SOURCE TEST REPORT
2022 COMPLIANCE TESTING
GENERAL MOTORS LLC - SAGINAW METAL CASTING OPERATIONS (SMCO)
Z02-BH-4
SAGINAW, MICHIGAN

Prepared For:

General Motors LLC - Saginaw Metal Casting Operations (SMCO)
1629 N Washington Ave.
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For Submittal To:

Michigan Department of Environment, Great Lakes, and Energy
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Prepared By:

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ACCREDITED
TO ASTM D7036 ONLY
CERT #3328.01

MONTROSE
AIR QUALITY SERVICES

REVIEW AND CERTIFICATION

All work, calculations, and other activities and tasks performed and presented in this document were carried out by me or under my direction and supervision. I hereby certify that, to the best of my knowledge, Montrose operated in conformance with the requirements of the Montrose Quality Management System and ASTM D7036-04 during this test project.

Signature: _____ Date: 03 / 03 / 2022

Name: James Christ, QSTI Title: Client Project Manager

I have reviewed, technically and editorially, details, calculations, results, conclusions, and other appropriate written materials contained herein. I hereby certify that, to the best of my knowledge, the presented material is authentic, accurate, and conforms to the requirements of the Montrose Quality Management System and ASTM D7036-04.

Signature: Henry M. Taylor Date: 03 / 03 / 2022

Name: Henry M. Taylor, QSTO Title: Field Project Manager

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1.0 INTRODUCTION

1.1 SUMMARY OF TEST PROGRAM

General Motors LLC (GM) - Saginaw Metal Casting Operations (SMCO) (State Registration No.: B1991) contracted Montrose Air Quality Services, LLC (Montrose) to perform a compliance test program on the Z02-BH-4 baghouse serving EU-SPMPROCESSAND at their facility located in Saginaw, Michigan. Testing was conducted for the purpose of satisfying the emission testing requirements pursuant to Michigan Department of Environment, Great Lakes, and Energy (EGLE) Renewable Operating Permit No. MI-ROP-B1991-2021a.

The specific objectives were to:

- Determine the concentration and emission rate of FPM
- Determine the opacity of VE
- Conduct the test program with a focus on safety

Montrose performed the tests to measure the emission parameters listed in Table 1-1.

TABLE 1-1
SUMMARY OF TEST PROGRAM

Test Dates	Unit ID/ Source Name	Activity/ Parameters	Test Methods	No. of Runs	Duration (Minutes)
2/23/22	Z02-BH-4 Baghouse	Velocity/Volumetric Flow	EPA 1 & 2	2	120
		O_2, CO_2	EPA 3A	2	120
		Moisture	EPA 4	2	120
		FPM	EPA 5	2	120
		Opacity	EPA 9	2	60
2/24/22	Z02-BH-4 Baghouse	Velocity/Volumetric Flow	EPA 1 & 2	1	120
		O_2, CO_2	EPA 3A	1	120
		Moisture	EPA 4	1	120
		FPM	EPA 5	1	120
		Opacity	EPA 9	1	60

To simplify this report, a list of Units and Abbreviations is included in Appendix D.1. Throughout this report, chemical nomenclature, acronyms, and reporting units are not defined. Please refer to the list for specific details.

This report presents the test results and supporting data, descriptions of the testing procedures, descriptions of the facility and sampling locations, and a summary of the quality assurance procedures used by Montrose. The average emission test results are summarized and compared to their respective permit limits in Table 1-2. Detailed results for individual test runs can be found in Section 4.0. All supporting data can be found in the appendices.

The tests were conducted according to Test Plan No. MW023AS-014023-PP-394 dated January 17, 2022.

TABLE 1-2
SUMMARY OF AVERAGE COMPLIANCE RESULTS -
Z02-BH-4
FEBRUARY 23 AND 24, 2022

Parameter/Units	Average Results	Emission Limits
Filterable Particulate Matter (FPM)		
lb/hr	0.126	0.19*
Visible Emissions (VE)		
highest 6-minute average, %	0.0	10

*Emission limits are from MI-ROP-B1991-2021a.

