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STATE OF FLORIDA  
DEPT. OF ENV. PROTECTION  
NORTHEAST DISTRICT-JAX

CONTINUOUS EMISSION AND OPACITY  
MONITOR CERTIFICATION AND  
NO<sub>x</sub>, SO<sub>2</sub>, CO AND VOC EMISSION MEASUREMENTS

KILN/RAW MILL AND  
CLINKER COOLER

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

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

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## TABLE OF CONTENTS

1.0	INTRODUCTION .....	1
2.0	KILN/RAW MILL MONITORS .....	3
2.1	Opacity COMS .....	3
2.1.1	Calibration Error .....	4
2.1.2	Zero and Upscale Calibration Drift .....	5
2.1.3	Response Time .....	5
2.1.4	Conclusion .....	5
2.2	Nitrogen Oxides CEMS .....	5
2.2.1	Zero and Upscale Calibration Drift .....	7
2.2.2	Relative Accuracy .....	7
2.2.3	Conclusion .....	8
2.3	Sulfur Dioxide CEMS .....	8
2.3.1	Zero and Upscale Calibration Drift .....	10
3.0	CLINKER COOLER MONITOR .....	11
3.1	Opacity COMS .....	11
3.1.1	Calibration Error .....	12
3.1.2	Zero and Upscale Calibration Drift .....	13
3.1.3	Response Time .....	13
3.1.4	Conclusion .....	13
4.0	NOX, SO <sub>2</sub> , CO AND VOC COMPLIANCE TESTING .....	14
4.1	Location of Sampling Ports .....	16
4.2	Field and Analytical .....	17
4.3	Summary of Results .....	18

## APPENDIX

## 1.0 INTRODUCTION

Florida Rock Industries, Inc. owns and operates a dry process precalciner Portland cement plant on CR 235, two miles north of the city center of Newberry, Florida. During the period July 5-14, 2000, Koogler & Associates Environmental Services of Gainesville, Florida, certified continuous monitors on the kiln/raw mill stack for nitrogen oxides and sulfur dioxide (NO<sub>x</sub> and SO<sub>2</sub> CEMS) and opacity of emissions (COMS). A COMS was also certified on the clinker cooler stack. Additionally, emission measurements were conducted in the kiln/raw mill stack for nitrogen oxides (NO<sub>x</sub>), sulfur dioxide (SO<sub>2</sub>), carbon monoxide (CO) and volatile organic compounds (VOC, measured as total hydrocarbons).

The certifications were conducted in accordance with the requirements of 40 CFR 60, Appendix B, Performance Specifications 1 and 2. The emission measurements were conducted in accordance with EPA Methods 6C (SO<sub>2</sub>), 7E (NO<sub>x</sub>), 10 (CO) and 25A (VOC), all as described in 40 CFR 60, Appendix A.

The purpose of this effort was to provide the initial certifications of the continuous monitors and the initial demonstration of compliance with the NO<sub>x</sub>, SO<sub>2</sub>, CO and VOC emission limiting standards required by Permit No. AC01-267311/PSD-FL-228. The compliance test results for NO<sub>x</sub> and SO<sub>2</sub> are not required by permit as

compliance with these emission limits is to be demonstrated by CEMS. These data are reported for information.

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.

The results of the certifications are reported in the following sections.

## 2.0 KILN/RAW MILL MONITORS

### 2.1 Opacity COMS

During the period July 5-14, 2000, Koogler & Associates Environmental Services of Gainesville, Florida, and Florida Rock personnel conducted certification tests on the continuous opacity monitoring system (COMS) installed on the kiln/raw mill stack. These tests were conducted in accordance with COMS certification procedures outlined in 40 CFR 60, Appendix B, Performance Specification 1. This monitor successfully met EPA performance specifications, as summarized below:

<u>Parameter</u>	<u>Limit</u>	<u>Observed</u>
Calibration error:		
Low	3% opacity	0.05%
Mid	3% opacity	0.47%
High	3% opacity	2.49%
Zero Drift (24-hour)	2% opacity	0.6% (max)
Calibration Drift (24-Hour)	2% opacity	0.3% (max)
Response Time	10 seconds max.	5.7 sec
Operational Test Period	168 hrs.	168 hrs.

