Particulate Matter Air Emission Testing of Topcoat Spraybooth Exhausts

Chrysler Group LLC
Jefferson North Assembly Plant
2101 Connor Street
Detroit, Michigan

Prepared for
Chrysler Group LLC
Auburn Hills, Michigan

Bureau Veritas Project No. 11014-000011.00
May 15, 2014

Move Forward with Confidence

Bureau Veritas North America, Inc.
22345 Roethel Drive
Novi, Michigan 48375
248.344.1770
www.us.bureauveritas.com/hse

Executive Summary

Chrysler Group LLC retained Bureau Veritas North America, Inc. to test air emissions at the Jefferson North Assembly Plant (JNAP) in Detroit, Michigan. Chrysler Group LLC operates a body shop, paint shop, and final assembly line to manufacture the Dodge Durango and Jeep Grand Cherokee vehicles at this facility.

The purpose of the testing was to measure emissions of particulate matter (PM) from two paint lines (EU-TOPCOAT2 and EU-TOPCOAT3). The EU-TOPCOAT2 and EU-TOPCOAT3 air emission sources are included within the facility's air permit MI-ROP-N2155-2010 for the FG-FACILITY flexible group category.

Emission testing was performed following United States Environmental Protection Agency (USEPA) Methods 1 through 4 and 5 (Modified) on March 18 through 20, 2014. Three 120-minute test runs were performed at each of the six stacks (three stacks per paint line) to measure particulate matter concentrations and calculate mass emission rates in pounds per hour (lb/hr) and pounds per vehicle (lb/veh).

The tables on the following page summarize the results of the testing. Detailed results are presented in Tables 1 through 6 after the Tables Tab of this report.

Topcoat Spraybooth Exhausts PM Emission Results

Stack Identification	Units	Run 1	Run 2	Run 3	Average
EU-TOPCOAT2					
SVST-PS-040	lb/hr	1.2	0.81	1.0	0.99
	lb/veh	0.052	0.030	0.051	0.045
SVST-PS-042	lb/hr	0.40	0.36	0.27	0.34
	lb/veh	0.018	0.014	0.014	0.016
SVST-PS-044	lb/hr	1.7	1.3	1.6	1.6
	lb/veh	0.077	0.048	0.089	0.072
EU-TOPCOAT3					
SVST-PS-089	lb/hr	1.6	0.46	0.46	0.84
	lb/veh	0.069	0.028	0.020	0.039
SVST-PS-090	lb/hr	0.62	0.32	0.23	0.39
	lb/veh	0.039	0.014	0.013	0.022
SVST-PS-091	lb/hr	1.1	1.6	1.3	1.3
	lb/veh	0.056	0.086	0.087	0.076

PM: particulate matter
lb/hr: pound per hour
lb/veh: pound per vehicle

1.0 Introduction

Chrysler Group LLC retained Bureau Veritas North America, Inc. to test air emissions at the Jefferson North Assembly Plant (JNAP) in Detroit, Michigan. Chrysler Group LLC operates a body shop, paint shop, and final assembly line to manufacture the Dodge Durango and Jeep Grand Cherokee vehicles at this facility.

The purpose of the testing was to measure emissions of particulate matter from two paint lines (EU-TOPCOAT2 and EU-TOPCOAT3). The EU-TOPCOAT2 and EU-TOPCOAT3 air emission sources are included within the facility's air permit MI-ROP-N2155-2010 for the FG-FACILITY flexible group category.

1.1 Summary of Test Program

The topcoat paint process at JNAP is comprised of three topcoat paint lines in which basecoat and clearcoat coatings are applied. The topcoat spraybooths use a downdraft ventilation system and water wash system to control paint overspray. Emissions were measured at six topcoat spraybooth exhausts from EU-TOPCOAT2 and EU-TOPCOAT3 lines. The SVST-PS-042, SVST-PS-044, and SVST-PS-090 topcoat stacks have a diameter of 108 inches. The SVST-PS-040, SVST-PS-089, and SVST-PS-091 topcoat stacks have a diameter of 120 inches. All the topcoat stacks that discharge to atmosphere are approximately 50 feet high.

1.2 Contact Information

Mr. Thomas Schmelter, Senior Project Manager with Bureau Veritas, directed the testing program. Mr. Rohit Patel, Air Compliance Manager with Chrysler Group LLC, provided process coordination and arranged for facility operating parameters to be recorded. The testing was witnessed by Messrs. Thomas Maza, Robert Byrnes, and Mark Dziadosz with the Michigan Department of Environmental Quality (MDEQ). Contact information for these individuals is listed in Table 1-1.

