mostardi platt

Relative Accuracy Test Audit
Test Report

Lansing Board of Water and Light
Erickson Station
Unit 1 Stack
Lansing, Michigan
August 4 through 6, 2015

Report Submittal Date
August 25, 2015

Project No. M153106

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

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

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RENEWABLE OPERATING PERMIT REPORT CERTIFICATION

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating Permit (ROP) program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name: Lansing Board of Water & Light — County: Eaton

Source Address: 3725 S. Canal Road — City: Lansing

AQD Source ID (SRN): B4001 — ROP No.: MI-ROP-B4001-2010 — ROP Section No.: NA

Please check the appropriate box(es):

☐ **Annual Compliance Certification (Pursuant to Rule 213(4)(c))**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, this source was in compliance with **ALL** terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the ROP.

☐ 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference, **EXCEPT** for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the ROP, unless otherwise indicated and described on the enclosed deviation report(s).

☐ **Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))**

Reporting period (provide inclusive dates): From _____ To _____

☐ 1. During the entire reporting period, **ALL** monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred.

☐ 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred, **EXCEPT** for the deviations identified on the enclosed deviation report(s).

☒ **Other Report Certification**

Reporting period (provide inclusive dates): From NA To NA

Additional monitoring reports or other applicable documents required by the ROP are attached as described:

Mostardi Platt (MP) prepared the attached test report as required by MDEQ MI-ROP-B4001-2010 at the request of Lansing Board of Water & Light. MP performed a NOx, SO2, CO2 and flow RATA of the CEMS associated with Emission Unit EU001 under the operating conditions described.

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete

Mark Matus	Manager, Env Services	(517) 702-6153
Name of Responsible Official (print or type)	Title	Phone Number
Signature of Responsible Official		Date: 8/27/2015

* Photocopy this form as needed.

EQP 5736 (Rev 11-04)

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1.0 EXECUTIVE SUMMARY

MOSTARDI PLATT conducted a Continuous Emissions Monitoring System (CEMS) Relative Accuracy Test Audit (RATA) test program for Lansing Board of Water and Light at the Erickson Station in Lansing, Michigan, on the Unit 1 Stack on August 4 through 6, 2015. This report summarizes the results of the test program and test methods used in accordance with the Mostardi Platt Site Specific Test Plan dated August 3, 2015. Mostardi Platt is a self-certified air emissions testing body (AETB). A copy of Mostardi Platt's self-certification can be found in Appendix A.

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

TEST INFORMATION		
Test Location	**Test Dates**	**Test Parameters**
Unit 1 Stack	August 4 through 6, 2015	Carbon Dioxide (CO_2), Sulfur Dioxide (SO_2), Nitrogen Oxides (NO_x), and Volumetric Flow

The purpose of the test program was to demonstrate the relative accuracies of the Unit 1 Stack CO_2, SO_2, NO_x, and volumetric flow analyzers during the specified operating conditions. The test results from this test program indicate that each CEMS component meets the United States Environmental Protection Agency (USEPA) annual performance specification for relative accuracy as published in 40 Code of Federal Regulations Part 75 (40CFR75).

RATA RESULTS						
Test Location	**Date**	**Parameter**	**Units**	**Relative Accuracy Acceptance Criteria**	**Relative Accuracy (RA)**	**Bias Adjustment Factor (BAF)**
Unit 1 Stack	8/4/15	NO_x	lb/mmBtu	≤ 7.5 % of the mean reference value	4.21 %	1.034
		SO_2	ppmv	≤ 7.5 % of the mean reference value	1.47 %	1.012
		CO_2	% wet	≤ 7.5 % of the mean reference value	0.46 %	N/A
		Volumetric Flow – High (Normal) Load	scfh	≤ 7.5% of the mean reference value	1.11 %	1.000
	8/5/15	Volumetric Flow - Mid Load	scfh	≤ 7.5% of the mean reference value	2.54 %	1.000
	8/5 and 6/15	Volumetric Flow - Low Load	scfh	≤ 7.5% of the mean reference value	1.40 %	1.000

The gas cylinders used to perform the RATA are summarized below.

