1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a compliance dioxin and furan emissions test program for Holcim (US) Inc. d/b/a Lafarge Alpena at the Alpena Cement Plant in Alpena, Michigan, on Kiln 19, 20, 22, and 23 Breaching Ducts. This report summarizes the results of the test program and test methods.

The test locations, test dates, and test parameter are summarized below.

TEST INFORMATION		
Test Locations	**Test Dates**	**Test Parameter**
Kiln 19	September 13, 2021	Dioxin/Furan (D/F)
Kiln 20	September 14, 2021	
Kiln 22	September 9, 2021	
Kiln 23	September 8, 2021	

The purpose of the test program was to demonstrate compliance with Title 40, *Code of Federal Regulations*, Part 60 (40CFR60) and Part 63 (40CFR63) Subpart LLL "*National Emission Standards for Hazardous Air Pollutants (NESHAP) for the Portland Cement Manufacturing Industry and Standards of Performance for Portland Cement Plants.*" Specifically, to demonstrate that each of the below listed sources meet their D/F emission limit.

Test Location	Parameter	Test Method	Emission Limit	Emission Rate
Kiln 19	D/F	USEPA Method 23, 40CFR60, Appendix A	≤ 0.20 ng/dscm @ 7% O_2 (TEQ)	≤ 0.0194 ng/dscm @ 7% O_2 (TEQ)
Kiln 20	D/F			≤ 0.0065 ng/dscm @ 7% O_2 (TEQ)
Kiln 22	D/F			≤ 0.0076 ng/dscm @ 7% O_2 (TEQ)
Kiln 23	D/F			≤ 0.0048 ng/dscm @ 7% O_2 (TEQ)

The identifications of the individuals associated with the test program are summarized below.

TEST PERSONNEL INFORMATION		
Location	**Address**	**Contact**
Test Facility	Holcim (US) Inc. Alpena Cement Plant 1435 Ford Avenue Alpena, Michigan 49707	Mr. Travis Weide Area Environmental & Public Affairs Manager 989-358-3321 travis.weide@lafargeholcim.com
Testing Company Supervisor	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Eric L. Ehlers Director, Field Operations 630-993-2663 (phone) eehlers@mp-mail.com

The test crew consisted of Messrs. C. Reice, C. Trezak, D. Kossack, D. Panek, J. Gross, J. Devereux, M. Friduss, N. Colangelo, R. Spoolstra, W. Petrovich, and E. Ehlers.

2.0 TEST METHODOLOGY

Emission testing was conducted following the United States Environmental Protection Agency (USEPA) methods specified in 40CFR60, Appendix A, in addition the Mostardi Platt Quality Manual.

CPMS data and process data as provided by Holcim (US) Inc. are also included in Appendix A. Schematics of the test section diagrams and sampling train diagrams are included in Appendix B and C respectively. Calculation nomenclature are included in Appendix D. Laboratory analysis for each test run are included in Appendix E. The computerized reference method test data is included in Appendix F.

The following methodologies were used during the test program:

Method 1 Sample and Velocity Traverse Determination

Test measurement points were selected in accordance with USEPA Method 1, 40CFR60, Appendix A. The characteristics of the measurement location are summarized below.

TEST POINT INFORMATION							
Test Location	Stack Dimensions (Equivalent)	No. of Ports	Port Length (Inches)	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points
Kiln 19	8.856	3	3.25	0.73	0.79	D/F	27
Kiln 20	8.358	3	3.25	0.47	1.11		
Kiln 22	10	2	8.00	0.19	1.46		24
Kiln 23	10	2	8.00	0.19	1.46		

Method 2 Volumetric Flow Rate Determination

Gas velocity was measured following USEPA Method 2, 40CFR60, Appendix A, for purposes of calculating stack gas volumetric flow rate. S-type pitot tubes, 0-10" differential pressure gauge, and K-type thermocouple and temperature readout were used to determine gas velocity at each sample point. All of the equipment used was calibrated in accordance with the specifications of the Method. Copies of field data sheets are included in Appendix G. Calibration data are presented in Appendix H. This testing met the performance specifications as outlined in the Method.

Method 3A Oxygen (O_2)/Carbon Dioxide (CO_2) Determination

Flue gas O_2 and CO_2 concentrations were determined in accordance with USEPA Method 3A. An Ecom analyzer was used to determine the O_2 and CO_2 concentrations by connecting the analyzer to the exit of the dry gas meter. The O_2 instrument operates in the nominal range of 0% to 21% with the specific range determined by the high-level calibration gas. The CO_2 instrument operates in the nominal range of 0% to 20% with the specific range determined by the high-level calibration gas. High and mid-range calibrations were performed using USEPA Protocol gas. Zero nitrogen (a low ppm pollutant in balance nitrogen calibration gases) was introduced during other instrument calibrations to check instrument zero. Zero and mid-range calibrations were performed using USEPA Protocol gas after each test run. Calibration data are presented in Appendix H. Copies of the gas cylinder certifications are found in Appendix I.

Method 4 Moisture (H_2O) Determination

Stack gas moisture content was determined using a Method 4 sampling train as a component of the Method 23 sampling system. In this technique, stack gas was drawn through a series of impingers as detailed in EPA Method 23. The entire impinger train was measured or weighed before and after each test run to determine the mass of moisture condensed.

During testing, the sample train was operated in the manner specified in USEPA Method 4. All of the data specified in Method 4 (gas volume, delta H, impinger outlet well temperature, etc.) was recorded on field data sheets.

All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data is included in Appendix H.

Method 23 Dioxin and Furan Determination

Stack gas dioxin and furan concentrations and emission rates were determined in accordance with Method 23, 4CFR60, Appendix A. An Environmental Supply Company sampling train was used to sample for concentrations of dioxins and furans, in the manner specified in the Method.

The alternative recovery procedure was used that removes the methylene chloride recovery solvent rinse for toluene, as specified in ALT-036 - Approval Method 23 Modification for Cement Kilns.

After recovery, samples were analyzed by an accredited laboratory following the procedures specified in the Method. Laboratory analysis data are found in Appendix E. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data is presented in the Appendix H.

3.0 TEST RESULT SUMMARIES

Client: Holcim (US) Inc.
Facility: Alpena Cement Plant
Test Location: Kiln 19 Breaching Duct
Test Method: 23

Source Condition	Normal	Normal	Normal	
Date	9/13/21	9/13/21	9/13/21	
Start Time	9:54	15:35	19:05	
End Time	15:14	18:48	22:18	
	Run 1	Run 2	Run 3	Average
Stack Conditions				
Average Gas Temperature, °F	420.2	428.1	432.3	426.9
Flue Gas Moisture, percent by volume	5.7%	5.7%	4.8%	5.4%
Average Flue Pressure, in. Hg	29.41	29.41	29.41	29.41
Gas Sample Volume, dscf	117.831	116.827	119.379	118.012
Average Gas Velocity, ft/sec	32.756	32.695	33.566	33.006
Gas Volumetric Flow Rate, acfm	155,917	155,630	159,775	157,107
Gas Volumetric Flow Rate, dscfm	86,685	85,729	88,417	86,944
Gas Volumetric Flow Rate, scfm	91,921	90,941	92,917	91,926
Average $\%CO_2$ by volume, dry basis	16.7	17.8	17.3	17.3
Average $\%O_2$ by volume, dry basis	9.8	9.4	9.4	9.5
Isokinetic Variance	102.2	102.5	101.5	102.1
Baghouse Inlet Temperature, °C	240	246	253	246
PCDD/PCDF Emissions				
ng/dscm	≤ 0.3500	≤ 0.4400	≤ 0.3900	≤ 0.3933
ng/dscm TEQ	≤ 0.0079	≤ 0.0335	≤ 0.0064	≤ 0.0159
ng/dscm @ 7% O_2 Dry	≤ 0.0099	≤ 0.0405	≤ 0.0077	≤ 0.0194

Client: Holcim (US) Inc.
Facility: Alpena Cement Plant
Test Location: Kiln 20 Breaching Duct
Test Method: 23

Source Condition	Normal	Normal	Normal	
Date	9/14/21	9/14/21	9/14/21	
Start Time	8:43	12:12	15:44	
End Time	11:56	15:25	9:43	
	Run 1	Run 2	Run 3	Average
Stack Conditions				
Average Gas Temperature, °F	398.1	402.2	397.6	399.3
Flue Gas Moisture, percent by volume	5.3%	3.9%	4.0%	4.4%
Average Flue Pressure, in. Hg	29.13	29.13	29.13	29.13
Gas Sample Volume, dscf	146.180	143.799	146.332	145.437
Average Gas Velocity, ft/sec	36.316	35.839	36.720	36.292
Gas Volumetric Flow Rate, acfm	152,527	150,526	154,224	152,426
Gas Volumetric Flow Rate, dscfm	86,557	86,195	88,758	87,170
Gas Volumetric Flow Rate, scfm	91,365	89,733	92,438	91,179
Average $\%CO_2$ by volume, dry basis	17.7	18.0	16.8	17.5
Average $\%O_2$ by volume, dry basis	9.3	9.0	9.5	9.3
Isokinetic Variance	102.3	101.0	99.8	101.0
Baghouse Inlet Temperature, °C	258	254	257	256
PCDD/PCDF Emissions				
ng/dscm	≤ 0.0605	≤ 0.0739	≤ 0.0645	≤ 0.0663
ng/dscm TEQ	≤ 0.0047	≤ 0.0055	≤ 0.0060	≤ 0.0054
ng/dscm @ 7% O_2 Dry	≤ 0.0056	≤ 0.0064	≤ 0.0073	≤ 0.0065