Table 1-1
Key Personnel

Facility	Emission Testing Company
Chrysler Group LLC	Bureau Veritas North America, Inc.
Rohit Patel Air Compliance Manager 800 Chrysler Drive Auburn Hills, Michigan 48326 Telephone: 248.512.1599 rgp6@chrysler.com	Thomas Schmelter, QSTI Senior Project Manager 22345 Roethel Drive Novi, Michigan 48375-4710 Telephone: 248.344.3003 thomas.schmelter@us.bureauveritas.com
Michigan Department of Environmental Quality	
Thomas Maza Environmental Quality Analyst Air Quality Division-Detroit Office Cadillac Place, Suite 2-300 3058 West Grand Boulevard Detroit, Michigan 48202-6058 Telephone: 313.456.4709 Facsimile: 313.456.4692 Email: mazat@michigan.gov Robert Byrnes Environmental Quality Analyst Air Quality Division-Lansing District Constitution Hall, 2nd Floor South Tower 525 West Allegan Street Lansing, Michigan 48909-7760 Telephone: 517.284.6790 Facsimile: 517.335.3122 Email: byrnesr@michigan.gov	Mark Dziadosz Environmental Quality Analyst Air Quality Division Southeast Michigan District Office 27700 Donald Court Warren, Michigan 48092-2793 Telephone: 586.753.3745 Facsimile: 586.753.3731 Email: DziadoszM@michigan.gov

2.0 Source and Sampling Locations

2.1 Process Description

The topcoat paint process at the facility is comprised of three topcoat lines in which basecoat and clearcoat coatings are applied. Currently, coatings are applied to the Durango and Grand Cherokee production models. Emissions were measured at the Basecoat Zone 1-Stack, Basecoat Zone 2/Manual Pickup-Stack, and Clearcoat Stack spraybooth exhausts from the EU-TOPCOAT2 and EU-TOPCOAT3 lines.

Operating parameters, recorded by Chrysler during the testing, are included in Appendix E. Table 2-1 presents the number of vehicles processed through the topcoat spraybooths during the 120-minute particulate matter test runs.

Table 2-1
Facility Operating Parameters

Source		Exhausted Zone	Vehicles Processed per Hour				
			Run 1	Run 2	Run 3	Average	
EU-TOPCOAT3	SVST-PS-089	Basecoat Zone 1	22.9	16.8	23.4	21.0	19.3
	SVST-PS-090	Basecoat Zone 2	16.1	23.8	17.3	19.0	
	SVST-PS-091	Clearcoat Zone	19.3	19.0	15.3	17.9	
EU-TOPCOAT2	SVST-PS-040	Basecoat Zone 1	22.0	27.2	19.7	23.0	22.6
	SVST-PS-042	Basecoat Zone 2	22.0	24.9	19.1	22.0	
	SVST-PS-044	Clearcoat Zone	22.5	27.6	18.0	22.7	

2.2 Control Equipment

Coatings are applied in spray booths or "zones" using one of three types of application technology: robotic ("robot"), electrostatic bells ("bell"), or hand held spray guns ("manual"). Each of the spray booths on the three paint lines use a downdraft ventilation and water wash system below the grating to control paint overspray. After the water wash control, exhaust from the bell zones is further directed to a filter house, concentrator, and thermal incinerator for volatile organic compound pollution control, while exhaust from the robot and manual zones is released directly to the stacks. Testing was conducted on representative robot and manual zone stacks.

2.3 Flue Gas Sampling Locations

2.3.1 EU-TOPCOAT2 and 3 Topcoat Spraybooth Exhausts (108 inch Stack Diameter)

This section describes the flue gas sampling locations for the following spraybooth exhaust sources, which consist of stacks that have a stack diameter of 108 inches:

- EU-TOPCOAT2 (SVST-PS-042 and SVST-PS-044)
- EU-TOPCOAT3 (SVST-PS-090)

Four 6-by-6-inch-internal-dimension sampling ports oriented at 90° to one another are located in a straight section of the exhaust stacks accessed via the roof. The sampling ports are flush with the stack interior wall. The ports are located at the following locations relative to the nearest flow disturbances:

- Approximately 25 feet downstream (~2.8 duct diameters) of duct confluences beneath the roof.
- Approximately 25 feet upstream (~2.8 duct diameters) of the stack exit to the atmosphere.

Figure 1 in the Appendix depicts the sampling ports and traverse point locations for the three sampling locations with a stack diameter of 108 inches. All of the stacks sampling locations are set up similarly. A photograph showing one of the EU-TOPCOAT2 topcoat spraybooth sampling locations is provided in Figure 2-1.