GAS CYLINDER INFORMATION				
Parameter	**Gas Vendor**	**Cylinder Serial Number**	**Cylinder Value**	**Expiration Date**
NO_x	Zero Air Material	N/A	0.0 ppm	N/A
NO_x	Airgas	CC422751	89.47 ppm	6/29/23
NO_x	Airgas	CC12497	180.3 ppm	4/17/22
SO_2	Zero Air Material	N/A	0.0 ppm	N/A
SO_2	Airgas	CC284773	252.5 ppm	7/21/22
SO_2	Airgas	CC452296	481.3 ppm	2/23/23
CO_2	Zero Air Material	N/A	0.0 %	N/A
CO_2	Airgas	SG9133187BAL	10.22 %	6/23/23
CO_2	Airgas	CC105628	19.42 %	5/13/23

No deviations, additions, or exclusions from the site specific test plan, test methods, the Mostardi Platt Quality Manual, or the ASTM D7036-12 occurred. The specific test conditions encountered did not interfere with the collection of the data.

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

TEST PERSONNEL INFORMATION		
Location	**Address**	**Contact**
Test Coordinator	Lansing Board of Water and Light Erickson Station 3725 South Canal Road Lansing, Michigan 48917	Ms. Shannon Whiton Senior Environmental Engineer (517) 702-6003 (phone) smw@LBWL.COM
Testing Company Supervisor	Mostardi Platt 888 Industrial Drive Elmhurst, Illinois 60126	Mr. Jacob Howe Project Manager 630-993-2100 (phone) jhowe@mp-mail.com QI Group V (certified on 9/8/11 and 2/1/13)
Testing Company Personnel		Mr. Tom Nelson Test Engineer QI Group V (certified on 4/3/15)
		Mr. William Disselhorst Test Technician

Copies of the QI certifications for test personnel are included in Appendix B.

2.0 TEST METHODOLOGY

Emission testing was conducted following the United States Environmental Protection Agency (USEPA) methods specified in 40CFR75 and 40 Code of Federal Regulations (40CFR60), Appendix A, and ASTM E337-02 in addition to the Mostardi Platt Quality Manual and the site

specific test plan. Schematics of the test section diagrams and sampling trains used are included in Appendix C and D respectively. Calculation and nomenclature are included in Appendix E. Copies of analyzer print-outs for each test run are included in Appendix F. CEM data and process data as provided by Lansing Board of Water and Light are included in Appendix G.

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 AT UNIT 1 STACK							
Stack Diameter (Feet)	Stack Area (Square Feet)	No. of Ports	Port Length (Inches)	Upstream Diameters	Downstream Diameters	Test Parameter	Number of Sampling Points
17.0	226.98	4	78.0	7.94	11.76	Volumetric Flow	16
						Stratification Test	12

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. A 12.0 foot long S-type pitot tube, 0-10 inch 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 H. Calibration data are presented in Appendix I. This testing met the performance specifications as outlined in the Method.

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

Stack gas molecular weight was determined in accordance with USEPA Method 3, 40CFR60, Appendix A, during each volumetric flow rate determination. A Fyrite analyzer was used to determine stack gas O_2 and CO_2 content and, by difference, nitrogen content. Multiple gas extractions were performed during each test run to ensure a stable reading. Chemicals are changed frequently and inspected for reactivity prior to each use. This testing met the performance specifications as outlined in the Method.

Stratification Test for Gaseous Sampling

A twelve point stratification test was performed prior to the RATA test. All of the results were less than 10% difference and consequently three points were used for the RATA test.

Method 3A Carbon Dioxide (CO_2) Determination

Stack gas CO_2 concentrations were determined in accordance with USEPA Method 3A, 40CFR60, Appendix A. A Thermo Scientific Model 41C Gas Filter Correlation Carbon Dioxide Analyzer was used to determine carbon dioxide concentrations in the manner specified in the Method. The instrument has a nondispersive infrared-based detector and operated in the nominal range of 0% to 20% with the specific range determined by the high-level span calibration gas of 19.42%.

The Model 41C High Level is based on the principle that CO_2 absorbs infrared radiation. Because infrared absorption is a non-linear measurement technique, it is necessary for the instrument electronics to transform the basic analyzer signal into a linear output. The analyzer uses an exact calibration curve to accurately linearize the instrument output over any range up to a concentration of 2000 ppm.

