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# Mercury and Air Toxics Standard Particulate Matter and Hydrogen Chloride Emissions Test Report

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Lansing Board of Water and Light
Eckert Station
Unit 4 ESP Outlet Duct
Lansing, Michigan
Project No. M162906C
July 20 and 21, 2016

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# Mercury and Air Toxics Standard Particulate Matter and Hydrogen Chloride Emissions Test Report

## Lansing Board of Water and Light
## Eckert Station
## Unit 4 ESP Outlet Duct
## Lansing, Michigan
## July 20 and 21, 2016

**Report Submittal Date**
**August 29, 2016**



**Project No. M162906C**

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

# 1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a Mercury and Air Toxics Standards (MATS) filterable particulate matter and hydrogen chloride emissions test program for the Lansing Board of Water and Light at the Eckert Station on the Unit 4 ESP Outlet Duct in Lansing, Michigan on July 20 and 21, 2016. This report summarizes the results of the test program and test methods used.

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

| TEST INFORMATION | | |
|---|---|---|
| **Test Location** | **Test Date** | **Test Parameters** |
| Unit 4 ESP Outlet Duct | July 20 and 21, 2016 | Filterable Particulate Matter (FPM) and Hydrogen Chloride (HCl) |

The purpose of the test program was to document FPM and HCl emissions to qualify for the LEE designation as required by 40 CFR Part 63, Subpart UUUUU. 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 Rates** |
| Unit 4 ESP Outlet Duct | FPM | ≤0.030 lb/mmBtu | 0.0053 lb/mmBtu |
| | HCl | ≤0.002 lb/mmBtu | 0.0010 lb/mmBtu |

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 Lansing Board of Water and Light is included in Appendix A.

The Stationary Source Audit Sample Program audit sample was obtained from ERA and submitted for analysis to Maxxam Analytical. The results of the audit sample was compared to the assigned value by ERA and found to be acceptable. The audit sample result and evaluation are appended to this report.

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<br>1232 Haco Drive<br>P.O. Box 13007<br>Lansing , Michigan 48912 | Ms. Trista Gregorski<br>Environmental Engineer<br>(517)702-6865 (phone)<br>tmg@LBWL.COM |
| Test Facility | Lansing Board of Water and Light<br>Eckert Station<br>601 Island Ave<br>Lansing, Michigan 48901 | |
| Testing Company Representative | Mostardi Platt<br>888 Industrial Drive<br>Elmhurst, Illinois 60126 | Mr. Rich Sollars<br>Project Manager<br>(630) 993-2100 (phone)<br>rsollars@mp-mail.com |

The test crew consisted of Messrs. B. Garcia, D. Dixon, J. Keable, and R. Sollars 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 4 ESP Outlet Duct | 0.49 | 1.95 | FPM, HCl | 32 |

## 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 ($O_2$)/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 FPM concentrations and emission rates were determined in accordance with USEPA Method 5, 40CFR60, Appendix A. An Environmental Supply Company, Inc. sampling train was used to sample stack gas at an isokinetic rate, as specified in the Method. Filter and probe temperatures were elevated to 320° Fahrenheit as described in 40CFR63, Subpart UUUUU. Particulate matter in the sample probe was recovered using an acetone rinse. The probe wash and filter catch were analyzed by Mostardi Platt in accordance with the Method in the Elmhurst, Illinois laboratory. Sample 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 26A Hydrogen Chloride (HCl) Determination

Stack gas HCl concentrations and emission rates were determined in accordance with Method 26A, 40CFR60, Appendix A. An Environmental Supply Company sampling train was used to sample stack gas, in the manner specified in the Method. Analyses of the samples collected were conducted by Maxxam Analytics, Inc. of Mississauga, Ontario. Sample 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.

