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Compliance Emissions Test Report

Lansing Board of Water and Light
REO Town Facility
HRSG #1 Stack
Lansing, Michigan
February 14, 2019

Report Submittal Date
March 7, 2019

Project No. M190706B

888 Industrial Drive
Elmhurst, Illinois 60126
630-993-2100

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1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a compliance emissions test program for Lansing Board of Water and Light on February 14, 2019 at the REO Town Facility in Lansing, Michigan on the HRSG #1 Stack. This report summarizes the results of the test program and test methods used.

The test location, test date, and test parameters are summarized below.

TEST INFORMATION		
Test Location	**Test Date**	**Test Parameters**
HRSG #1 Stack	February 14, 2019	Filterable Particulate Matter (FPM), Condensable Particulate Matter (CPM), Total Particulate Matter (TPM), and Carbon Monoxide (CO)

The purpose of the test program was to demonstrate the above test parameter emissions during normal operating conditions to satisfy the regulatory permit limits. Selected results of the test program are summarized below. A complete summary of emission test results follows the narrative portion of this report.

TEST RESULTS			
Test Location	**Test Parameter**	**Emission Limits**	**Emission Rate**
HRSG #1 Stack	FPM	2.1 lb/hr	0.696 lb/hr
	TPM ($PM_{2.5}$, PM_{10})	5.5 lb/hr	1.867 lb/hr
	CO	51.7 lb/hr 50 ppmvd @15% O_2	27.53 lb/hr 24.0 ppmvd @15% O_2

All of the filterable and condensable particulate matter were considered to be $PM_{2.5}$ and PM_{10} in the TPM evaluation. Operating data as provided by Lansing Board of Water and Light are included in Appendix A.

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

TEST PERSONNEL INFORMATION		
Location	**Address**	**Contact**
Test Coordinator	Lansing Board of Water and Light 1232 Haco Drive P.O. Box 13007 Lansing, Michigan 48912	Mr. Nathan Hude Environmental Regulatory Compliance (517) 490-3069 (cell phone) nathan.hude@lbwl.com
Test Facility	Lansing Board of Water and Light REO Town Facility 1201 S. Washington Ave. Lansing, Michigan 48917	
Testing Company Representative	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Mark E. Peterson Project Manager (630) 993-2100 (phone) mpeterson@mp-mail.com

The test crew consisted of Messrs. J. Adams, J. Kukla, K. Krofel, and M. Peterson of Mostardi Platt.

2.0 TEST METHODOLOGY

Emissions testing was conducted following the methods specified in 40CFR60, Appendix A, and 40CFR51, Appendix M. A schematic of the test section diagram is found in Appendix B and schematics of the sampling trains used are included in Appendix C. Calculation nomenclature and sample calculations are included in Appendix D. Laboratory analysis data are found in Appendix E. Copies of analyzer print-outs for each test run are included in Appendix F and field data sheets are found in Appendix G.

The following methodologies were used during the test program:

Method 1 Traverse Point Determination

Test measurement points were selected in accordance with Method 1. The characteristics of the measurement location are summarized below.

TEST POINT INFORMATION						
Location	**Stack Diameter**	**Stack Area**	**Upstream Diameters**	**Downstream Diameters**	**Test Parameter**	**Number of Sampling Points**
HRSG #1 Stack	9.667 feet	73.396 sq. ft.	3.6 feet	8.0 feet	FPM, TPM	24

Gaseous Stratification Test

A twelve-point stratification test was performed during Run 1 of the test program. Based on the stratification test results, three test point used for Runs 2 and 3.

Method 2 Volumetric Flowrate Determination

Gas velocity was measured following Method 2, for purposes of calculating stack gas volumetric flow rate and FPM/TPM emissions on a lb/hr basis. An S-type pitot tube, differential pressure gauge, 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. Calibration data are presented in Appendix H.

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

Stack gas molecular weight was determined in accordance with Method 3A. A Servomex analyzer was used to determine stack gas oxygen and carbon dioxide content and, by difference, nitrogen content. All of the equipment used was calibrated in accordance with the specifications of the Method. Calibration data are presented in Appendix H and copies of the gas cylinder certifications are found in Appendix I.

Method 5 Filterable Particulate Matter (FPM) Determination

Stack gas filterable particulate concentrations and emission rates were determined in accordance with Method 5. An Environmental Supply Company, Inc. sampling train was used to sample stack gas at an isokinetic rate, as specified in the Method. Particulate matter in the sample probe was recovered using an acetone wash. The probe wash and filter catch were analyzed by Mostardi Platt personnel. Laboratory analysis data are found in Appendix E. Calibration data are presented in Appendix H.

Method 202 Condensable Particulate Matter (CPM) Determination

Stack gas CPM concentrations and emission rates were determined in accordance with the Method 202, 40CFR51, Appendix M, in conjunction with Method 5 filterable particulate sampling. Condensable particulate matter was collected in the impinger portion of the Method 202 sampling train.

The condensable particulate matter (CPM) was collected in impingers after filterable particulate material was collected using Method 5. The organic and aqueous fractions were then taken to dryness and weighed. The total of all fractions represents the CPM. Compared to the December 17, 1991 promulgated Method 202, this Method includes the addition of a condenser, followed by a water dropout impinger immediately after the final heated filter. One modified Greenburg Smith impinger and an ambient temperature filter follow the water dropout impinger. A schematic of the sampling train configured with these updates is found in the Appendix.