The sample is drawn into the analyzer through the sample bulkhead. The sample flows through the optical bench. Radiation from an infrared source is chopped and then passed through a gas filter alternating between CO_2 and N_2. The radiation then passes through a narrow bandpass interference filter and enters the optical bench where absorption by the sample gas occurs. The infrared radiation then exits the optical bench and falls on an infrared detector.

The CO_2 side of the filter wheel acts to produce a reference beam which cannot be further attenuated by CO_2 in the sample cell. The N_2 side of the filter wheel is transparent to the infrared radiation and therefore produces a measure beam which can be absorbed by CO_2 in the cell. The rotating gas filter wheel causes the detector signal to be modulated. The amplitude of the detector signal is directly proportional to the concentration of CO_2 in the sample cell. Gases other than CO_2 do not cause modulation of the detector signal since they absorb the reference and measure beams equally. Thus the GFC system responds specifically to CO_2. The Model 41C High Level outputs the CO_2 concentration to the front panel display and the analog outputs.

Stack gas was delivered to the analyzer through an EPM in-situ dilution sampling system. Stack gas concentrations were diluted at a nominal 100:1 ratio utilizing purified dilution air. The entire system was calibrated in accordance with the Method, using USEPA Protocol 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 are found in Appendix I. Copies of the gas cylinder certifications are found in Appendix J. This testing met the performance specifications as outlined in the Method.

Method 4 Moisture Determination

USEPA Method 4, 40CFR60, Appendix A, was utilized to determine water (H_2O) content of the exhaust gas. 100 milliliters (ml) of water were added to each of the first two impingers, the third impinger was left empty, and the fourth impinger was charged with approximately 200 grams of silica gel. The impingers were placed in an ice bath to maintain the sampled gas passed through the silica gel impinger outlet below 68°F in order to increase the accuracy of the sampled dry gas volume measurement. The water volumes of the impinger train were measured and the silica gel was weighed before and after each test run to determine the mass of moisture condensed.

Each sample was extracted through a heated stainless-steel probe and filter assembly at a constant sample rate of approximately 0.75 cubic feet per minute, which was maintained throughout the course of the test run. A minimum of 21 dry standard cubic feet (dscf) are sampled for, each moisture run. After each run, a leak check of the sampling train was performed at a vacuum greater than the sampling vacuum to determine if any leakage had occurred during sampling. Following the leak check, the impingers were removed from the ice bath, water levels were measured, and the silica gel weight was recorded.

All of the equipment used was calibrated in accordance with the specifications of the Method.

Copies of field data sheets are included in Appendix H. Calibration data is presented in Appendix I. This testing met the performance specifications as outlined in the Method.

Method 6C Sulfur Dioxide (SO_2) Determination

Stack gas SO_2 concentrations and emission rates were determined in accordance with USEPA Method 6C, 40CFR60, Appendix A. A Thermo Scientific Model 43i Pulsed Fluorescence Sulfur Dioxide Analyzer was used to determine sulfur dioxide concentrations, in the manner specified in the Method. The instrument operated in the nominal range of 0 ppm to 500 ppm with the specific range determined by the high-level span calibration gas of 481.3 ppm.

The Model 43i operates on the principle that SO_2 molecules absorb ultraviolet (UV) light and become excited at one wavelength, then decay to a lower energy state emitting UV light at a different wavelength. Specifically,

$$SO_2 + h\nu_1 \rightarrow SO_2^* \rightarrow SO_2 + h\nu_2$$

The sample is drawn into the Model 43*i* through the sample bulkhead. The sample flows through a hydrocarbon "kicker", which removes hydrocarbons from the sample by forcing the hydrocarbon molecules to permeate through the tube wall. The SO_2 molecules pass through the hydrocarbon "kicker" unaffected.

The sample flows into the fluorescence chamber, where pulsating UV light excites the SO_2 molecules. The condensing lens focuses the pulsating UV light into the mirror assembly. The mirror assembly contains four selective mirrors that reflect only the wavelengths which excite SO_2 molecules.

