	IMP	32	33	71	72	212	212	409	410		IMP
KA3/25'	STACK	32	33	73	73	211	210	409	410	KA3/25'	STACK
SWBXKA3	BOX	33	32	72	73	215	215	415	416		BOX
	IMP	33	32	72	73	212	212	408	407		IMP
KA4/25'	STACK	32	32	73	74	205	205	420	420	KA4/25'	STACK
SWBXKA3	BOX	32	33	74	74	207	208	422	421		BOX
	IMP	32	33	72	73	211	212	425	425		IMP
KAK/200K	STACK	31	32	74	74	213	213	419	420	KAK/200K	STACK
KAK-38	BOX	32	32	72	73	215	216	422	422	KAK-38	BOX
SWBXKAK1	IMP	32	33	74	73	219	220	400	401		IMP
KA1/200'	STACK	33	33	73	73	211	210	422	422	KA1/200'	STACK
	BOX	33	33	73	72	214	214	419	418		BOX
	IMP	33	32	73	72	209	209	425	425		IMP
KA2/100'	STACK	33	33	73	72	209	210	422	423	KA2/100'	STACK
	BOX	33	32	73	74	212	211	425	425		BOX
	IMP	32	33	72	73	212	211	426	425		IMP

Signature _____

Date 12/27/99

KOOGLER & ASSOCIATES, ENVIRONMENTAL SERVICES
ANNUAL THERMOCOUPLE CALIBRATION 12/27/99

THERMOCOUPLE #	ICE (F)	ASTM (F)	AMB. (F)	ASTM (F)	212 (F)	ASTM (F)	400 (F)	ASTM (F)	THERMOCOUPLE #
KA-06	33	33	73	74	212	212	420	419	KA-06
KA-07	33	32	74	75	209	210	421	422	KA-07
KA-08	34	33	74	74	211	211	415	416	KA-08
KA-09	33	33	74	74	215	216	416	417	KA-09
KA-10	34	33	72	72	214	215	408	407	KA-10
KA-11	33	33	72	72	212	212	415	414	KA-11
KA-12	33	33	73	72	219	220	408	407	KA-12
KA-38	34	33	73	74	211	211	412	411	KA-38
KA-39	34	33	73	73	212	211	416	415	KA-39
KA-50	33	34	74	73	215	214	415	416	KA-50
KA-64	33	33	74	74	211	211	410	411	KA-64
KA-70	33	33	73	74	212	213	405	406	KA-70
KA-71	34	34	73	73	211	210	407	408	KA-71
KA-72	34	33	72	72	216	215	410	410	KA-72
KA-105	34	33	73	73	217	218	404	405	KA-105
KA-108	34	34	72	73	214	215	412	411	KA-108
KA-115	34	33	72	72	213	214	409	410	KA-115
KA-126	34	33	72	72	216	216	410	409	KA-126

THERMOCOUPLE #	ICE (F)	ASTM (F)	AMB. (F)	ASTM (F)	212 (F)	ASTM (F)	400 (F)	ASTM (F)	THERMOCOUPLE #
KAK-08	32	32	73	74	218	217	407	406	KAK-08
KAK-09	31	31	73	73	211	212	405	406	KAK-09
KAK-10	32	32	74	74	209	210	377	376	KAK-10
KAK-11	31	31	75	75	206	206	399	398	KAK-11
KAK-12	32	31	74	74	218	217	407	406	KAK-12
KAK-38	31	31	74	74	210	211	410	410	KAK-38
KAK-65	32	32	74	74	205	205	377	377	KAK-65
KAK-72	31	31	74	75	208	208	400	401	KAK-72
KAK-110	31	32	75	74	209	210	399	400	KAK-110
KAK-07	32	31	75	74	209	210	389	390	KAK-07

