

FINAL REPORT



FCA US LLC

STERLING HEIGHTS, MICHIGAN

STERLING HEIGHTS ASSEMBLY PLANT - SOUTH PAINT SHOP: REPAIR BOOTH COMPLIANCE - PARTICULATE TESTING

RWDI #2102556

July 19, 2021

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) completed compliance source testing at the FCA US LLC (FCA) Sterling Heights Assembly Plant (SHAP) – South Paint Shop (SPS) located at 38111 Van Dyke, Sterling Heights, Michigan. SHAP operates an automobile assembly plant that produces Ram trucks and operates a North Paint Shop (NPS) and a South Paint Shop (SPS). The testing is required under Permit to Install (PTI) 27-17C for FG-REPAIR BOX (including 1 exhaust for 2 repair booths) by the Michigan Department of Environment, Great Lakes, and Energy (EGLE).

Triplicate 240-minute tests were completed while the Repair Booth was being operated, and triplicate 240-minute tests were completed while the Repair Booth was not operating (no repairs or operations in Repair booths). The results from all tests are presented in the report. The non-operating background is representative of the background particulate matter that exists while no production is running.

One test under each condition was completed on three separate days, May 19-21, 2021. A summary of the results can be found in the “**Tables**” section of this report.

Source	Parameter ^[1]	Concentration ^[2] (gr/dscf)	Emission Rate (lb/hr)
Repair Booth (Operating)	Filterable Particulate Matter	0.00031	0.161
Repair Booth (Background / Not Operating)	Filterable Particulate Matter	0.00015	0.083

[1] Sampling followed U.S. EPA Method 5; average of three tests

[2] Concentration values are expressed at 29.92”Hg and 680F

All values are blank corrected



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1 INTRODUCTION

RWDI USA LLC (RWDI) completed compliance source testing at the FCA US LLC (FCA) Sterling Heights Assembly Plant (SHAP) – South Paint Shop (SPS) located at 38111 Van Dyke, Sterling Heights, Michigan. SHAP operates an automobile assembly plant that produces Ram trucks and operates a North Paint Shop (NPS) and a South Paint Shop (SPS). The testing is required under Permit to Install (PTI) 27-17C for FG-REPAIR BOX (including 1 exhaust for 2 repair booths) by the Michigan Department of Environment, Great Lakes, and Energy (EGLE). It should be noted that, while the PTI identifies the repair sources as "booths", the physical areas where the repair activity is performed is not inside a walled-off area, as is typical for a "booth", but more of a designated area and/or station. This test report uses the term "booth" to reflect consistency with the PTI. Copies of the Source Testing Plan, EGLE's acceptance letter and PTI 27-17C are included in Appendix A.

Triplicate 240-minute tests were completed while the Repair Booth was being operated, and triplicate 240-minute tests were completed while the Repair Booth was not operating (no repairs or operations in Repair booths). The results from all tests are presented in the report. The non-operating background is representative of the background particulate matter that exists while no production is running.

One test under each condition was completed on three separate days, May 19-21, 2021. A summary of the results can be found in the "**Tables**" section of this report.

2 SAMPLING LOCATIONS AND METHODS

2.1 Sampling Location

The FG-REPAIR BOX is where spot and final repairs are completed on light duty truck boxes. The repair booths consist of sanding, spot painting, and panel swap out operations. EU-SPOT REPAIR 1 BOX and EU-SPOT REPAIR 2 BOX emissions are combined into one (1) stack (SV-SPOT REPAIR 1 BOX SPOT REPAIR 2 BOX). Sampling was completed on the Repair Booth exhaust stack using the ports provided which are located on the roof of the building. Two traverses were sampled with 12 points each.



2.2 Test Methods

2.2.1 Velocity, Temperature and Volumetric Flow Rate Determination

The exhaust velocities and flow rates were determined following U.S. EPA Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)". Velocity measurements were taken with a pre-calibrated S-Type pitot tube and incline manometer. Volumetric flow rates were determined following the equal area method as outlined in U.S. EPA Method 1. Temperature measurements were made simultaneously with the velocity measurements and were conducted using a chromel-alumel type "K" thermocouple in conjunction with a calibrated digital temperature indicator.

The dry molecular weight of the stack gas was determined following calculations outlined in U.S. EPA Method 3, "Gas Analysis for the Determination of Dry Molecular Weight". Stack moisture content was determined through direct condensation and according to U.S. EPA Method 4, "Determination of Moisture Content of Stack Gases".