1.2 KEY PERSONNEL

A list of project participants is included below:

Facility Information

Source Location:	General Motors SMCO 1629 N. Washington Ave. Saginaw, Michigan 48601	
Project Contact:	Alex Thibeault	Jeffrey Hummel
Role:	SMCO Sr. Environmental Eng.	Senior Environmental Project Eng.
Company:	General Motors	General Motors
Telephone:	810-577-9003	517-719-9053
Email:	alexandra.thibeault@gm.com	jeffrey.hummel@gm.com

Agency Information

Regulatory Agency:	Michigan Department of Environment, Great Lakes and Energy
Agency Contact:	Karen Kajiya-Mills
Telephone:	517-256-0880
Email:	Kajiya-millsk@michigan.gov

Testing Company Information

Testing Firm:	Montrose Air Quality Services, LLC
Contact:	Sean Wheeler
Title:	Field Project Manager
Telephone:	630-860-4740
Email:	stwheeler@montrose-env.com

Laboratory Information

Laboratory:	Montrose Air Quality Service, LLC
City, State:	Elk Grove Village, IL
Method:	5

Test personnel and observers are summarized in Table 1-3.

TABLE 1-3
TEST PERSONNEL AND OBSERVERS

Name	Affiliation	Role/Responsibility
James Christ	Montrose	Client Project Manager/Field Team Leader/QSTI/Trailer Operator/Sample Recovery/VE Observer
Mike Hess	Montrose	Client Project Manager/QSTI/Bag Analysis
Jeremy Devries	Montrose	Field Technician/Sample Train Operator
Jack Hutchison	Montrose	Report Preparation
Alex Thibeault	GM	Client Liaison/Test Coordinator

2.0 PLANT AND SAMPLING LOCATION DESCRIPTIONS

2.1 PROCESS DESCRIPTION, OPERATION, AND CONTROL EQUIPMENT

The emission unit EU-SPMPROCESSSAND consists of a 120 ton new sand storage silo with bin vent filter that receives sand via blower truck and a 30 ton pre-reclaim sand silo that receives process sand recovered in the facility. Sand from both silos is transported to the natural gas fired fluidized bed sand reclaim process system (sand reclaim furnace, sand cooler, sand screen, and deduster) for cleaning and preparation of sand. From there, sand is transferred to the prepared sand silo. Top core, scrap cores, broken cores and process sand collected from EU-SPMCASTLINE and scrap cores and process sand from EU-SPMCOREROOM are collected in a bin/hopper and taken to a Sand Load Out Station for reclaim or returned to the process by the receiving dump chute of EU-SPMPROCESSSAND for transport by conveyor to the hopper/storage silo of EU-SPMPROCESSSAND. PM emissions from these sand handling processes and sand handling transfer points including the pre-reclaim sand silo, sand transfer system, fluidized bed sand reclaim, and prepared sand silo in EU-SPMPROCESSAND are controlled by a single 34,000 scfm fabric filter collector. There is no emission control on the remaining sand handling or transfer points (bin/hopper, Sand Load Out Station, receiving dump chute).

2.2 FLUE GAS SAMPLING LOCATION

Information regarding the sampling location is presented in Table 2-1.

TABLE 2-1
SAMPLING LOCATION

Sampling Location	Stack Inside Diameter (in.)	Distance from Nearest Disturbance		Number of Traverse Points
		Downstream EPA "B" (in./dia.)	Upstream EPA "A" (in./dia.)	
SV-Z02-BH-4 Baghouse	50	384 / 7.68	204 / 4.08	Isokinetic: 12 (6/port)

The sample location was verified in the field to conform to EPA Method 1. Absence of cyclonic flow conditions were confirmed following EPA Method 1, Section 11.4. See Appendix A.1 for more information.