The COMS is an Environmental Monitor Service monitor, Model 1303, Serial Number 1303-133. A copy of the Design and Performance Specification (Section

5.0, Performance Specification 1) for this system is included in the Appendix. The span of the instrument is 100 percent opacity.

The COMS was installed in the 112-inch diameter stack exhausting the kiln and raw mill 51.6 feet (5.5 diameters) below the top of the stack and 145.8 feet (15.6 diameters) above the point where the gases enter the stack. The path length of the COMS is adjusted to the 112-inch diameter of the stack. The installation complies with the requirements of Section 4.0 of Performance Specification 1.

Test results are presented and discussed in the order addressed in Section 7.0 of Performance Specification 1.

#### 2.1.1 Calibration Error

In accordance with Section 7.1.4, three calibrated filters were inserted in the transmissometer path. Each filter was inserted a total of five times and the instrument response was recorded for each insertion; a total of 15 responses. The attenuation represented by the filter was 9.55, 50.84 and 78.49 percent opacity. Certification of the filters is included in the Appendix. The data are summarized in Table 1. The calibration errors ranged from 0.05 to 2.49 percent opacity. The maximum acceptable calibration error is 3.0 percent.



### 2.1.2 Zero and Upscale Calibration Drift

Zero drift and upscale drift were determined as specified in Section 7.4 during the period July 5-11, 2000. The zero calibration drift data are summarized in Table 2. The maximum zero drift was 0.60 percent. The upscale calibration drift data are also reported in Table 2. The maximum upscale drift was 0.30 percent. The limit on both drift errors is 2.0 percent.

### 2.1.3 Response Time

Response time was determined in accordance with Section 7.1.5. Table 3 summarizes these data. The response time averaged 5.7 seconds compared with a maximum acceptable response time of 10 seconds.

### 2.1.4 Conclusion

Based on the data presented herein, it can be concluded that the Environmental Monitor Service COMS installed on the kiln/raw mill stack meets the requirements of 40 CFR 60, Appendix B, Performance Specification 1.

## 2.2 **Nitrogen Oxides CEMS**

During the period July 5-14, 2000, Koogler & Associates Environmental Services of Gainesville, Florida, and Florida Rock personnel conducted certification tests on the continuous emission monitoring system (CEMS) for NO<sub>x</sub> installed on the kiln/raw mill stack. These tests were conducted in accordance with CEMS

certification procedures published in 40 CFR 60, Appendix B, Performance Specification 2. This monitor successfully met the EPA performance specifications, as summarized below:

<u>Parameter</u>	<u>Limit</u>	<u>Observed</u>
Zero Drift (24 hour)	2.5% of span	0.71% of span (max)
Calibration Drift (24-Hour)	2.5 % of span	0.68% of span (max)
Relative Accuracy	20% of RM	9.2% of RM
Operational Test Period	168 hrs.	168 hrs.

The NOx CEMS is a Shamrock Environmental Monitoring Systems, Inc., Model S180 monitor. A copy of the Design and Performance Specification for this system, as provided by the manufacturer, is included in the Appendix. The NOx CEMS measures the NOx concentration on a dry gas basis. This is accomplished by passing the sample gas stream through a chiller to remove moisture before the sample gas enters the CEMS. The span of the instrument is 1000 ppm NOx (v/v).

The NOx CEMS was installed in the 112-inch diameter stack exhausting the kiln and raw mill 51.6 feet (5.5 diameters) below the top of the stack and 145.8 feet (15.6 diameters) above the point where the gases enter the stack. The installation of the CEMS complies with the installation requirements of Section 3.0 of Performance Specification 2.