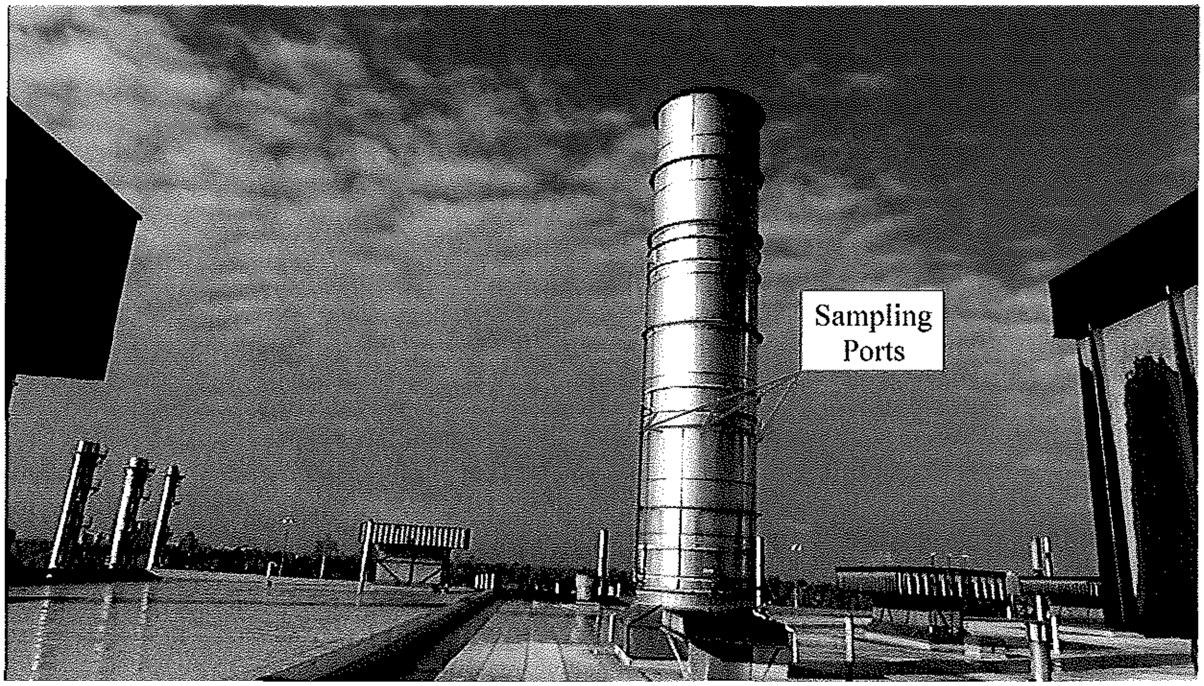


Figure 2-1. EU-TOPCOAT2 (SVST-PS-044) Topcoat Spraybooth Sampling Location

2.3.2 EU-TOPCOAT2 and 3 Topcoat Spraybooth Exhausts (120 inch Stack Diameter)

This section describes the flue gas sampling locations for the following spraybooth exhaust sources, which consist of stacks that have a stack diameter of 120 inches:

- EU-TOPCOAT2 (SVST-PS-040)
- EU-TOPCOAT3 (SVST-PS-089 and SVST-PS-091)

Four 6-by-6-inch-internal-dimension sampling ports oriented at 90° to one another are located in a straight section of the exhaust stacks, accessed via the roof. The sampling ports are flush with the stack interior wall. The ports are located at the following locations relative to the nearest flow disturbances:

- Approximately 25 feet downstream (~2.5 duct diameters) of duct confluences beneath the roof.
- Approximately 25 feet upstream (~2.5 duct diameters) of the stack exit to the atmosphere.

Figure 2 in the Appendix depicts the sampling ports and traverse point locations for the three sampling locations with a stack diameter of 120 inches. A photograph showing one of the EU-TOPCOAT3 topcoat spraybooth sampling locations is provided in Figure 2-2.