2.3 OPERATING CONDITIONS AND PROCESS DATA

Emission tests were performed while SPMPROCESSAND and the air pollution control devices were operating at the conditions required by the permit. SPMPROCESSAND was tested following the process production capacities listed in Section 2.3 Table 2-2 of the Test Plan.

Plant personnel were responsible for establishing the test conditions and collecting all applicable unit-operating data. The process data that was provided is presented in Appendix B. Data collected includes the following parameters:

- Sand throughput, tonnes/hr
- Natural gas usage of the fluidized bed sand reclaim systems, cubic feet
- Pressure drop across the control device, in-H_2O

3.0 SAMPLING AND ANALYTICAL PROCEDURES

3.1 TEST METHODS

The test methods for this test program were presented previously in Table 1-1. Additional information regarding specific applications or modifications to standard procedures is presented below.

3.1.1 EPA Method 1, Sample and Velocity Traverses for Stationary Sources

EPA Method 1 is used to assure that representative measurements of volumetric flow rate are obtained by dividing the cross-section of the stack or duct into equal areas, and then locating a traverse point within each of the equal areas. Acceptable sample locations must be located at least two stack or duct equivalent diameters downstream from a flow disturbance and one-half equivalent diameter upstream from a flow disturbance.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - None
- Method Exceptions:
  - None

3.1.2 EPA Method 2, Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

EPA Method 2 is used to measure the gas velocity using an S-type pitot tube connected to a pressure measurement device, and to measure the gas temperature using a calibrated thermocouple connected to a thermocouple indicator. Typically, Type S (Stausscheibe) pitot tubes conforming to the geometric specifications in the test method are used, along with an inclined manometer. The measurements are made at traverse points specified by EPA Method 1. The molecular weight of the gas stream is determined from independent measurements of O_2, CO_2, and moisture. The stack gas volumetric flow rate is calculated using the measured average velocity head, the area of the duct at the measurement plane, the measured average temperature, the measured duct static pressure, the molecular weight of the gas stream, and the measured moisture.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - S-type pitot tube coefficient is 0.84
- Method Exceptions:
  - None

The typical sampling system is detailed in Figure 3-1.

3.1.3 EPA Methods 3A, Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedures)

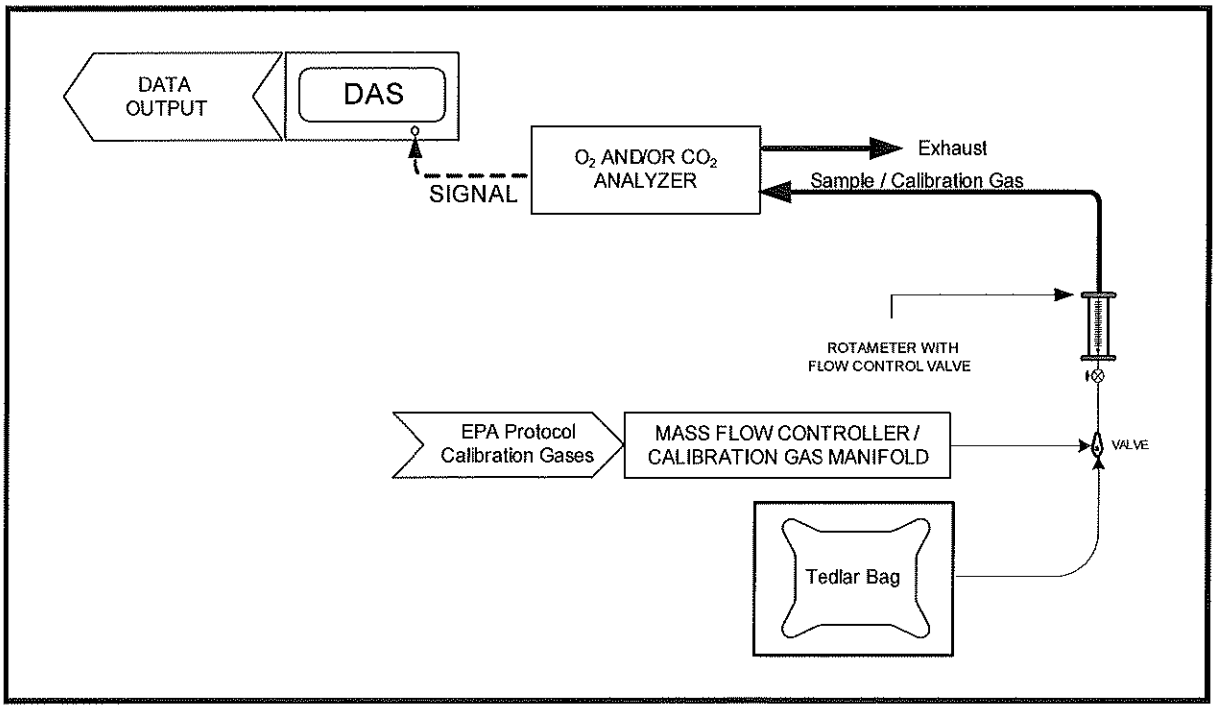
Concentrations of O_2 and CO_2 are measured simultaneously using EPA Method 3A which are instrumental test methods. Conditioned gas is sent to a series of analyzers to measure the gaseous emission concentrations. The performance requirements of the method must be met to validate the data.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - A dry extractive sampling system is used to report emissions on a dry basis
  - A paramagnetic analyzer is used to measure O_2
  - A nondispersive infrared analyzer is used to measure CO_2
  - The sample is collected into a Tedlar bag from the back of the sample train for the duration of the test run
- Method Exceptions:
  - None
- Target and/or Minimum Required Sample Duration: 60 minutes