VOST SWITCH BOX	T.COUPLE				
CH#1	C-1	32	33	74	75
CH#2	C-1	33	32	74	74
CH#3	C-1	33	33	75	74

VOST SWITCH BOX					
CH#1	C-2	32	33	73	74
CH#2	C-2	33	33	74	75
CH#3	C-2	32	33	75	75

Signature Steph S-Bee

Date 12/27/99

KOOGLER & ASSOCIATES, ENVIRONMENTAL SERVICES
ANNUAL THERMOCOUPLE CALIBRATION 12/27/99

Range (ºC)	Measured Voltage (mV)	Measured Voltage (V)	Calc. Temp. (ºC)	Readout Temp. (ºC)	Percent Difference (%)
KAK-12	28.7	0.029	690	693	-0.45023
	37.4	0.037	902	900	0.217654
KAK-38	28.9	0.029	694	698	-0.51192
	37.2	0.037	897	900	-0.33898
KAK-72	28.5	0.029	685	687	-0.30387
	37.5	0.038	904	908	-0.39058
KAK-65	28.2	0.028	678	680	-0.32666
	37.8	0.038	912	910	0.218082
KA-110	29	0.029	694	699	-0.65592
	37	0.037	894	899	-0.50758

EQUATIONS :

T (calc.)=(0.226584602+(24152.109*V)+(67233.4248*V^2)+(2210340.682*V^3)
-(860963914.9*V^4)+(48350600000*V^5)-(1184520000000*V^6)
+(13869000000000*V^7)-(63370800000000*V^8))

Where :

V = Measured Voltage (Volts)
T(calc.) = Temperature calculated based on voltage

Signature Stephen S Beu

Date 12/27/99

POST-TEST DRY GAS METER CALIBRATION FORM

COMPANY:	FLORIDA ROCK / NEWBERRY, FL.
SOURCE:	CLINKER COOLER
DATE:	JULY 14, 2000
PRETEST Y:	0.997
TEST METER NUMBER:	KA-1
METER BOX NUMBER:	KA-4
BAROMETRIC PRESSURE (Pb):	29.88
DELTA H (dH):	1

	TEST METER READING (ft^3)	DRY GAS READING (ft^3)	TIME (min) ⏥	VACUUM SETTING (in. Hg)
INITIAL	164.603	264.144		
FIRST	174.180	273.774	14.5	5
SECOND	186.066	285.773	18	5
THIRD	196.230	296.086	15.5	5

DELTA H	TEST METER Vt (ft^3)	DRY GAS Vd (ft^3)	TEST METER TEMP. Tt (|F)	DRY GAS TEMP. Td (|F)
1	9.577	9.630	78	84
PB	11.886	11.999	78	87
29.88	10.164	10.313	78	90

$$Yi = \frac{Vt*Pb*(Td+460)}{Vd*(Pb+dH/13.6)*(Tt+460)}$$

RUN 1 (Yi)=	1.003118	155671.4 / 155187.4
RUN 2 (Yi)=	1.004681	194269.0 / 193363.8
RUN 3 (Yi)=	1.005061	167035.1 / 166193.9
AVG. Y =	1.004287	

PRETEST Y =	0.997
AVG. DETA Y =	0.007287
DELTA Y LIMIT =	• 0.05
IS TEST WITHIN 5%?	YES

Vt = Gas volume passing through the test meter, ft^3
Vd = Gas volume passing through the dry gas meter, ft^3
Tt = Temperature of the gas in the test meter, |F
Tdi = Temperature of the inlet gas of the dry gas meter, |F
Tdo = Temperature of the outlet gas of the dry gas meter, |F
Td = Average temperature of the gas in the dry gas meter, the average of Tdi and Tdo, |F
dH = Pressure difference accross the orifice, in, H2O
Yi = Ratio of test meter to dry gas meter for each run
Y = Average ratio of accuracy of test meter to dry gas meter for all three runs, tolerance = pretest • 0.05*Y
⏥ = Time of calibration run, min
Pb = Barometric pressure, in Hg.

DRY GAS METER AND ORIFICE CALIBRATION

CONTROL BOX NO. KA-4 BAROMETRIC PRESS. 30.39 IN. HG.