2.2.2 Determination of Total Particulate Matter (US EPA Method 5)

Sampling for total particulate matter was performed in accordance with U.S. EPA Method 5 - "Determination of Particulate Matter Emissions from Stationary Sources". Sampling was conducted using a calibrated Environmental Supply C-5000 Source Sampling System. The sampling probe including nozzle, probe liner, probe sheath, and pitot were constructed out of stainless steel. Triplicate 240-minute sampling runs were conducted under the operating condition and non-operating condition.

Sampling was conducted isokinetically with a total of 24 points (twelve (12) per traverse) across the stack diameter. The sample was drawn through a non-heated nozzle, sample probe and quartz fiber filter under 85°F to capture total particulate matter. The sample was then introduced into the impinger train where it passed through two empty impingers, a secondary filter which was maintained at a temperature between 68°F and 85°F. Lastly, the gas stream was drawn through one water impinger and one impinger containing silica gel. The back half USEPA Method 202 portion of the testing was used for moisture analysis and not recovered for particulate matter due to the sample never reaching 85°F. All noted procedures were provided in the Source Testing Plan that was approved by EGLE.

Upon completion of the test, the sampling train was recovered, and the samples were packaged for transport to ALS in Burlington, Ontario for analysis.

A summary of the Sampling Parameters and Methodology may be found in **Table 1 (Table Section)**.



2.3 Quality Assurance/ Quality Control Measures

Applicable quality assurance measures were implemented during the sampling program to ensure the integrity of the results. These measures included detailed documentation of field data, equipment calibrations for all measured parameters, completion of Chain of Custody forms when submitting laboratory samples, and submission of field blank samples to the laboratories. **Table 2 (Table Section)** presents a sample log and summarizes the sampling times.

All samplers were bench tested and calibrated in RWDI's Guelph office prior to field deployment. For each sample collected with a Method 5 sampling train, both pre- and post- leak checks were conducted by plugging the inlet and drawing a vacuum of equal to or greater than the vacuum recorded during the test. Dry gas meter reading leakage rates greater than 4 percent of the average sampling rate or 0.00057 m³/min (0.02 cfm), whichever is less, were considered unacceptable. Similar leak check procedures for pitot tube and pressure lines were also conducted. Leak checks for each test were documented on the field data sheets presented in the applicable appendices for each sample parameter.

3 RESULTS

The average emission results for this study are presented in the **Table 4** found in the 'Tables' section of this report. Detailed information for each test run can be found in the **Appendix B**.

All sampling field notes are provided in **Appendix C**. All laboratory results are included in **Appendix E**. All calibration information for the equipment used for this study is included in **Appendix D**. Process Data is provided in **Appendix F**.

3.1 Discussion of Results

Sampling was completed between May 19th- 21st, 2021 and no issues occurred during the sampling process. The first test of the day was done during operation, and the second test of the day occurred with no production in the booth. Results for each condition are reported, along with the difference between the operating and non-operating runs. The non-operating runs are a representation of the background particulate matter that exists while no production is running.

A summary of the results can be found in the tables section of this report and the more detailed calculations can be found in **Appendix B**. Contact was maintained between the site contact and the sampling team. A member of the RWDI sampling team contacted the operator before each test, to ensure that the process was at representative operating conditions.

Total particulate matter (TPM) was measured (U.S. EPA Method 5). The results have been summarized below in **Table 3.1.1**.



Table 3.1.1: Sampling Result Summary

Source	Parameter ^[1]	Concentration ^[2] (gr/dscf)	Emission Rate (lb/hr)
Repair Booth (Operating)	Filterable Particulate Matter	0.00031	0.161
Repair Booth (Background / Not Operating)	Filterable Particulate Matter	0.00015	0.083

[1] Sampling followed U.S. EPA Method 5; average of three tests

[2] Concentration values are expressed at 29.92"Hg and 680F

All values are blank corrected

3.2 Process Data

As noted in the test plan, the following process data was required to be collected during testing:

- Number of cars in the booth during each test.

This can be found in **Appendix F**.

4 CONCLUSIONS

Testing was successfully completed on May 19th- 21st, 2021. All parameters were tested in accordance with referenced methodologies.