### 2.2.1 Zero and Upscale Calibration Drift

Zero and upscale calibration drift were determined as specified in Section 6.0 of Performance Specification 2 during the period July 5-11, 2000. The calibration gas used for the zero drift was a zero air (zero NO<sub>x</sub>) and the upscale calibration drift was evaluated with a calibration gas with 534 ppm (v/v) NO<sub>x</sub>. The zero drift calibration gas was within 0-20 percent of the instrument zero value and the upscale calibration drift was determined with a calibration gas that was within 50-100 percent of the instrument span of 1000 ppm (v/v). During the seven day drift test, no zero or span adjustments were made to the NO<sub>x</sub> CEMS and no maintenance was conducted on the instrument.

The zero and upscale calibration drift data are summarized in Table 4. The zero drift ranged from 0.05 to 0.71 percent of span and averaged 0.22 percent of span. The upscale drift ranged from 0.00 to 0.68 percent of span and averaged 0.33 percent of span. Performance Specification 2 limits the maximum zero and calibration drift for any 24-hour period to 2.5 percent of span.

### 2.2.2 Relative Accuracy

The relative accuracy test procedure published in Section 7.0 of Performance Specification 2 requires at least nine sets of NO<sub>x</sub> concentration measurements; one series of measurements made with the CEMS and one series of measurements made with the NO<sub>x</sub> reference method. The NO<sub>x</sub> reference method used for these measurements was EPA Method 7E as described in 40 CFR 60, Appendix A.



As required by Performance Specification 2, each NOx concentration measurement with the CEMS and reference method was made over a 21-minute period. The reference method sampling consisted of a three-point traverse across the stack with sampling conducted at each traverse point for seven minutes.

The relative accuracy test data were analyzed as prescribed in Section 7.0 of Performance Specification 2. The error associated with the relative accuracy of NOx CEMS is 9.21 percent of the reference method mean. The relative accuracy error limit specified by Performance Specification 2 is 20 percent of the mean of the reference method measurements or 10 percent of the standard; whichever is greater.

### **2.2.3 Conclusion**

Based on the data presented herein, it can be concluded that the NOX CEMS installed on the kiln/raw mill stack meets the requirements of 40 CFR 60, Appendix B, Performance Specification 2.

### **2.3 Sulfur Dioxide CEMS**

During the period July 5-14, 2000, Koogler & Associates Environmental Services of Gainesville, Florida, and Florida Rock personnel attempted to conduct certification tests on the continuous emission monitoring system (CEMS) for SO<sub>2</sub> installed on the kiln/raw mill stack. These certification tests were to be conducted

in accordance with CEMS certification procedures published in 40 CFR 60, Appendix B, Performance Specification 2. The monitoring system failed during the seven-day zero and calibration drift tests. As a result, further certification were canceled. Florida Rock currently has a temporary SO<sub>2</sub> CEMS operating in the kiln/raw mill stack and is working with the CEMS supplier to resolve this matter.

The SO<sub>2</sub> CEMS was a Shamrock Environmental Monitoring Systems, Inc., Model S180 monitor. A copy of the Design and Performance Specifications for this system, as provided by the manufacturer, are included in the Appendix for the NO<sub>x</sub> CEMS.

The system was to measure SO<sub>2</sub> concentration on a dry gas basis. This was accomplished by passing the sample gas stream through a chiller to remove moisture before the sample gas enters the CEMS. The span of the instrument was 0-100 ppm SO<sub>2</sub> (v/v).

The SO<sub>2</sub> CEMS was installed in the 112-inch diameter stack exhausting the kiln and raw mill 51.6 feet (5.5 diameters) below the top of the stack and 145.8 feet (15.6 diameters) above the point where the gases enter the stack. The installation of the SO<sub>2</sub> CEMS complied with the installation requirements of Section 3.0 of Performance Specification 2.

### 2.3.1 Zero and Upscale Calibration Drift

During the seven-day zero and upscale calibration drift period, the SO<sub>2</sub> CEMS failed. Hence, no further certification testing was conducted. The data that were collected during the calibration drift period are included in the Appendix.