CPM was collected in the water dropout, modified Greenburg Smith impinger and ambient filter portion of the sampling train as described in this Method. The impinger contents were purged with nitrogen (N_2) immediately after sample collection to remove dissolved sulfur dioxide (SO_2) gases from the impingers. The impinger solution was then extracted with DI water, acetone, and hexane. The organic and aqueous fractions were dried and the residues weighed. The total of the aqueous, organic, and ambient filter fractions represents the CPM. 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 are presented in Appendix H.

Method 10 Carbon Monoxide (CO) Determination

Stack gas carbon monoxide concentrations and emission rates were determined in accordance with Method 10. A TECO 48i carbon monoxide analyzer was used to determine carbon monoxide concentrations, in the manner specified in the Method.

Stack gas was delivered to the analyzer via a Teflon® sampling line, heated to a minimum temperature of 250°F. Excess moisture in the stack gas was removed using a refrigerated condenser. The entire system was calibrated in accordance with the Method, using certified calibration gases introduced at the probe, before and after each test run.

A list of calibration gases used and the results of all calibration and other required quality assurance checks can be found in Appendix H. Copies of calibration gas certifications can be found in Appendix I.

3.0 TEST RESULT SUMMARIES

Client: Lansing Board of Water and Light
Facility: REO Town Facility
Test Location: HRSG #1 Stack
Test Method: 5/202

Source Condition	Full Load	Full Load	Full Load	
Date	2/14/19	2/14/19	2/14/19	
Start Time	8:15	11:00	13:30	
End Time	10:23	13:07	15:36	
	Run 1	Run 2	Run 3	Average
Stack Conditions				
Average Gas Temperature, °F	356.1	354.8	354.4	355.1
Flue Gas Moisture, percent by volume	7.1%	6.9%	6.4%	6.8%
Average Flue Pressure, in. Hg	28.76	28.76	28.76	28.76
Gas Sample Volume, dscf	72.572	71.911	71.814	72.099
Average Gas Velocity, ft/sec	88.556	87.572	87.235	87.788
Gas Volumetric Flow Rate, acfm	389,979	385,648	384,161	386,596
Gas Volumetric Flow Rate, dscfm	225,169	223,675	224,098	224,314
Gas Volumetric Flow Rate, scfm	242,501	240,200	239,384	240,695
Average $\%CO_2$ by volume, dry basis	3.5	3.4	3.3	3.4
Average $\%O_2$ by volume, dry basis	14.2	14.5	14.6	14.4
Isokinetic Variance	101.2	101.0	100.7	101.0
Standard Fuel Factor Fd, dscf/mmBtu	8,710.0	8,710.0	8,710.0	8,710.0
Filterable Particulate Matter (Method 5)				
grams collected	0.00123	0.00187	0.00197	0.00169
grains/acf	0.0002	0.0002	0.0002	0.0002
grains/dscf	0.0003	0.0004	0.0004	0.0004
lb/hr	0.505	0.769	0.813	0.696
lb/mmBtu (Standard Fd Factor)	0.0010	0.0016	0.0017	0.0014
Condensable Particulate Matter (Method 202)				
grams collected	0.00246	0.00294	0.00314	0.00285
grains/acf	0.0003	0.0004	0.0004	0.0004
grains/dscf	0.0005	0.0006	0.0007	0.0006
lb/hr	1.009	1.209	1.296	1.171
lb/mmBtu (Standard Fd Factor)	0.0020	0.0026	0.0028	0.0025
Total Particulate Matter (5/202)				
grams collected	0.00369	0.00481	0.00511	0.00454
grains/acf	0.0005	0.0006	0.0006	0.0006
grains/dscf	0.0008	0.0010	0.0011	0.0010
lb/hr	1.514	1.978	2.109	1.867
lb/mmBtu (Standard Fd Factor)	0.0030	0.0042	0.0045	0.0039

Lansing Board of Water and Light REO Town Facilty HRGS #1 Stack Gaseous Summary									
Test No.	Date	Start Time	End Time	CO ppmvd	CO_2 % (dry)	O_2 % (dry)	CO ppmvd @ 15% O2	Flowrate, DSCFM	CO lb/hr
1	02/14/19	08:15	09:30	30.6	3.9	14.1	26.6	225,169	30.04
2	02/14/19	09:47	10:46	27.7	3.9	13.9	23.3	225,169	27.19
3	02/14/19	11:27	12:26	26.0	3.9	14.0	22.2	223,675	25.35
Average				28.1	3.9	14.0	24.0	224,671	27.53

4.0 CERTIFICATION

MOSTARDI PLATT is pleased to have been of service to Lansing Board of Water and Light If you have any questions regarding this test report, please do not hesitate to contact us at 630-993-2100.

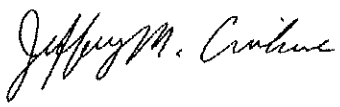
CERTIFICATION

As project 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, and the test program was performed in accordance with the methods specified in this test report.

MOSTARDI PLATT

Program Manager

Mark E. Peterson



Quality Assurance

Jeffrey M. Crivlare