LAFARGE NORTH AMERICA, Inc.
ALPENA, MICHIGAN

TEST REPORT:

EMISSIONS OF PARTICULATE MATTER
From FG Clinker Cooler 22

PREPARED FOR

LAFARGE NORTH AMERICA, INC.
1435 FORD AVENUE
ALPENA, MICHIGAN 49707

PREPARED BY

AECOM
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MORRISVILLE, NORTH CAROLINA 27560

NOVEMBER 2015

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

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RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating (RO) Permit program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as described in General Condition No. 22 in the RO Permit and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: Lafarge Midwest Inc. County: Alpena

Source Address: 1435 Ford Ave. City: Alpena

AQD Source ID (SRN): B1477 RO Permit No.: MI-ROP-B1477-2012 RO Permit Section No.:

Please check the appropriate box(es):

☐ **Annual Compliance Certification (General Condition No. 28 and No. 29 of the RO Permit)**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the RO Permit, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the RO Permit.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the RO Permit, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the RO Permit, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (General Condition No. 23 of the RO Permit)**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the RO Permit were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the RO Permit were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From 10/22/2015 To 10/23/2015

Additional monitoring reports or other applicable documents required by the RO Permit are attached as described:

Emissions of Particulate Matter From FG Clinker Cooler 22, PC NESHAP Compliance

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete.

Paul Rogers	Plant Manager	989-354-4171
Name of Responsible Official (print or type)	Title	Phone Number
[signature]		12/1/2015
Signature of Responsible Official		Date

* Photocopy this form as needed.

EQP 5736 (Rev 9/01)

1.0 SUMMARY

1.1 Introduction

This particulate matter compliance test was performed at Lafarge North America on FG Clink Cooler 22 (CC 22). The purpose of the compliance test was to recertify the PM CEMS unit of Clinker Cooler 22. This test satisfies the requirements of 40 CFR Part 63, Michigan Rule 336 and the National Emission Standards for Hazardous Air Pollutants for Source Categories; Portland Cement Manufacturing Industry; Final Rule (PC MACT Regulation 40 CFR 63, Subpart LLL).

The PM CEMS unit had an internal failure (light source) which rendered the unit inoperable. The unit was returned to the factory and a new lamp (laser) was installed. Upon the PM CEMS unit's return to service a compliance test was performed in accordance with EPA Method 5 protocols to correlate the particulate matter (PM) emission rates. (40 CFR 64.4(e), 40 CFR 64.6(d)).

This test was performed in addition to particulate matter testing that is required every five (5) years per Michigan ROP-B1477-2012. This PM testing was successfully completed in July of 2015.

Table 1-1. Test Program Parameters and Location

Parameter	CC 22
Flow Rate	•
Moisture	•
PM	•

An AECOM test team consisting of Pat Turner, Willie Lea, and David Marzec performed the emissions testing. Travis Weide of Lafarge provided oversight and coordination to the sampling.

Section 2 includes a summary of the results, Section 3 contains the source and process description, Section 4 discusses the sampling location, Section 5 describes the sampling and analytical procedures, Section 6 discusses the test results in detail, and Section 7 discusses quality assurance and quality control practices. Questions regarding this test report should be directed to the following individuals:

AECOM Corporation	MDEQ - Air Quality Division	Lafarge Corporation
1. Bob Jongleux Senior Scientist Direct: 919.461.1242 Main: 919.461.1100 bob.jongleux@aecom.com	1. Karen Kajiya-Mills Compliance Support Unit 517.335.4874 kajiya-millsk@michigan.gov	1. Travis Weide Area Environmental and Public Affairs Manager 989.358.3321 travis.weide@lafargeholcim.com
2. Jerry Workman, PE Measurements Dept. Mgr. Direct: 919.461.1289 Main: 919.461.1100 jerry.workman@aecom.com	2. Rob Dickman Air Quality Division 231.876.4412 dickmanr@michigan.gov	

2.0 PARTICULATE MATTER RESULTS

Testing for particulate matter was conducted by AECOM during the time period of October 22-October 23, 2015. The objective was to sample PM emission rate concentrations by utilizing EPA Method 5 to correlate with CPMS monitor. This test re-establishes the PM CPMS Operating Limit (OI) for Clinker Cooler 22.

EPA Method 5 (40 CFR 60, Appendix A) was used to sample the clinker cooler exhaust gases for particulate matter. Airflow was manually measured using EPA Methods 1 and 2 in conjunction with the PM test runs. EPA Methods 3 and 4 were used to determine stack gas molecular weight and moisture, respectively.

The test results from the individual test runs are presented in Section 5. The required PC MACT operating limits (OI) are determined from the PM-CPMS correlation with the Method 5 determined PM results. See Appendix A-4 for calculation details.

Table 2-1 summarizes results for the PM CPMS Operating Limit. Tables 2-2 and 2-3 summarizes the PM test results and operating conditions of the each source tested. Detailed results are in Section 6.

Table 2-1. Summary of CC 22 PM CPMS Test Results

Source	Average mA	Relationship (R) (lbs/ton clinker/mA)	OI
CC 22	4.05	0.298	4.18

Table 2-2. Summary of CC 22 PM Test Results

Source	PM Emission Result	PM Emission Rate Limit	Units of Measurement
CC 22	0.01	.10	lb/ton of feed (dry basis)
CC 22	0.004	.04	lb/1000 lb of exhaust gases (dry basis)
CC 22	1.17	24.8	lb/hr

Table 2-3. Summary of CC 22 Operating Conditions during PM Testing

Source	Date(s) of Testing	Fuel Used	Clinker Produced (tons/hr)	Raw Material Feed Rate (tons/hr)
CC 22	10/22/15-10/23/15	Coal/coke	75.54	126.46

3.0 SOURCE AND PROCESS DESCRIPTIONS

FG Clinker Cooler 22 (CC 22) is one of two clinker coolers (CC 22 and CC 23) in Flexible Group 6 (FG 6). FG 6 consists of two rotary kilns (#22 and #23) which heat materials up to 3,000 degrees Fahrenheit to make clinker. Clinker produced by Kiln 22 exits via gravity and is sent through Clinker Cooler 22.

3.1 FG Clink Cooler 22

Clinker Cooler 22 cools the clinker, reclaims the hot air for return to the kilns, and moves clinker to the FG CLINKER SYS. As the clinker is conveyed toward the clinker storage building the recovered heat from Clinker Cooler 22 is re-circulated back to Kiln 22.

Figure 3-1 illustrates a detailed process flow diagram for Clinker Cooler 22 which is part of Flexible Group 6.

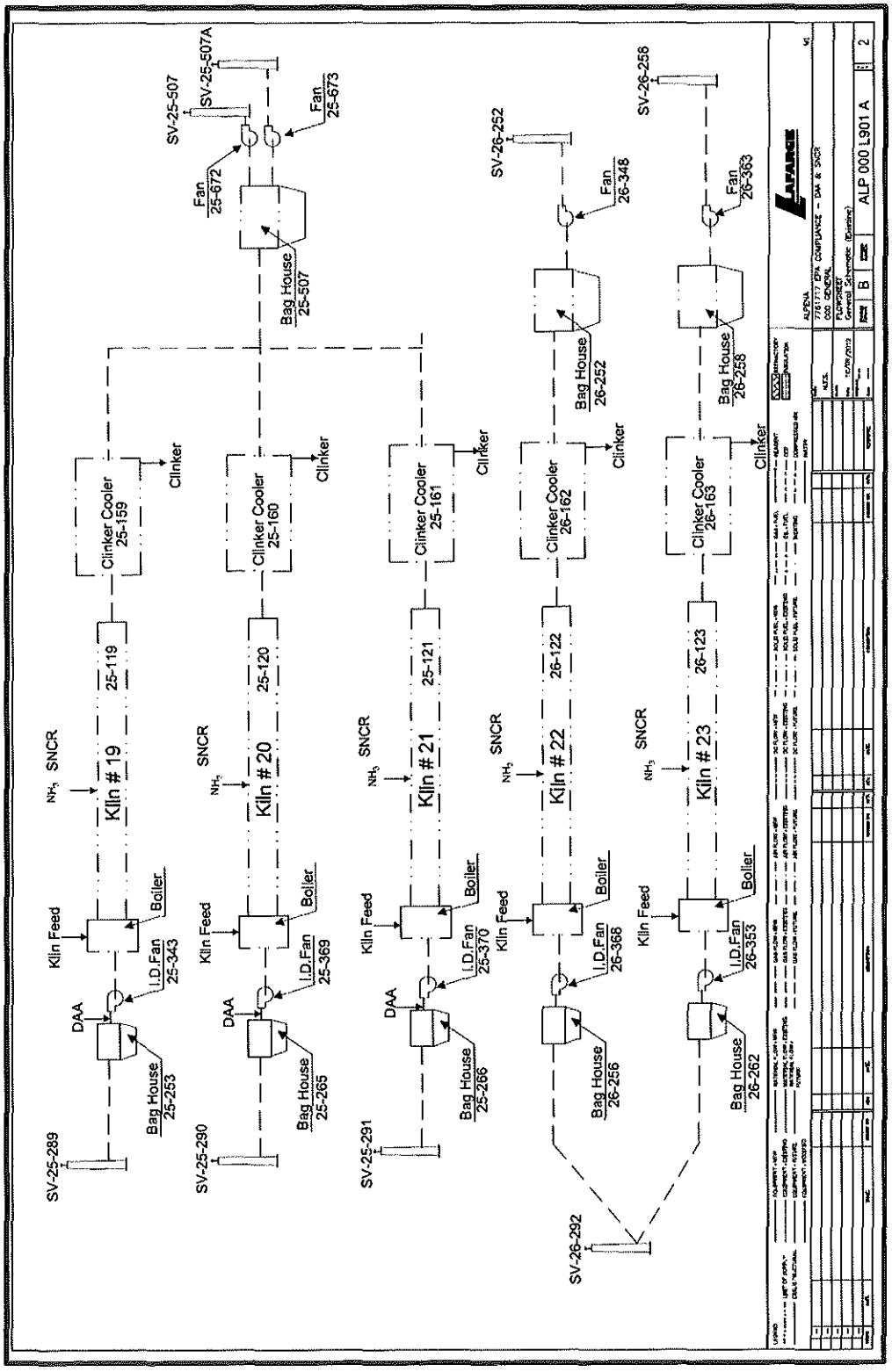

Figure 3-1. Detailed Process Flow Diagram for Kiln Group 5 and Kiln Group 6

4.0 SAMPLING LOCATIONS

The sampling location for FG CLINK COOLER 22 is the exhaust stack for Clinker Cooler 22. There are four existing test ports that were sampled manually using EPA Method 5 procedures. Each port was tested using a full particulate traverse in a series of three (3) one hour test runs. The test ports were the same sample location that was used during the intial PM CPMS certification test in July 2015. The physical location of the PM CEMS unit remained the same as the initial certification test.

The sampling location for Clinker Cooler 22 is illustrated in Figure 4-1.