Client: Holcim (US) Inc.
Facility: Alpena Cement Plant
Test Location: Kiln 22 Baghouse Outlet
Test Method: 23

Source Condition	Normal	Normal	Normal	
Date	9/9/21	9/9/21	9/9/21	
Start Time	8:55	13:17	16:57	
End Time	12:40	16:30	20:11	
	Run 1	Run 2	Run 3	Average
Stack Conditions				
Average Gas Temperature, °F	289.3	391.1	402.3	360.9
Flue Gas Moisture, percent by volume	3.7%	5.0%	4.5%	4.4%
Average Flue Pressure, in. Hg	29.03	29.03	29.03	29.03
Gas Sample Volume, dscf	163.769	151.086	148.091	154.315
Average Gas Velocity, ft/sec	45.098	47.978	47.505	46.860
Gas Volumetric Flow Rate, acfm	212,518	226,092	223,862	220,824
Gas Volumetric Flow Rate, dscfm	139,855	129,348	127,029	132,077
Gas Volumetric Flow Rate, scfm	145,289	136,090	132,996	138,125
Average %CO_2 by volume, dry basis	18.7	18.9	19.1	18.9
Average %O_2 by volume, dry basis	8.4	8.2	8.1	8.2
Isokinetic Variance	100.1	99.9	99.7	99.9
Baghouse Inlet Temperature, °C	254	257	259	257
PCDD/PCDF Emissions				
ng/dscm	≤ 0.0881	≤ 0.0821	≤ 0.2415	≤ 0.1372
ng/dscm TEQ	≤ 0.0054	≤ 0.0105	≤ 0.0048	≤ 0.0069
ng/dscm @ 7% O_2 Dry	≤ 0.0060	≤ 0.0115	≤ 0.0052	≤ 0.0076

Client: Holcim (US) Inc.
Facility: Alpena Cement Plant
Test Location: Kiln 23 Baghouse Outlet
Test Method: 23

Source Condition	Normal	Normal	Normal	
Date	9/8/21	9/8/21	9/8/21	
Start Time	13:00	16:45	20:28	
End Time	16:12	20:00	23:41	
	Run 1	Run 2	Run 3	Average
Stack Conditions				
Average Gas Temperature, °F	280.3	252.4	199.9	244.2
Flue Gas Moisture, percent by volume	4.2%	3.9%	3.1%	3.7%
Average Flue Pressure, in. Hg	28.74	28.74	28.74	28.74
Gas Sample Volume, dscf	153.847	161.273	166.841	160.654
Average Gas Velocity, ft/sec	42.483	42.810	40.787	42.027
Gas Volumetric Flow Rate, acfm	200,198	201,738	192,206	198,047
Gas Volumetric Flow Rate, dscfm	131,398	138,019	143,112	137,510
Gas Volumetric Flow Rate, scfm	137,147	143,617	147,717	142,827
Average $\%CO_2$ by volume, dry basis	20.4	20.1	20.3	20.3
Average $\%O_2$ by volume, dry basis	7.3	7.6	7.5	7.5
Isokinetic Variance	100.1	99.9	99.7	99.9
Baghouse Inlet Temperature, °C	258	256	250	255
PCDD/PCDF Emissions				
ng/dscm	≤ 0.6417	≤ 0.2933	≤ 0.5149	≤ 0.4833
ng/dscm TEQ	≤ 0.0046	≤ 0.0033	≤ 0.0061	≤ 0.0047
ng/dscm @ 7% O_2 Dry	≤ 0.0047	≤ 0.0034	≤ 0.0063	≤ 0.0048

4.0 CERTIFICATION

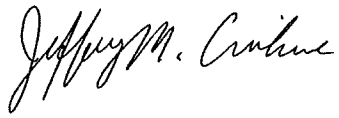
MOSTARDI PLATT is pleased to have been of service to Holcim (US) Inc. If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

As the program manager, I hereby certify that this test report represents a true and accurate summary of emissions test results and the methodologies employed to obtain those results. The test program was performed in accordance with the test methods and the Mostardi Platt Quality Manual, as applicable.

MOSTARDI PLATT

Project Manager

Eric L. Ehlers



Quality Assurance

Jeffrey M. Crivlare