### 3.0 CLINKER COOLER MONITOR

#### 3.1 Opacity COMS

During the period July 5-14, 2000, Koogler & Associates Environmental Services of Gainesville, Florida, and Florida Rock Industries personnel conducted certification tests on the continuous opacity monitoring system (COMS) installed on the clinker cooler stack. These tests were conducted in accordance with COMS certification procedures outlined in 40 CFR 50, Appendix B, Performance Specification 1. This monitor successfully met EPA performance specifications, as summarized below:

<u>Parameter</u>	<u>Limit</u>	<u>Observed</u>
Calibration error:		
Low	3% opacity	0.05%
Mid	3% opacity	0.55%
High	3% opacity	0.70%
Zero Drift (24-hour)	2% opacity	2.0% (max)
Calibration Drift (24-Hour)	2% opacity	0.0% (max)
Response Time	10 seconds max.	6.1 sec
Operational Test Period	168 hrs.	168 hrs.

The COMS is Environmental Monitor Service monitor, Model 1303, Serial Number 1303-137. A copy of the Design and Performance Specification (Section 5.0,

Performance Specification 1) for this system is included in the Appendix. The span of the instrument is 100 percent opacity.

The COMS was installed in the 78-inch diameter stack exhausting the clinker cooler 87 feet (13.4 diameters) below the top of the stack and 72 feet (11.1 diameters) above the point where the gases enter the stack. The path length of the COMS is adjusted to the 78-inch diameter of the stack. The installation complied with the requirements of Section 4.0 of Performance Specification 1.

Test results are presented and discussed in the order addressed in Section 7.0 of Performance Specification 1.

### 3.1.1 Calibration Error

In accordance with Section 7.1.4, three calibrated filters were inserted in the transmissometer path. Each filter was inserted a total of five times and the instrument response was recorded for each insertion; a total of 15 responses. The attenuation represented by the filter was 9.55, 50.84 and 78.49 percent opacity. Certification of the filters is included in the Appendix. The data are summarized in Table 6. The calibration errors ranged from 0.05 to 0.70 percent opacity. The maximum acceptable calibration error is 3.0 percent.

### 3.1.2 Zero and Upscale Calibration Drift

Zero drift and upscale drift were determined as specified in Section 7.4 during the period July 5-11, 2000. The zero calibration drift data are summarized in Table 7. The maximum zero drift was 2.0 percent of span. The upscale calibration drift data are also reported in Table 7. There was no (zero drift) upscale calibration drift. The limit on both drift errors is 2.0 percent of span.

### 3.1.3 Response Time

Response time was determined in accordance with Section 7.1.5. Table 8 summarizes these data. The response time averaged 6.1 seconds compared with a maximum acceptable response time of 10 seconds.

### 3.1.4 Conclusion

Based on the data presented herein, it can be concluded that the Environmental Monitor Service COMS installed on the clinker cooler stack meets the requirements of 40 CFR 60, Appendix B, Performance Specification 1.

#### 4.0 NOX, SO<sub>2</sub>, CO AND VOC COMPLIANCE TESTING

Permit AC01-267311/PSD-FL-228 requires (Specific Condition 6) that performance tests to demonstrate compliance with emission limiting standards for the kiln and raw mill begin within 60 days after achieving and maintaining the permitted production rate, but not later than 180 days after initial operation at that rate. The permit requires performance tests for particulate matter, opacity of emissions, carbon monoxide, volatile organic compounds, beryllium and sulfuric acid mist.

The permit also requires the performance tests be conducted while firing both primary fuels at permitted capacity; i.e., 100 percent coal and a combination of 70 percent coal and 30 percent tire derived fuel. The permit further states that if it is impractical to test at a permitted capacity, the plant operation is limited to 110 percent of the plant operating rate at the time of testing until such time a new test is conducted. The performance tests reported herein were conducted with the kiln fired with 100 percent coal. Based on permit conditions, the kiln can operate on only coal until such time tests are conducted to demonstrate compliance with permit conditions while operating on some combination of coal and tire derived fuel.

The particulate matter and visible emissions performance tests on the kiln/raw mill required by permit were reported under separate cover. This report summarizes only the performance test data for CO and VOCs. While not required by permit,



performance test data for NO<sub>x</sub> and SO<sub>2</sub> are reported for informational purposes. Compliance with NO<sub>x</sub> and SO<sub>2</sub> emission limiting standards is to be demonstrated by CEMS. The performance test data for beryllium and sulfuric acid mist will also be reported under separate cover.