DATE FEB. 22, 2000 PERFORMED BY ROC

	RUN 1	RUN 2	RUN 3	RUN 4	RUN 5
VACUUM ("Hg)	0.0	0.0	0.0	0.0	0.0
dHw ("H2O)	-0.28	-0.30	-0.33	-0.37	-0.43
dHd ("H2O)	0.50	1.00	1.50	2.50	3.50
INITIAL WTM	3.036	28.727	994.704	20.046	9.754
FINAL WTM	9.754	34.540	1003.036	28.727	20.046
INITIAL DGM	103.007	129.171	94.618	120.249	109.760
FINAL DGM	109.760	135.141	103.007	129.171	120.249
TEMP. WTM (F)	68.00	69.00	68.00	69.00	68.00
TEMP. DGM (F)	76.00	80.00	75.00	80.00	78.00
TEST TIME (MIN.)	14.50	9.00	11.00	9.00	9.00
NET VOLUME WTM	6.718	5.813	8.332	8.681	10.292
NET VOLUME DGM	6.753	5.970	8.389	8.922	10.489
Y	1.009	0.992	1.004	0.988	0.992
dH@	1.264	1.296	1.421	1.453	1.447

AVERAGE Y = 0.997

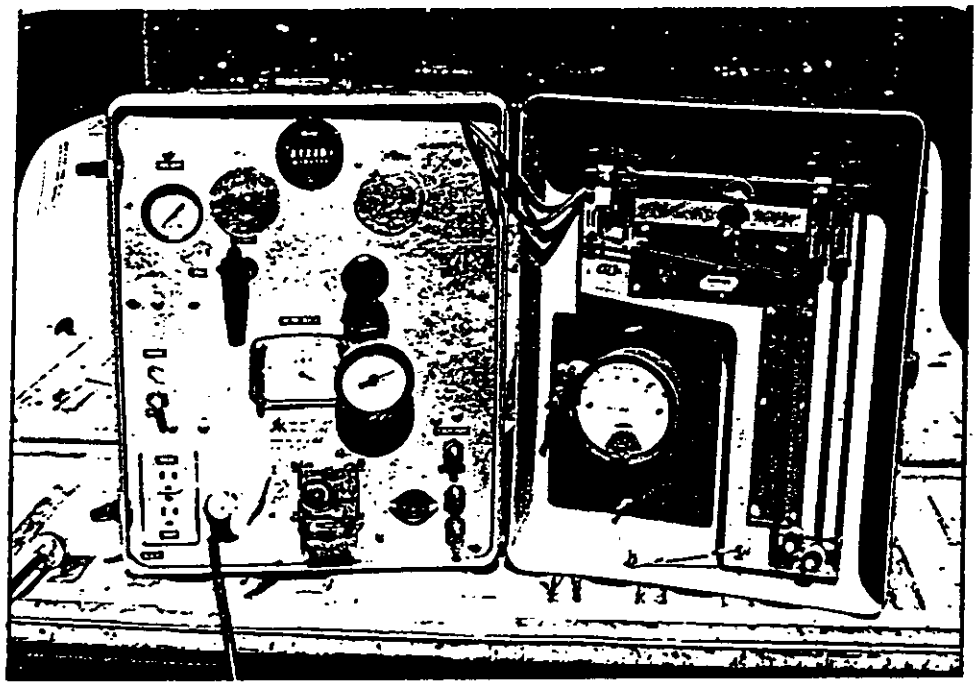
ACCEPTABLE Y RANGE = 0.980 TO 1.020 OK

AVERAGE dH@ = 1.376

$$Y = (Vw\ (Pb - (dHw / 13.6)) \times (Td + 460)) / (Vd\ (Pb + (dHd / 13.6)) \times (Tw + 460)$$

$$dH@ = 0.0317 \times dHd / (Pb\ (Td + 460)) \times ((Tw + 460) \times time) / Vw)^2$$

SOURCE SAMPLING EQUIPMENT



METER BOX

Equipment used in Source Sampling is either manufactured by or assembled by Koogler & Associates. The guidelines followed are A.P.T.D. 0581, Details of Isokinetic Source Sampling Equipment and A.P.T.D. 0576, Maintenance, Calibration and Operation of Isokinetic Source Sampling Equipment.

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

PROJECT PARTICIPANTS

PROJECT PARTICIPANTS

John B. Koogler, Ph.D., P.E.	Project Advisor
Rodney C. Paul	Field Test Crew
Stephen S. Bell	Field Test Crew
Glen A. Haven	Field Test Crew

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES