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**Mercury and Air Toxics Standard Particulate Matter
Emissions Test Report**

**Marquette Board of Light and Power
Shiras Steam Plant
Unit 3 Stack
Marquette, Michigan
April 5, 2016**

**Report Submittal Date
May 4, 2016**

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Mostardi Platt

Project No. M161406

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1.0 EXECUTIVE SUMMARY

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MOSTARDI PLATT conducted a Mercury and Air Toxics Standards (MATS) filterable particulate matter (FPM) emissions test program for the Marquette Board of Light and Power at the Shiras Steam Plant on the Unit 3 Stack in Marquette, Michigan on April 5, 2016. This report summarizes the results of the test program and test methods used.

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

TEST INFORMATION		
Test Location	Test Date	Test Parameter
Unit 3 Stack	April 5, 2016	Filterable Particulate Matter (FPM)

The purpose of this test program was to demonstrate that the Unit 3 Stack qualifies for Low Emitting Electric Generating Unit (LEE) status for FPM as detailed in 40CFR63, Subpart UUUUU, Section 63.10005 (h)(5). 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	Test Method	Emission Limit	Emission Rate
Unit 3 Stack	FPM	Method 5	0.03 lb/mmBtu	0.0046 lb/mmBtu
			0.015 lb/mmBtu (LEE Status)*	

*LEE designation for FPM is established if the FPM emissions measured during the initial compliance test and all subsequent quarterly testing completed over the initial 3-year period are less than 50% of the applicable emission limit, which equates to 0.015 lb/mmBtu.

A leak check failed during Run 1 and was not included in the average emission rate above, which consists of Runs 2, 3, and 4.

Particulate emissions on lb/mmBtu basis were determined using a standard F_d-Factor of 9,820 dscf/mmBtu for sub-bituminous coal. Plant operating data as provided by Marquette Board of Light and Power is included in Appendix A. Soot blowing occurred from 11:52 through 13:15.

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

TEST PERSONNEL INFORMATION		
Location	Address	Contact
Test Facility	Marquette Board of Light and Power 2200 Wright Street Marquette, Michigan 49855	Mr. Erik Booth Manager of Planning and Utility Compliance (906) 228-0333 (phone) ebooth@mblp.org
Testing Company Representative	Mostardi Platt 888 Industrial Drive Eimhurst, Illinois 60126	Mr. Patrick Lyons Project Supervisor (630) 993-2100 (phone) plyons@mp-mail.com

The test crew consisted of Messrs. K. Cadagin and P. Lyons of Mostardi Platt.

2.0 TEST METHODOLOGY

Emissions testing was conducted following the methods specified in 40CFR60, Appendix A. 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	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points
Unit 3 Stack	2.0 diameters (26.5 Feet)	8.0 diameters (106 Feet)	FPM	12

Method 2 Volumetric Flowrate Determination

Gas velocity was measured following Method 2, for purposes of calculating stack gas volumetric flow rate. 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 (O₂)/Carbon Dioxide (CO₂) Determination

Stack gas molecular weight was determined in accordance with Method 3A. An ECOM analyzer was used to determine stack gas oxygen and carbon dioxide content and, by difference, nitrogen content. Data logger times are approximately one hour behind local time for all sample and calibration data. 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 with filter and probe temperatures elevated to 320 degrees Fahrenheit in accordance with MATS requirements. 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.

3.0 TEST RESULT SUMMARY

Client: Marquette Board of Light and Power
Facility: Shiras Steam Plant
Test Location: Unit 3 Stack
Test Method: 5 MATS

	Source Condition	Normal	Normal	Normal	
	Date	4/5/16	4/5/16	4/5/16	
	Start Time	11:50	14:36	17:30	Runs 2, 3,
	End Time	14:05	16:50	19:45	and 4
	Run 2	Run 3	Run 4	Average	
Stack Conditions					
Average Gas Temperature, °F	244.2	221.0	239.5	234.9	
Flue Gas Moisture, percent by volume	15.2%	15.3%	15.6%	15.4%	
Average Flue Pressure, in. Hg	30.20	30.20	30.20	30.20	
Gas Sample Volume, dscf	68.469	63.895	63.084	65.149	
Average Gas Velocity, ft/sec	23.101	21.282	21.214	21.866	
Gas Volumetric Flow Rate, acfm	191,121	176,069	175,510	180,900	
Gas Volumetric Flow Rate, dscfm	122,610	116,654	112,857	117,374	
Gas Volumetric Flow Rate, scfm	144,640	137,791	133,720	138,717	
Average %CO ₂ by volume, dry basis	14.0	14.2	14.3	14.2	
Average %O ₂ by volume, dry basis	5.3	5.3	5.2	5.3	
Isokinetic Variance	105.5	103.5	105.6	104.9	
Standard Fuel Factor Fd, dscf/mmBtu	9,820.0	9,820.0	9,820.0	9,820.0	
Filterable Particulate Matter (Method 5 MATS)					
grams collected	0.0058	0.0144	0.0105	0.0102	
mg/dscm	2.992	7.959	5.878	5.6094	
mg/wscm	2.537	6.741	4.961	4.7463	
grains/acf	0.0008	0.0023	0.0017	0.0016	
grains/dscf	0.0013	0.0035	0.0026	0.0025	
lb/hr	1.374	3.477	2.484	2.445	
lb/mmBtu (Standard Fd Factor)	0.0025	0.0065	0.0048	0.0046	

4.0 CERTIFICATION

MOSTARDI PLATT is pleased to have been of service to Marquette Board of Light and Power. 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

Patrick Lyons



Quality Assurance

Scott W. Banach