The performance tests required by permit were conducted by Koogler & Associates Environmental Services of Gainesville, Florida, on the kiln/raw mill on July 13, 2000. The emission measurements for SO<sub>2</sub> was conducted in accordance with EPA Method 6C, the measurements for NO<sub>x</sub> were conducted in accordance with EPA Method 7E, the measurements for CO were conducted in accordance with EPA Method 10 and the measurements for VOCs were made in accordance with EPA Method 25A (a measure of total hydrocarbons). All test methods are published in 40 CFR 60, Appendix A.

During the test period, the kiln was operating in a compound mode (both kiln and war mill operating) at an average preheater feed rate of 140.7 tons per hour. Permit AC01-267311 limits the preheater feed rate of 149.9 tons per hour. The performance testing demonstrated that the kiln/raw mill operates well within the permit limits published for NO<sub>x</sub>, SO<sub>2</sub> and CO. However, the initial performance testing demonstrated that the hydrocarbon emission rate (expressed as total hydrocarbons) exceeded the permitted emission limit. In-house testing has demonstrated that the anomalous VOC emissions result from hydrocarbons

contained in certain feed materials. This matter will be addressed in detail under separate cover.

During the test period on July 13, 2000, the following emission rates were measured:

<u>Pollutant</u>	<u>Measured Emission Rate</u>	<u>Permit Limit</u>
NOx	287.9 lbs/hr	364.1 lbs/hr
SO <sub>2</sub>	1.4 lbs/hr	28.8 lbs/hr
CO	251.0 lbs/hr	346.4 lbs/hr
VOC	30.8 lbs/hr	11.6 lbs/hr

Based upon the data presented herein, it can be concluded that the kiln/raw mill was operating in compliance with the NOx, SO<sub>2</sub> and CO emission limiting standards. Additional work is required under the terms of the construction permit to demonstrate compliance with the VOC emission limiting standard.

#### **4.1 Location of Sampling Ports**

Four sampling 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.

#### **4.2 Field and Analytical Procedures**

The NO<sub>x</sub>, SO<sub>2</sub>, CO and VOC emission measurements were made on the kiln/raw mill stack using EPA Method 7E, 6C, 10 and 25A, respectively. Sampling for all gases was conducted at a single point near the center of the kiln/raw mill stack. The gas sample was withdrawn through an in-stack filter, a heated sampling probe and was conveyed to the instrument van through a heated teflon sample line. The gases then entered a heated manifold and were split with subsamples going to each of the four gas sampling instruments. The gas conditioning for the NO<sub>x</sub>, SO<sub>2</sub>, and CO samples included removal of moisture. The concentration of these gases were measured on a dry gas basis. The gas sample analyzed for hydrocarbons was passed through a heated sampling line directly to the hydrocarbon analyzer and analyzed for total hydrocarbons on a wet basis. The hydrocarbon concentration is reported as propane.

The sampling point locations for the EPA Method 2 velocity traverses were established in accordance with EPA Method 1. Stack gas velocity measurements and stack gas moisture measurements were made 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. 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 diagrams of the sampling trains for all test methods can be found in 40 CFR 60, Appendix A.

### 4.3 Summary of Results

The performance tests measurements made on July 13, 2000, are summarized in Table 9. During the test period, the feed rate to the preheater averaged 140.7 tons per hour. This is within 10 percent of the maximum preheater feed rate of 149.9 tons per hour. During the test period, the plant was operating in the compound mode; that is, with both the kiln and raw mill operating.

During testing, the stack gas flow rate averaged 170,281 acfm at a temperature of 206°F and 20 percent moisture. The standard stack gas flow rate averaged 108,789 dscfm.

The NO<sub>x</sub> concentration in the stack gas averaged 369.1 ppm (v/v). This is equivalent to a mass emission rate of NO<sub>x</sub> (as NO<sub>2</sub>) of 287.9 pounds per hour. The permitted NO<sub>x</sub> emission limit, based on a unit emission rate of 3.8 pounds of NO<sub>x</sub> per ton of clinker, is 364.1 pounds per hour.

The SO<sub>2</sub> concentration in the stack gas averaged 1.3 ppm, v/v, which is equivalent to a mass emission rate of 1.4 pounds per hour. The permitted SO<sub>2</sub> emission rate is 28.8 pounds per hour.

The CO concentration in the stack gas averaged 528.2 ppm (v/v) which is equivalent to a mass emission rate of 251.0 pounds per hour. The permitted mass emission rate of CO is 364.4 pounds per hour.

The concentration of VOC (as total hydrocarbons) in the stack gas averaged 32.9 ppm (v/v, as propane on a wet gas basis). This is equivalent to a mass emission rate of 30.8 pounds per hour. The permit limit for hydrocarbons (as VOC) is 11.6 pounds per hour. Subsequent testing, which will be reported under separate cover, has demonstrated that approximately five pounds per hour of the total hydrocarbons is methane and that the majority of the remaining hydrocarbons is contributed by hydrocarbons in mill scale and flyash. Florida Rock is working to resolve this matter under the terms of Permit AC01-267311.

Based on the data presented herein, it can be concluded that during the period of testing on July 13, 2000, the kiln/raw mill was operating in compliance with the NO<sub>x</sub>, SO<sub>2</sub> and CO emission limiting standards set forth in Permit AC01-267311. VOC emissions (reported as total hydrocarbons) exceeded the permit limit at the time of testing. Florida Rock is working to resolve this matter.

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

**TABLE 1**  
**CALIBRATION ERROR DETERMINATION**  
**OPACITY MONITOR**

Plant : Florida Rock Industries	Location : Newberry, Florida
Date : July 14, 2000	Opacity Source : Cement Kiln
Affiliation : Koogler & Associates	Monitor Pathlength, L1 : 136 in.
Analyzer Manufacturer : E.M.S.	Emission Pathlength, L2 : 112 in.
Model/Serial No. : 1303OEM / 1303-133	Person Conducting Test : S. Bell, G. Haven
Monitoring System Pathlength Corrected ? Yes	

**Calibrated Neutral Density Filter Values**

<b>Actual Optical Density (Opacity)</b>	<b>Path Adjusted Optical Density (Opacity)</b>
Optical Density (Opacity)	Optical Density (Opacity)
Low Range : 9.55	Low Range : 9.55
Mid Range : 50.84	Mid Range : 50.84
High Range : 78.49	High Range : 78.49

Run No.	Calibrated Filter Value Path Adjusted % Opacity	(Zero)	Analyzer Response (% Opacity)		Arithmetic Difference (% Opacity)		
			Uncor.	Corrected	Low	Mid	High
1-Low	9.55	1.20	10.40	9.20	-0.35	-	-
2-Mid	50.84		52.20	51.00	-	0.16	-
3-High	78.49		81.80	80.60	-	-	2.11
4-Low	9.55	1.20	10.80	9.60	0.05	-	-
5-Mid	50.84		52.30	51.10	-	0.26	-
6-High	78.49		81.80	80.60	-	-	2.11
7-Low	9.55	1.20	10.60	9.40	-0.15	-	-
8-Mid	50.84		51.90	50.70	-	-0.14	-
9-High	78.49		81.70	80.50	-	-	2.01
10-Low	9.55	0.90	10.40	9.50	-0.05	-	-
11-Mid	50.84		52.00	51.10	-	0.26	-
12-High	78.49		81.50	80.60	-	-	2.11
13-Low	9.55	0.90	10.20	9.30	-0.25	-	-
14-Mid	50.84		52.20	51.30	-	0.46	-
15-High	78.49		82.00	81.10	-	-	2.61
Arithmetic Mean =					-0.15	0.20	2.19
Confidence Coefficient =					0.196	0.272	0.296
Calibration Error =					0.05	0.47	2.49