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TABLES



Table 1: Summary of Sampling Parameters and Methodology

Source	No. of Tests per Stack	Sampling Parameter	Sampling Method
Repair Booth (Operating)	3	Stack Parameters	U.S. EPA ^[1] Methods 1-4
	3	Total Particulate Matter	U.S. EPA ^[1] Method 5
Repair Booth (Not Operating)	3	Stack Parameters	U.S. EPA ^[1] Methods 1-4
	3	Total Particulate Matter	U.S. EPA ^[1] Method 5

Notes:

[1] U.S. EPA - United States Environmental Protection Agency

**Table 2: Sampling Times and Sample Log
SHAP Repair Booth**

Source and Test #	Sampling Date	Start Time	End Time	Filter ID / Trap ID	Lab Sample ID
Blanks					
SHAP (Operating)-Blank-Filter (M5)	May 21, 2021	--	--	--	L2592892-8
SHAP (Operating)-Blank-Acetone	May 21, 2021	--	--	--	L2592892-7
SHAP (Not Operating)-Blank-Filter (M5)	May 21, 2021	--	--	--	L2592903-8
SHAP (Not Operating)-Blank-Acetone	May 21, 2021	--	--	--	L2592903-7
Repair Booth (Operating)					
Test #1	May 19, 2021	7:14 AM	11:22 AM	QZ8431	L2592892-1/2
Test #3	May 20, 2021	6:58 AM	11:05 AM	QZ8433	L2592892-3/4
Test #5	May 21, 2021	6:54 AM	10:58 AM	QZ8442	L2592892-5/6
Repair Booth (Not Operating)					
Test #2	May 19, 2021	1:10 PM	5:16 PM	QZ8432	L2592903-1/2
Test #4	May 20, 2021	12:52 PM	4:56 PM	QZ8434	L2592903-3/4
Test #6	May 21, 2021	1:05 PM	5:07 PM	QZ8443	L2592903-5/6

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Table 3: Stack Gas Characteristics Summary
SHAP Repair Booth Source Testing

Stack Gas Parameter		Repair Booth(Operating)				Repair Booth(Not Operating)			
		Test #1	Test #3	Test #5	Average	Test #2	Test #4	Test #6	Average
	Testing Date	May/19	May/20	May/21		May/19	May/20	May/21	
Stack Temperature	°F	71	87	84	81	73	73	79	75
	°R	531	547	544	541	533	533	539	535
Sample Volume	ft ³	190.95	183.85	183.89	186.23	188.24	186.89	197.87	191.00
	m ³	5.40	5.20	5.20	5.27	5.33	5.29	5.60	5.41
Moisture	%	1.0%	1.5%	2.0%	1.5%	1.4%	1.3%	1.2%	1.3%
Velocity	ft/s	40.65	40.30	40.04	40.33	40.08	40.04	42.36	40.83
	m/s	12.39	12.28	12.20	12.29	12.22	12.20	12.91	12.44
Actual Flow Rate	cf/min	65,182	64,615	64,200	64,666	64,267	64,203	67,928	65,466
Referenced Flow Rate ^[1]	dscf/min	63,296	60,943	60,576	61,605	61,926	62,270	65,312	63,169
	m ³ /s	1792	1725	1715	1744	1753	1763	1849	1788
Oxygen	%	20.9	20.9	20.9	20.9	20.9	20.9	20.9	20.9
Carbon Dioxide	%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Notes:

[1] Referenced flow rate expressed as dry at 101.3 kPa, 68 °F, and Actual Oxygen

Detailed sampling results including individual test results can be found in Appendix B

Table 4: Repair Booth Summary Emissions

Source	Parameter ^[1]	Test 1-2		Test 3-4		Test 5-6		Average	
		Concentration ^[2] (gr/dscf)	Emission Rate (lbs/hr)						
Repair Booth (Operating)	Filterable Particulate Matter	0.00025	0.133	0.00033	0.173	0.00034	0.178	0.00031	0.161
Repair Booth (Not Operating)	Filterable Particulate Matter	0.00014	0.074	0.00017	0.088	0.00015	0.085	0.00015	0.083

Notes:

[1] Sampling followed U.S. EPA Method 5; average of three tests,

[2] Concentration values are expressed at 29.92 in.Hg, and 68 °F,

Sample Gas temperature was below 85°F and did not need separate condensable measurement