As the excited SO_2 molecules decay to lower energy states, they emit UV light that is proportional to the SO_2 concentration. The bandpass filter allows only the wavelengths emitted by the excited SO_2 molecules to reach the photomultiplier tube (PMT). The PMT detects the UV light emission from the decaying SO_2 molecules. The photodetector, located at the back of the fluorescence chamber, continuously monitors the pulsating UV light source and is connected to a circuit that compensates for fluctuations in the lamp intensity.

As the sample leaves the optical chamber, it passes through a flow sensor, a capillary, and the "shell" side of the hydrocarbon kicker. The Model 43*i* outputs the SO_2 concentration to the front panel display, the analog outputs, and also makes the data available over the serial or Ethernet connection.

Stack gas was delivered to the analyzer through an EPM in-situ dilution sampling system. Stack gas concentrations were diluted at a nominal 100:1 ratio utilizing purified dilution air. The entire system was calibrated in accordance with the Method, using USEPA Protocol 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 are found in Appendix I. Copies of the gas cylinder certifications are found in Appendix J. This testing met the performance specifications as outlined in the Method.

Method 7E Nitrogen Oxides (NO_x) Determination

Stack gas NO_x concentrations and emission rates were determined in accordance with USEPA Method 7E, 40CFR60, Appendix A. A Thermo Scientific Model 42C Chemiluminescence

Nitrogen Oxides Analyzer was used to determine nitrogen oxides concentrations, in the manner specified in the Method. The instrument operated in the nominal range of 0 ppm to 500 ppm with the specific range determined by the high-level span calibration gas of 180.3 ppm.

The Model 42C High Level is based on the principle that nitric oxide (NO) and ozone (O_3) react to produce a characteristic luminescence with an intensity linearly proportional to the NO concentration. Infrared light emission results when electronically excited nitrogen dioxide (NO_2) molecules decay to lower energy states. Specifically,

$$NO+O_3 \rightarrow NO_2+O_2+h\upsilon$$

NO_2 must first be transformed into NO before it can be measured using the chemiluminescent reaction. NO_2 is converted to NO by a molybdenum NO_2-to-NO converter heated to about 318°C. The flue gas air sample is drawn into the Model 42C High Level through the sample bulkhead. The sample flows through a particulate filter, a capillary, and then to the mode solenoid valve. The solenoid valve routes the sample either straight to the reaction chamber (NO mode) or through the NO_2-to-NO converter and then to the reaction chamber (NOx mode).

Dry air enters the Model 42C High Level through the dry air bulkhead, through a flow sensor, and then through a silent discharge ozonator. The ozonator generates the necessary ozone concentration needed for the chemiluminescent reaction. The ozone reacts with the NO in the ambient air sample to produce electronically excited NO_2 molecules. A photomultiplier tube (PMT) housed in a thermoelectric cooler detects the NO_2 luminescence.

The NO and NO_x concentrations calculated in the NO and NO_x modes are stored in memory. The difference between the concentrations are used to calculate the NO_2 concentration. The Model 42C High Level outputs NO, NO_2, and NO_x concentrations to both the front panel display and the analog outputs.

Stack gas was delivered to the analyzer through an EPM in-situ dilution sampling system. Stack gas concentrations were diluted at a nominal 100:1 ratio utilizing purified dilution air. The entire system was calibrated in accordance with the Method, using USEPA Protocol 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 are found in Appendix I. Copies of the gas cylinder certifications are found in Appendix J. The NO_2 to NO converter test can be found in Appendix K. This testing met the performance specifications as outlined in the Method.

3.0 TEST RESULT SUMMARIES

Client: Lansing Board Water and Light | **Location:** Unit 1 Stack
Facility: Erickson Station | **Date:** 8/4/15
Project #: M153106 | **Test Method:** 7E, 3A
Fuel Type: Sub Bituminous Coal | **Fuel Factor:** 1840

NO_x lb/mmBtu RATA

CEM Monitor Information

NO_x Monitor/Model:	Teledyne T200H	**NO_x Serial # :**	71
CO_2 Monitor/Model:	Teledyne T360M	**CO_2 Serial # :**	63

