



**Compliance Emissions Test Report**

**Lansing Board of Water and Light  
REO Town Facility  
HRSG #2 Stack  
Lansing, Michigan  
February 13, 2019**

**Report Submittal Date  
March 7, 2019**

**RECEIVED**  
MAR 13 2019  
AIR QUALITY DIVISION

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**Project No. M190706C**

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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 13, 2019 at the REO Town Facility in Lansing, Michigan on the HRSG #2 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 #2 Stack    | February 13, 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 #2 Stack | FPM   | 2.1 lb/hr                                  | 0.712 lb/hr                                    |
|               | TPM (PM <sub>2.5</sub> , PM <sub>10</sub> ) | 5.5 lb/hr                                  | 1.534 lb/hr                                    |
|               | CO  | 51.7 lb/hr<br>50 ppmvd @15% O <sub>2</sub> | 14.30 lb/hr<br>13.21 ppmvd @15% O <sub>2</sub> |

All of the filterable and condensable particulate matter were considered to be PM<sub>2.5</sub> and PM<sub>10</sub> 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<br>1232 Haco Drive<br>P.O. Box 13007<br>Lansing, Michigan 48912            | Mr. Nathan Hude<br>Environmental Regulatory Compliance<br>(517) 490-3069 (cell phone)<br>nathan.hude@lbwl.com |
| Test Facility                  | Lansing Board of Water and Light<br>REO Town Facility<br>1201 S. Washington Ave.<br>Lansing, Michigan 48917 |   |
| Testing Company Representative | Mostardi Platt<br>888 Industrial Drive<br>Elmhurst, Illinois 60126  | Mr. Mark E. Peterson<br>Project Manager<br>(630) 993-2100 (phone)<br>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 #2 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<sub>2</sub>)/Carbon Dioxide (CO<sub>2</sub>) 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<sub>2</sub>) immediately after sample collection to remove dissolved sulfur dioxide (SO<sub>2</sub>) 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

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 MAR 13 2019  
 AIR QUALITY DIVISION

Client: Lansing Board of Water and Light  
 Facility: REO Town Facility  
 Test Location: HRSG #2 Stack  
 Test Method: 5/202

|  | Source Condition | Full Load | Full Load | Full Load |  |
|--|------------------|-----------|-----------|-----------|--|
|  | Date             | 2/13/19   | 2/13/19   | 2/13/19   |  |
|  | Start Time       | 8:55      | 12:50     | 15:40     |  |
|  | End Time         | 12:13     | 14:58     | 17:47     |  |
|  | Run 1            | Run 2     | Run 3     | Average   |  |
| <b>Stack Conditions</b>                            |                  |           |           |           |  |
| Average Gas Temperature, °F                        | 359.7            | 358.5     | 358.0     | 358.7     |  |
| Flue Gas Moisture, percent by volume               | 7.2%             | 7.1%      | 7.0%      | 7.1%      |  |
| Average Flue Pressure, in. Hg                      | 28.59            | 28.59     | 28.59     | 28.59     |  |
| Gas Sample Volume, dscf                            | 75.726           | 71.313    | 71.137    | 72.725    |  |
| Average Gas Velocity, ft/sec                       | 89.069           | 87.751    | 87.466    | 88.095    |  |
| Gas Volumetric Flow Rate, acfm                     | 392,239          | 386,435   | 385,179   | 387,951   |  |
| Gas Volumetric Flow Rate, dscfm                    | 224,094          | 221,209   | 220,814   | 222,039   |  |
| Gas Volumetric Flow Rate, scfm                     | 241,392          | 238,171   | 237,555   | 239,039   |  |
| Average %CO <sub>2</sub> by volume, dry basis      | 3.5              | 3.5       | 3.5       | 3.5       |  |
| Average %O <sub>2</sub> by volume, dry basis       | 14.3             | 14.0      | 14.2      | 14.2      |  |
| Isokinetic Variance                                | 101.8            | 101.3     | 101.2     | 101.4     |  |
| Standard Fuel Factor Fd, dscf/mmBtu                | 8,710.0          | 8,710.0   | 8,710.0   | 8,710.0   |  |
| <b>Filterable Particulate Matter (Method 5)</b>    |                  |           |           |           |  |
| grams collected                                    | 0.00191          | 0.00190   | 0.00148   | 0.00176   |  |
| grains/acf   | 0.0002           | 0.0002    | 0.0002    | 0.0002    |  |
| grains/dscf  | 0.0004           | 0.0004    | 0.0003    | 0.0004    |  |
| lb/hr  | 0.748            | 0.779     | 0.608     | 0.712     |  |
| lb/mmBtu (Standard Fd Factor)                      | 0.0015           | 0.0015    | 0.0012    | 0.0014    |  |
| <b>Condensable Particulate Matter (Method 202)</b> |                  |           |           |           |  |
| grams collected                                    | 0.00218          | 0.00191   | 0.00202   | 0.00204   |  |
| grains/acf   | 0.0003           | 0.0002    | 0.0003    | 0.0003    |  |
| grains/dscf  | 0.0004           | 0.0004    | 0.0004    | 0.0004    |  |
| lb/hr  | 0.853            | 0.784     | 0.829     | 0.822     |  |
| lb/mmBtu (Standard Fd Factor)                      | 0.0018           | 0.0016    | 0.0017    | 0.0017    |  |
| <b>Total Particulate Matter (5/202)</b>            |                  |           |           |           |  |
| grams collected                                    | 0.00409          | 0.00381   | 0.00350   | 0.00380   |  |
| grains/acf   | 0.0005           | 0.0004    | 0.0005    | 0.0005    |  |
| grains/dscf  | 0.0008           | 0.0008    | 0.0007    | 0.0008    |  |
| lb/hr  | 1.601            | 1.563     | 1.437     | 1.534     |  |
| lb/mmBtu (Standard Fd Factor)                      | 0.0033           | 0.0031    | 0.0029    | 0.0031    |  |

**Lansing Board of Water and Light**  
**REO Town Facility**  
**HRGS #2 Stack**  
**Gaseous Summary**

| Test No.       | Date     | Start Time | End Time | CO ppmvd | CO <sub>2</sub> % (dry) | O <sub>2</sub> % (dry) | CO ppmvd @ 15% O <sub>2</sub> | Flowrate, DSCFM | CO lb/hr |
|----------------|----------|------------|----------|----------|-------------------------|------------------------|-------------------------------|-----------------|----------|
| 1              | 02/13/19 | 08:55      | 10:05    | 15.2     | 3.8                     | 14.3                   | 13.59                         | 224,094         | 14.85    |
| 2              | 02/13/19 | 10:30      | 11:29    | 14.4     | 3.6                     | 14.4                   | 13.07                         | 224,094         | 14.07    |
| 3              | 02/13/19 | 11:52      | 12:51    | 14.3     | 3.6                     | 14.4                   | 12.98                         | 224,094         | 13.97    |
| <b>Average</b> |          |            |          | 14.6     | 3.7                     | 14.4                   | 13.21                         | 224,094         | 14.30    |

## 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