The typical sampling system is detailed in Figure 3-1.

FIGURE 3-1
EPA METHOD 3A (TEDLAR BAG) ANALYSIS TRAIN



3.1.4 EPA Method 4, Determination of Moisture Content in Stack Gas

EPA Method 4 is a manual, non-isokinetic method used to measure the moisture content of gas streams. Gas is sampled at a constant sampling rate through a probe and impinger train. Moisture is removed using a series of pre-weighed impingers containing methodology-specific liquids and silica gel immersed in an ice water bath. The impingers are weighed after each run to determine the percent moisture.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Condensed water is measured gravimetrically
  - Moisture sampling is performed as part of the pollutant sample trains
- Method Exceptions:
  - None
- Target and/or Minimum Required Sample Duration: 120 minutes
- Target and/or Minimum Required Sample Volume: 21 scf

The typical sampling system is detailed in Figure 3-2.

3.1.5 EPA Method 5, Determination of Particulate Matter from Stationary Sources

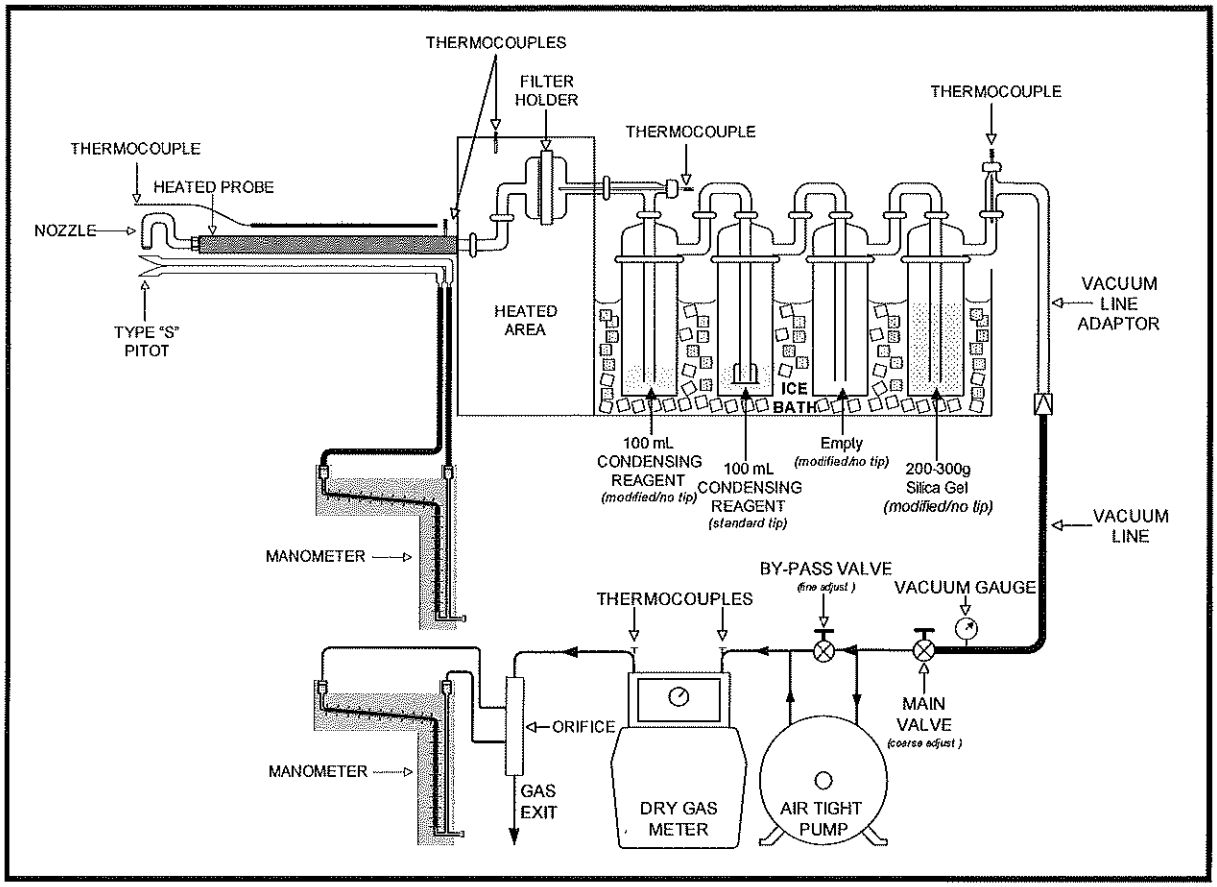
EPA Method 5 is a manual, isokinetic method used to measure FPM emissions. The samples are analyzed gravimetrically. This method is performed in conjunction with EPA Methods 1 through 4. The stack gas is sampled through a nozzle, probe, filter, and impinger train. FPM results are reported in emission concentration and emission rate units.

Pertinent information regarding the performance of the method is presented below:

- Method Options:
  - Stainless steel sample nozzles and glass probe liners are used
- Method Exceptions:
  - None
- Target and/or Minimum Required Sample Duration:120 minutes
- Analytical Laboratory: Montrose, Elk Grove Village, Illinois

The typical sampling system is detailed in Figure 3-2.

FIGURE 3-2
EPA METHOD 5 SAMPLING TRAIN



3.1.6 EPA Method 9, Visual Determination of the Opacity of Emissions

EPA Method 9 is used to observe the visual opacity of emissions (opacity). The observer stands at a distance sufficient to provide a clear view of the emissions with the sun oriented in the 140° sector to their back. The line of vision is perpendicular to the plume direction and does not include more than one plume diameter. Observations are recorded at 15-second intervals and are made to the nearest 5% opacity. The qualified observer is certified according to the requirements of EPA Method 9, section 3.1.

- Method Options:
  - Observations are attempted to be made 30 minutes before, during, or within 30 minutes after each concurrent particulate run, unless weather conditions are unfavorable.
- Method Exceptions:
  - None

3.2 PROCESS TEST METHODS

The test plan did not require that process samples be collected during this test program; therefore, no process sample data are presented in this test report.