1=accept 0=reject	Test Run	Mw	Test Date	Start Time	End Time	RM NO_x lb/mmBtu	CEM NO_x lb/mmBtu	(RM-CEM) Difference (di)	(RM-CEM) Difference^2 (di^2)
1	1	163.5	08/04/15	08:10	08:30	0.207	0.202	0.005	0.000
1	2	163.4	08/04/15	08:50	09:10	0.207	0.203	0.004	0.000
1	3	162.8	08/04/15	09:30	09:50	0.213	0.208	0.005	0.000
1	4	161.7	08/04/15	10:10	10:30	0.211	0.207	0.004	0.000
1	5	162.4	08/04/15	10:50	11:10	0.213	0.205	0.008	0.000
1	6	162.1	08/04/15	11:30	11:50	0.214	0.204	0.010	0.000
1	7	162.1	08/04/15	12:10	12:30	0.217	0.207	0.010	0.000
1	8	163.3	08/04/15	12:50	13:10	0.223	0.213	0.010	0.000
0	9	163.6	08/04/15	13:30	13:50	0.228	0.214	0.014	0.000
1	10	163.8	08/04/15	14:10	14:30	0.217	0.210	0.007	0.000

n	9	
t(0.025)	2.306	
Mean Reference Method Value	0.214	RM avg
Mean CEM Value	0.207	CEM avg
Sum of Differences	0.063	di
Mean Difference	0.007	d
Sum of Differences Squared	0.000	di^2
Standard Deviation	0.003	sd
Confidence Coefficient 2.5% Error (1-tail)	0.002	cc
Relative Accuracy	4.21	RA
Bias Adjustment Factor	1.034	BAF

Client: Lansing Board Water and Light | **Location:** Unit 1 Stack
Facility: Erickson Station | **Date:** 8/4/15
Project #: M153106 | **Test Method:** 6C

SO_2 ppmv RATA

CEM Monitor Information

SO_2 Monitor/Model:	Teledyne T100H	SO_2 Serial # :	61

1=accept 0=reject	Test Run	Mw	Test Date	Start Time	End Time	RM SO_2 ppmv	CEM SO_2 ppmv	(RM-CEM) Difference (di)	(RM-CEM) Difference^2 (di^2)
1	1	163.5	08/04/15	08:10	08:30	276.7	273.0	3.7	13.7
1	2	163.4	08/04/15	08:50	09:10	267.5	263.0	4.5	20.3
1	3	162.8	08/04/15	09:30	09:50	263.5	259.5	4.0	16.0
1	4	161.7	08/04/15	10:10	10:30	259.2	256.8	2.4	5.8
1	5	162.4	08/04/15	10:50	11:10	261.2	258.0	3.2	10.2
0	6	162.1	08/04/15	11:30	11:50	269.6	265.0	4.6	21.2
1	7	162.1	08/04/15	12:10	12:30	266.9	262.7	4.2	17.6
1	8	163.3	08/04/15	12:50	13:10	265.8	263.9	1.9	3.6
1	9	163.6	08/04/15	13:30	13:50	265.4	263.4	2.0	4.0
1	10	163.8	08/04/15	14:10	14:30	266.7	264.6	2.1	4.4

n	9	
t(0.025)	2.306	
Mean Reference Method Value	265.9	RM avg
Mean CEM Value	262.8	CEM avg
Sum of Differences	28.0	di
Mean Difference	3.1	d
Sum of Differences Squared	95.6	di^2
Standard Deviation	1.030	sd
Confidence Coefficient 2.5% Error (1-tail)	0.792	cc
Relative Accuracy	1.47	RA
Bias Adjustment Factor	1.012	BAF

Client: Lansing Board Water and Light | **Location:** Unit 1 Stack
Facility: Erickson Station | **Date:** 8/4/15
Project #: M153106 | **Test Method:** 3A