**TABLE 2**  
**CALIBRATION DRIFT DETERMINATION**  
**OPACITY MONITOR**

FLORIDA ROCK INDUSTRIES, INC.  
 NEWBERRY, FLORIDA

SOURCE: Kiln/Raw Mill  
 DATE: July 5-11, 2000  
 ANALYZER: EMS Model 1303-133; Span 0-100 percent

	Date and Time	Initial Value	Final Value	Absolute Difference	Percent of Span Value
Low Level	7/5/2000 1255	0.0	0.6	0.6	0.6
	7/6/200 0947	1.8	1.8	0.0	0.0
	7/7/2000 0938	1.0	1.0	0.0	0.0
	7/8/2000 1050	0.8	0.8	0.0	0.0
	7/9/2000 1210	0.8	0.8	0.0	0.0
	7/10/2000 1152	0.9	0.9	0.0	0.0
	7/11/2000 1400	0.9	0.9	0.0	0.0
High Level	7/5/2000 1255	77.3	77.3	0.0	0.0
	7/6/200 0947	77.3	77.6	0.3	0.3
	7/7/2000 0938	77.3	77.3	0.0	0.0
	7/8/2000 1050	77.3	77.3	0.0	0.0
	7/9/2000 1210	77.3	77.3	0.0	0.0
	7/10/2000 1152	77.3	77.3	0.0	0.0
	7/11/2000 1400	77.3	77.3	0.0	0.0



TABLE 3  
 RESPONSE TIME DETERMINATION  
 OPACITY MONITOR

Plant : Florida Rock Industries	Location : Newberry, Florida
Date : July 14, 2000	Opacity Source : Cement Kiln
Affiliation : Koogler & Associates	Analyzer Manufacturer : E.M.S.
Person Conducting Test : S. Bell, G. Haven	Model/Serial No. : 1304OEM / 1303-133

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High Range Calibration Filter Value :	Actual Optical Density ( Opacity %)	<u>78.49</u>
	Path Adjusted Optical Density ( Opacity%)	<u>78.49</u>

Upscale Response Value (0.95 X filter value)	<u>73.6</u> percent opacity
Downscale Response Value (0.05 X filter value)	<u>3.7</u> percent opacity

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Upscale	1	<u>5</u>	seconds
	2	<u>6</u>	seconds
	3	<u>6</u>	seconds
	4	<u>6</u>	seconds
	5	<u>7</u>	seconds
Downscale	1	<u>6</u>	seconds
	2	<u>4</u>	seconds
	3	<u>6</u>	seconds
	4	<u>5</u>	seconds
	5	<u>6</u>	seconds
Average Response :		<u>5.7</u>	seconds

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**TABLE 4**  
**CALIBRATION DRIFT DETERMINATION**  
**NOX CEMS**

FLORIDA ROCK INDUSTRIES, INC.  
 NEWBERRY, FLORIDA

SOURCE: Kiln/Raw Mill  
 DATE: July 5-11, 2000  
 ANALYZER: Shamrock Model S180; Span 1000

	Date and Time	Initial Value(1)	Final Value	Absolute Difference	Percent of Span Value
Low Level	7/5/2000 1251	0.0	7.1	7.1	0.71
	7/6/2000 0850	7.1	9.1	2.0	0.20
	7/7/2000 01300	9.1	8.3	0.8	0.08
	7/8/2000 1211	8.3	8.8	0.5	0.05
	7/9/2000 1248	8.8	7.9	0.9	0.09
	7/10/2000 1300	7.9	6.0	1.9	0.19
	7/11/2000 1626	6.0	3.5	2.5	0.25
High Level	7/5/2000 1251	539.5	534.0	5.5	0.55
	7/6/2000 0850	534.0	540.8	6.8	0.68
	7/7/2000 01300	540.8	537.8	3.0	0.30
	7/8/2000 1211	537.8	539.3	1.5	0.15
	7/9/2000 1248	539.3	535.4	3.9	0.39
	7/10/2000 1300	535.4	533.0	2.4	0.24
	7/11/2000 1626	533.0	533.0	0.0	0.00

(1) 7/5/2000 initial values are true concentration of calibration gases for zero and upscale. Initial values for other days are final values of preceding days as no instrument adjustments were made.