# 3.0 TEST RESULT SUMMARIES



| | |
|---|---|
| **Client:** | Lansing Board of Water and Light |
| **Facility:** | Eckert Station |
| **Test Location:** | Unit 4 ESP Outlet Duct |
| **Test Method:** | 5 MATS |

| | | | | |
|---|---|---|---|---|
| **Source Condition** | High | High | High | |
| **Date** | 7/21/16 | 7/21/16 | 7/21/16 | |
| **Start Time** | 8:50 | 11:15 | 14:20 | |
| **End Time** | 10:57 | 13:22 | 16:27 | |
| | Run 1 | Run 2 | Run 3 | Average |
| **Stack Conditions** | | | | |
| **Average Gas Temperature, °F** | 336.9 | 347.1 | 345.7 | 343.2 |
| **Flue Gas Moisture, percent by volume** | 10.1% | 12.7% | 11.9% | 11.6% |
| **Average Flue Pressure, in. Hg** | 28.66 | 28.66 | 28.66 | 28.66 |
| **Gas Sample Volume, dscf** | 78.572 | 75.627 | 78.218 | 77.472 |
| **Average Gas Velocity, ft/sec** | 59.354 | 59.020 | 59.580 | 59.318 |
| **Gas Volumetric Flow Rate, acfm** | 320,512 | 318,711 | 321,734 | 320,319 |
| **Gas Volumetric Flow Rate, dscfm** | 182,960 | 174,367 | 177,966 | 178,431 |
| **Gas Volumetric Flow Rate, scfm** | 203,436 | 199,724 | 201,970 | 201,710 |
| **Average %$CO_2$ by volume, dry basis** | 13.7 | 15.0 | 15.1 | 14.6 |
| **Average %$O_2$ by volume, dry basis** | 5.9 | 4.7 | 4.5 | 5.0 |
| **Isokinetic Variance** | 100.9 | 101.9 | 103.3 | 102.0 |
| **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** | 0.0250 | 0.0084 | 0.0088 | 0.0141 |
| **mg/dscm** | 11.236 | 3.922 | 3.973 | 6.3773 |
| **grains/acf** | 0.0028 | 0.0009 | 0.0010 | 0.0016 |
| **grains/dscf** | 0.0049 | 0.0017 | 0.0017 | 0.0028 |
| **lb/hr** | 7.699 | 2.561 | 2.648 | 4.303 |
| **lb/mmBtu (Standard Fd Factor)** | 0.0096 | 0.0031 | 0.0031 | 0.0053 |

Client: Lansing Board of Water and Light
Facility: Eckert Station
Test Location: Unit 4 ESP Outlet Duct
Test Method: 26A

| | | | | |
|---|---|---|---|---|
| Source Condition | High | High | High | |
| Date | 7/20/16 | 7/20/16 | 7/20/16 | |
| Start Time | 7:30 | 9:58 | 12:20 | |
| End Time | 9:38 | 12:05 | 14:27 | |
| | Run 1 | Run 2 | Run 3 | Average |
| **Stack Conditions** | | | | |
| Average Gas Temperature, °F | 335.9 | 344.2 | 353.3 | 344.5 |
| Flue Gas Moisture, percent by volume | 11.6% | 11.6% | 11.5% | 11.6% |
| Average Flue Pressure, in. Hg | 28.66 | 28.66 | 28.66 | 28.66 |
| Gas Sample Volume, dscf | 79.904 | 76.525 | 77.270 | 77.900 |
| Average Gas Velocity, ft/sec | 60.649 | 58.854 | 59.484 | 59.662 |
| Gas Volumetric Flow Rate, acfm | 327,503 | 317,812 | 321,214 | 322,176 |
| Gas Volumetric Flow Rate, dscfm | 183,890 | 176,656 | 176,752 | 179,099 |
| Gas Volumetric Flow Rate, scfm | 208,127 | 199,880 | 199,776 | 202,594 |
| Average $\%CO_2$ by volume, dry basis | 13.8 | 14.2 | 14.2 | 14.1 |
| Average $\%O_2$ by volume, dry basis | 5.9 | 5.5 | 5.5 | 5.6 |
| Isokinetic Variance | 102.1 | 101.8 | 102.7 | 102.2 |
| Standard Fuel Factor Fd, dscf/mmBtu | 9,820.0 | 9,820.0 | 9,820.0 | 9,820.0 |
| **Hydrogen Chloride (HCl) Emissions** | | | | |
| ug of sample collected | 2600.00 | 2500.00 | 2600.00 | 2566.67 |
| ppm | 0.76 | 0.76 | 0.78 | 0.77 |
| mg/dscm | 1.15 | 1.15 | 1.19 | 1.16 |
| lb/hr | 0.792 | 0.763 | 0.787 | 0.781 |
| lb/mmBtu (Standard Fd Factor) | 0.0010 | 0.0010 | 0.0010 | 0.0010 |

# 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

Rich Sollars

Quality Assurance

Scott W. Banach