CO_2 % (wet) RATA

CEM Monitor Information

CO2 Monitor/Model:	Teledyne T360M	CO2 Serial # :	63

1=accept 0=reject	Test Run	Mw	Test Date	Start Time	End Time	RM CO_2 % (wet)	CEM CO_2 % (wet)	(RM-CEM) Difference (di)	(RM-CEM) Difference^2 (di^2)
1	1	163.5	08/04/15	08:10	08:30	12.6	12.5	0.1	0.01
1	2	163.4	08/04/15	08:50	09:10	12.5	12.5	0.0	0.00
1	3	162.8	08/04/15	09:30	09:50	12.4	12.4	0.0	0.00
1	4	161.7	08/04/15	10:10	10:30	12.4	12.4	0.0	0.00
1	5	162.4	08/04/15	10:50	11:10	12.4	12.5	-0.1	0.01
1	6	162.1	08/04/15	11:30	11:50	12.5	12.6	-0.1	0.01
1	7	162.1	08/04/15	12:10	12:30	12.5	12.5	0.0	0.00
1	8	163.3	08/04/15	12:50	13:10	12.4	12.4	0.0	0.00
0	9	163.6	08/04/15	13:30	13:50	12.1	12.3	-0.2	0.04
1	10	163.8	08/04/15	14:10	14:30	12.5	12.5	0.0	0.00

n	9	
t(0.025)	2.306	
Mean Reference Method Value	12.467	RM avg
Mean CEM Value	12.478	CEM avg
Sum of Differences	-0.100	di
Mean Difference	-0.011	d
Sum of Differences Squared	0.030	di^2
Standard Deviation	0.060	sd
Confidence Coefficient 2.5% Error (1-tail)	0.046	cc
Relative Accuracy	0.46	RA

Client: Lansing Board Water and Light — **Test Location:** Unit 1 Stack
Facility: Erickson Station — **Test Date:** 8/4/2015
Project #: M153106 — **Test Method:** 2

CEM Monitor Information

Volumetric Flow RATA - High(Normal) Load

Flow Monitor/Model:			Teledyne Ultraflow 150			Flow Serial # :	1501157	
1=accept 0=reject	Test Run	Test Date	Start Time	End Time	Reference Method Flow SCFH	CEM Flow SCFH	(RM-CEM) Difference (di)	(RM-CEM) Difference ^{2} (di^2)
0	1	08/04/15	08:15	08:27	26,741,000	30,618,000	-3,877,000	15,031,129,000,000
1	2	08/04/15	08:34	08:42	29,587,000	29,957,000	-370,000	136,900,000,000
1	3	08/04/15	08:46	08:54	29,765,000	29,966,000	-201,000	40,401,000,000
1	4	08/04/15	09:10	09:17	30,218,000	29,997,000	221,000	48,841,000,000
1	5	08/04/15	09:18	09:25	30,290,000	30,550,000	-260,000	67,600,000,000
1	6	08/04/15	09:26	09:34	29,952,000	30,334,000	-382,000	145,924,000,000
1	7	08/04/15	09:50	09:58	30,160,000	29,750,000	410,000	168,100,000,000
1	8	08/04/15	09:59	10:06	30,190,000	29,670,000	520,000	270,400,000,000
1	9	08/04/15	10:07	10:13	30,054,000	29,716,000	338,000	114,244,000,000
1	10	08/04/15	10:14	10:20	29,991,000	29,750,000	241,000	58,081,000,000

n	9	
t(0.025)	2.306	
Mean Reference Method Value	30023000.000	RM avg
Mean CEM Value	29965555.556	CEM avg
Sum of Differences	517000.000	di
Mean Difference	57444.444	d
Sum of Differences Squared	1050491000000.000	di^2
Standard Deviation	357210.061	sd
Confidence Coefficient 2.5% Error (1-tail)	274575.467	cc
Relative Accuracy	1.11	RA
Bias Adjustment Factor	1.000	BAF