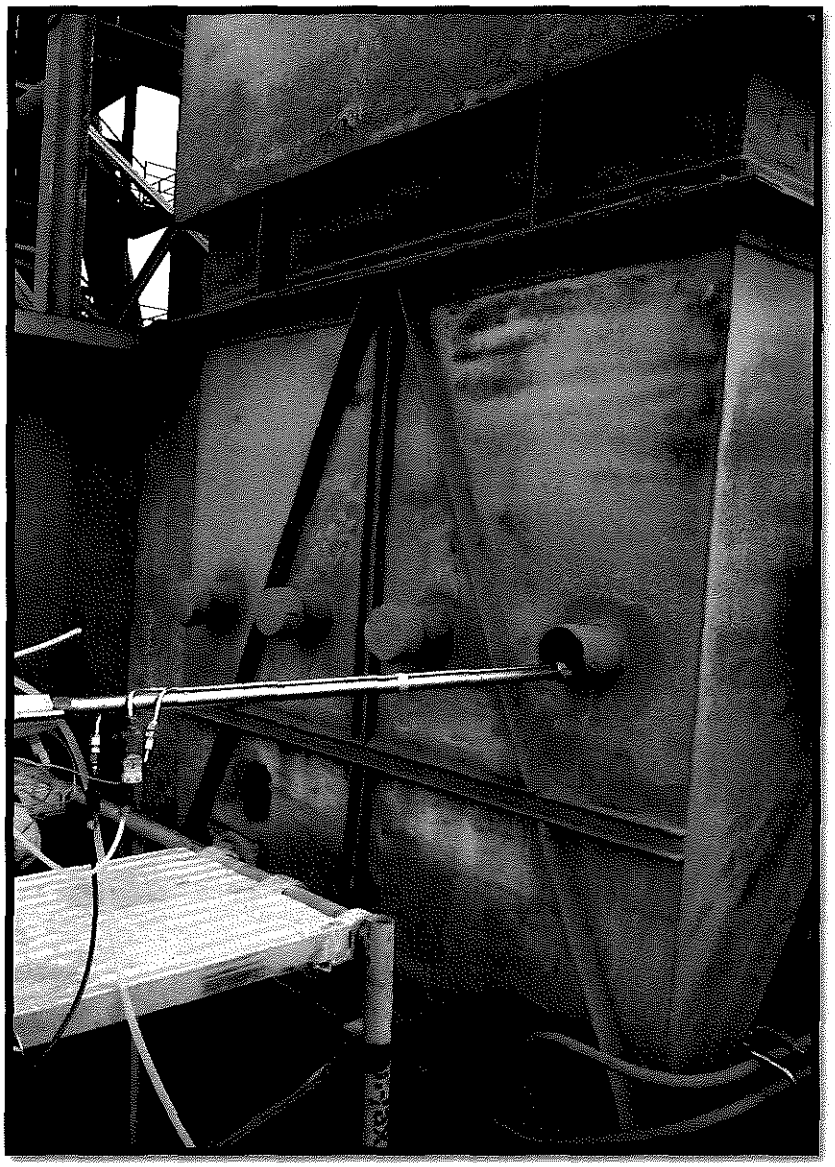

Figure 4-1. Clinker Cooler 22 Test Port Locations

5.0 SAMPLING AND ANALYTICAL PROCEDURES

AECOM Corporation (AECOM) conducted emissions measurements in accordance with procedures specified in the United States Environmental Protection Agency's (U.S. EPA's), and MDEQ's "General Rules, Part 10, Intermittent Testing and Sampling." The test methods used to perform the sampling and analysis are provided in Table 5-1.

Table 5-1. Test Methods

Parameter Measured	Method	Method Description
Particulate Matter	EPA Method 5	Determination of Particulate Matter Emissions from Stationary Sources
Velocity	EPA Method 2	Determination of Stack Gas Velocity and Volumetric Flow Rate
Oxygen and Carbon Dioxide	EPA Method 3	Dry Molecular Weight Determination by sampling Oxygen and Carbon Dioxide Assuming Ambient Conditions
Moisture	40 CFR 60 Appendix A: Method 4	Determination of Moisture Content In Stack Gases

6.0 TEST RESULTS AND DISCUSSION

6.1 Emission Testing Results

Tables 6-1 and 6-3 summarize the detailed test results for the PM CPMS test and the particulate matter emissions sampling. Appendix A-4 provides the equations and sample calculations that describe the derivation of the results from the field data.

As shown in Table 6-1 the PM-CPMS operating limit has been re-established for the Clinker Cooler 22 exhaust stack to ensure continuous compliance with the PC MACT regulation.As shown in Table 6-3, particulate matter (PM) test results indicate that Clinker Cooler 22 at the Lafarge Alpena plant meets the PM concentration emission limits contained in Michigan ROP-B1477-2012.

6.2 Particulate Matter Measurements

For the clinker cooler emission test, AECOM used EPA Method 5 impinger trains to sample the concentrations of the clinker cooler flue gas. Particulate matter is withdrawn isokinetically from the source. Clinker Cooler 22 had an EPA Method 1 performed to determine the necessary traverse points prior to testing. Preliminary velocity flow rates were determined according to EPA Method 2 procedures in order to determine the appropriate sampling parameters.

6.3 Stack Flow Measurement

The stack volumetric flow rate is a necessary component to calculate emission rates (lb/hr) as an intermediate step for calculating the mass of emissions per mass of dry raw feed (lb/ton). Stack flow rates were manually measured by AECOM during sampling periods at all sources. A summary of the volumetric flow rate measurements obtained during EPA Method 5 testing is presented in Table 6-2.