4.0 TEST DISCUSSION AND RESULTS

4.1 FIELD TEST DEVIATIONS AND EXCEPTIONS

The run 1 post leak check was failed and the collected volume was corrected using equation 5.1(a) in EPA Method 5. With the exception of EPA Method 3A being used in place of EPA Method 3 being used for O_2 and CO_2 analysis, no field deviations or exceptions from the test plan occurred during this test program.

4.2 PRESENTATION OF RESULTS

The average results are compared to the permit limits in Table 1-2. The results of individual compliance test runs performed are presented in Table 4-1. Emissions are reported in units consistent with those in the applicable regulations or requirements. Additional information is included in the appendices as presented in the Table of Contents.

TABLE 4-1
FPM EMISSIONS RESULTS -
Z02-BH-4 BAGHOUSE

Run Number	1	2	3	Average
Date	2/23/2022	2/23/2022	2/24/2022	--
Time	08:55-10:59	12:06-14:28	08:50-10:53	--
Flue Gas Parameters				
flue gas temperature, °F	125	127	126	126
volumetric flow rate, acfm	42,234	42,194	41,882	42,103
volumetric flow rate, scfm	37,352	37,231	37,572	37,385
volumetric flow rate, dscfm	36,752	36,726	37,053	36,844
carbon dioxide, %	0.4	0.5	0.5	0.4
oxygen, %	20.67	20.67	20.67	20.67
moisture content, % volume	1.64	1.40	1.42	1.49
Sample Parameters				
duration, minutes	120	120	120	--
FPM collected, g	0.0013	0.0017	0.0021	0.0017
volume, dscf	65.14	65.54	66.98	65.55
isokinetic ratio, %	99.2	99.9	101.2	101.1
Filterable Particulate Matter (PM)				
gr/dscf	0.0003	0.0004	0.0005	0.0004
lb/hr	0.097	0.123	0.157	0.126
Opacity Results				
duration, minutes	09:00-10:00	12:06-13:26	08:50-09:50	
highest 6-minute average, %	0.00	0.00	0.00	0.00
minimum opacity (%)	0	0	0	--
maximum opacity (%)	0	0	0	--

5.0 INTERNAL QA/QC ACTIVITIES

5.1 QA/QC AUDITS

The meter box and sampling train used during sampling performed within the requirements of their respective methods. All post-test leak checks, minimum metered volumes, minimum sample durations, and percent isokinetics met the applicable QA/QC criteria.

EPA Method 3A calibration audits were all within the measurement system performance specifications for the calibration drift checks, system calibration bias checks, and calibration error checks.

EPA Method 5 analytical QA/QC results are included in the laboratory report. The method QA/QC criteria were met, except if noted in Section 5.2. An EPA Method 5 reagent blank was analyzed. The maximum allowable amount that can be subtracted is 0.001% of the weight of the acetone used. The blank did not exceed the maximum residue allowed.

EPA Method 9 was performed by a certified Visible Emissions Evaluator. For quality assurance, the observer obtained a view of the emissions with the best available contrasting background and with the sun oriented in the 140° sector to their back. Readings were taken every 15 seconds and made to the nearest 5% opacity.

5.2 QA/QC DISCUSSION

All QA/QC criteria were met during this test program.

5.3 QUALITY STATEMENT

Montrose is qualified to conduct this test program and has established a quality management system that led to accreditation with ASTM Standard D7036-04 (Standard Practice for Competence of Air Emission Testing Bodies). Montrose participates in annual functional assessments for conformance with D7036-04 which are conducted by the American Association for Laboratory Accreditation (A2LA). All testing performed by Montrose is supervised on site by at least one QI as defined in D7036-04 Section 8.3.2. Data quality objectives for estimating measurement uncertainty within the documented limits in the test methods are met by using approved test protocols for each project as defined in D7036-04 Sections 7.2.1 and 12.10. Additional quality assurance information is included in the report appendices. The content of this report is modeled after the EPA Emission Measurement Center Guideline Document (GD-043).

APPENDIX A
FIELD DATA AND CALCULATIONS