Client: Lansing Board Water and Light				**Test Location:** Unit 1 Stack				
Facility: Erickson Station				**Test Date:** 8/5/2015				
Project #: M153106				**Test Method:** 2				
CEM Monitor Information								
Volumetric Flow RATA - Mid Load								
Flow Monitor/Model:			**Teledyne Ultraflow 150**			**Flow Serial # :**	1501157	
1=accept 0=reject	Test Run	Test Date	Start Time	End Time	Reference Method Flow SCFH	CEM Flow SCFH	(RM-CEM) Difference (di)	(RM-CEM) Difference ^{2} (di^2)
0	1	08/05/15	20:05	20:14	22,935,000	24,361,000	-1,426,000	2,033,476,000,000
1	2	08/05/15	20:19	20:25	24,038,000	24,510,000	-472,000	222,784,000,000
1	3	08/05/15	20:26	20:33	24,161,000	24,755,000	-594,000	352,836,000,000
1	4	08/05/15	20:45	20:54	24,293,000	24,927,000	-634,000	401,956,000,000
1	5	08/05/15	20:55	21:05	24,462,000	24,756,000	-294,000	86,436,000,000
1	6	08/05/15	21:06	21:14	24,463,000	24,806,000	-343,000	117,649,000,000
1	7	08/05/15	21:23	21:30	24,689,000	24,658,000	31,000	961,000,000
1	8	08/05/15	21:31	21:39	24,322,000	24,879,000	-557,000	310,249,000,000
1	9	08/05/15	21:40	21:47	24,245,000	25,018,000	-773,000	597,529,000,000
1	10	08/05/15	21:48	21:53	24,542,000	24,572,000	-30,000	900,000,000
				n	9			
				t(0.025)	2.306			
				Mean Reference Method Value	24357222.222		RM avg	
				Mean CEM Value	24764555.556		CEM avg	
				Sum of Differences	-3666000.000		di	
				Mean Difference	-407333.333		d	
				Sum of Differences Squared	2091300000000.000		di^2	
				Standard Deviation	273408.120		sd	
				Confidence Coefficient 2.5% Error (1-tail)	210159.708		cc	
				Relative Accuracy	2.54		RA	
				Bias Adjustment Factor	1.000		BAF	

Client: Lansing Board Water and Light **Test Location:** Unit 1 Stack
Facility: Erickson Station **Test Date:** 8/5-6/15
Project #: M153106 **Test Method:** 2

CEM Monitor Information

Volumetric Flow RATA - Low Load

Flow Monitor/Model:			Teledyne Ultraflow 150			Flow Serial # :	1501157	
1=accept 0=reject	Test Run	Test Date	Start Time	End Time	Reference Method Flow SCFH	CEM Flow SCFH	(RM-CEM) Difference (di)	(RM-CEM) Difference ^{2} (di^2)
1	1	08/05/15	23:02	23:09	20,220,000	20,515,000	-295,000	87,025,000,000
1	2	08/05/15	23:13	23:20	20,459,000	20,853,000	-394,000	155,236,000,000
0	3	08/05/15	23:21	23:29	20,469,000	20,905,000	-436,000	190,096,000,000
1	4	08/05/15	23:36	23:43	20,584,000	20,771,000	-187,000	34,969,000,000
1	5	08/05/15	23:44	23:51	20,731,000	20,907,000	-176,000	30,976,000,000
1	6	8/5-6/15	23:52	00:02	20,793,000	20,903,000	-110,000	12,100,000,000
1	7	08/06/15	00:13	00:20	20,859,000	21,074,000	-215,000	46,225,000,000
1	8	08/06/15	00:21	00:28	20,795,000	20,849,000	-54,000	2,916,000,000
1	9	08/06/15	00:29	00:35	20,672,000	20,976,000	-304,000	92,416,000,000
0	10	08/06/15	00:36	00:41	20,723,000	21,266,000	-543,000	294,849,000,000
1	11	08/06/15	00:42	00:47	20,690,000	20,768,000	-78,000	6,084,000,000

n	9	
t(0.025)	2.306	
Mean Reference Method Value	20644777.778	RM avg
Mean CEM Value	20846222.222	CEM avg
Sum of Differences	-1813000.000	di
Mean Difference	-201444.444	d
Sum of Differences Squared	467947000000.000	di^2
Standard Deviation	113318.259	sd
Confidence Coefficient 2.5% Error (1-tail)	87103.968	cc
Relative Accuracy	1.40	RA
Bias Adjustment Factor	1.000	BAF

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.

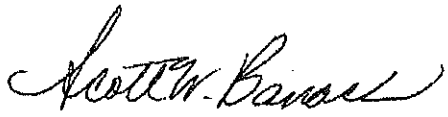
CERTIFICATION

As 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 site specific test plan, test methods, the Mostardi Platt Quality Manual, and the ASTM D7036-12, as applicable.

MOSTARDI PLATT

Program Manager

Jacob Howe



Quality Assurance

Scott W. Banach