The volumetric gas flow rate was measured by EPA Method 2 during isokinetic sampling runs. Historical cyclonic flow checks indicate that the flow was acceptable at the test locations. Copies of the field data sheets are presented in Appendix A.

Table 6-1. Detailed PM CPMS Test Results for CC 22 (October 2015)

Source	Run	Date	Time (EST)	PM CPMS Output (mA)	Relationship (R) (lbs/ton clinker/mA)	OI
CC 22	1	10/22/15	16:21-17:27	4.07		
	2	10/23/15	08:20-09:26	4.04		
	3	10/23/15	09:54-10:57	4.05		
Average:				4.05	0.298	4.18

Table 6-2. Stack Volumetric Flow Rates (October 2015)

Source	Run	Date	Time (EST)	dscfm
CC 22	1	10/22/15	16:21-17:27	48,337
	2	10/23/15	08:20-09:26	61,650
	3	10/23/15	09:54-10:57	62,590
Average:				57,526

Table 6-3. Detailed Particulate Matter Results for Clinker Cooler 22 (October 2015)

Source	Run No.	Date	Time (EST)	PM Emissions (lb/ton feed dry basis)	PM Emission Rate Limit (lb/ton feed dry basis)	PM Emissions (lb/1000 lb exhaust gas dry basis)	PM Emission Rate Limit (lb/1000 lb exhaust gas dry basis)	PM Emissions (lb/hr)	PM Emission Rate Limit (lb/hr)
CC 22	1	10/22/15	16:21-17:27	.007	.10	.003	.04	0.70	24.8
	2	10/23/15	08:20-09:26	.018		.008		2.16	
	3	10/23/15	09:54-10:57	.004		.002		0.65	
Average:				.010		.004		1.17	

Table 6-4. Detailed Operating Conditions during PM Testing (October 2015)

Source	Run No.	Date	Time (EST)	Raw Feed (tons/hr)	Clinker Produced (tons/hr)	CKD Removed (tons/hr)	Average Inlet Temperature (°C)
CC 22	1	10/22/15	16:21-17:27	106.06	63.36	5.92	56.76
	2	10/23/15	08:20-09:26	121.43	72.54	6.78	65.13
	3	10/23/15	09:54-10:57	151.88	90.73	8.47	88.23
Average:				126.46	75.54	7.06	70.04

7.0 QUALITY ASSURANCE/QUALITY CONTROL

This section presents the approaches used to reduce, validate, and report measurement data. The overall data reduction, validation, and reporting flow scheme for the Lafarge Alpena particulate matter emissions test program were the responsibility of AECOM.

AECOM reduced and validated all of the sampling and field measurement data collected. The sampling data includes flow measurements, run times, calibrations and sampling parameters. Enthalpy Analytical Inc. of Durham, NC reduced all analytical results prior to submission to AECOM. The analytical data and the field measurements were used to determine concentrations and emission rates of interest.

Extreme care was exercised to ensure that hand recorded data were written accurately and legibly. Additionally, prepared and formatted data recording forms were used for all data collection. These forms are an important aid to verify that all necessary data items are recorded. The collected field and laboratory data were reviewed for correctness and completeness through secondary detail checking.

7.1 Data Validation

All measurement data were validated based upon the following qualities:

- Representative process conditions during sampling;
- Acceptable sample collection and testing procedures;
- Consistency with expected and/or other results; and
- Adherence to prescribed QC procedures.

Separate quality assurance reviews were conducted on field data entry and analytical data entry.

7.2 Laboratory QC

Enthalpy Analytical of Durham North Carolina analyzed the EPA Method 5 samples from the particulate matter test program. The Method 5 samples were transported by AECOM from the test site to the analytical lab under standard chain of custody procedures. The samples were received by the laboratory in good condition and only accessed by authorized personnel by Enthalpy Analytical, Inc.

The samples were analyzed by Enthalpy Analytical, Inc. using procedures specified in EPA Method 5, Determination of Particulate Matter Emissions from Stationary Sources (40 CFR Part 60, Appendix A). The complete analytical results and supporting QA/QC data is located in Appendix B.