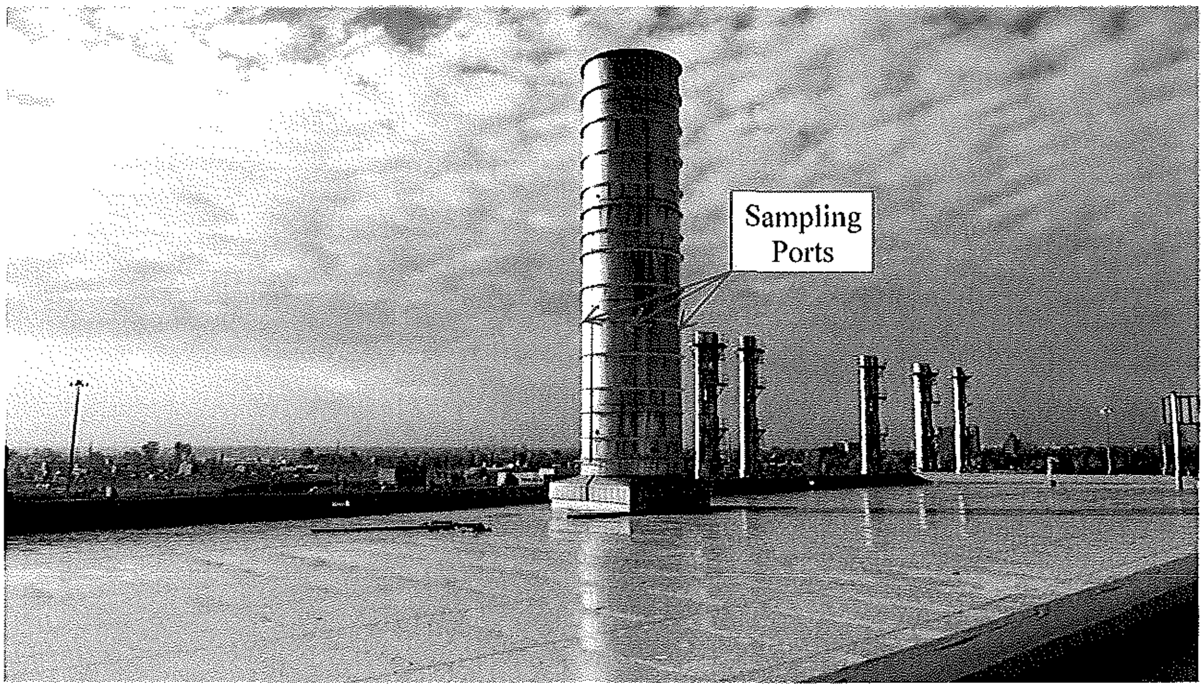


Figure 2-2. EU-TOPCOAT3 (SVST-PS-091) Topcoat Spraybooth Sampling Location

3.0 Summary and Discussion of Results

3.1 Objectives and Test Matrix

The purpose of the testing is to obtain PM emissions data for the Basecoat Zone 1, Basecoat Zone 2, and Clearcoat stacks at the JNAP facility. Table 3-1 presents the sampling and analytical test matrix.

Table 3-1
Test Matrix

Date (2014)	Topcoat	Stack	USEPA Sampling Method	Run	Sample Time†	Test Duration (min)
March 19	EU-TOPCOAT3	SVST-PS-089	1, 2, 3, 4, and 5	1 2 3	8:09-11:07 11:46-14:16 14:40-17:06	120
		SVST-PS-090		1 2 3	10:40-13:58 14:36-17:15 17:41-20:07	120
		SVST-PS-091		1 2 3	8:52-12:33 13:15-15:56 17:00-19:45	120
March 20	EU-TOPCOAT2	SVST-PS-040	1, 2, 3, 4, and 5	1 2 3	7:41-10:00 10:19-12:36 12:55-15:06	120
		SVST-PS-042		1 2 3	7:55-10:26 11:00-13:46 14:24-16:58	120
		SVST-PS-044		1 2 3	8:14-10:46 11:05-13:22 13:42-16:05	120

† Times include sampling port changes conducted during the 120-minute test runs

3.2 Field Test Changes and Issues

Field test changes were not required to complete the emissions testing. Communication between Chrysler Group LLC, Bureau Veritas, and MDEQ ensured the testing was performed in accordance with established requirements. The following section describes the testing and issues encountered.

3.2.1 Particulate Matter USEPA Method Change

Based on communications with MDEQ and USEPA, Bureau Veritas measured particulate matter emissions by modifying USEPA Method 5 sampling procedures to maintain the filter temperature ≤85°F.

MDEQ recommended the modified Method 5 sampling procedures be used to test measure particulate rather than Method 201A, which was listed in the Intent-to-Test Plan dated November 7, 2013. Therefore, during this testing program USEPA Method 5 was modified by maintaining the probe and filter temperature below 85°F. Because the stack, sampling components, and gas filtration temperatures were below 85°F during testing the collected particulates represent total PM, which consists of both filterable and condensable particulates.

3.2.2 Particulate Matter Test Date Change

Particulate matter testing was originally scheduled to occur on March 18 and 19, 2014. After communication with MDEQ, testing was postponed due to severe weather on March 19, 2014. The test program resumed and was completed on March 20, 2014.

3.3 Applicable Permit or Source Designation

Two topcoat paint booths identified as EU-TOPCOAT2 and EU-TOPCOAT3 were tested; these sources are included in the facility's air permit MI-ROP-N2155-2010 for the FG-FACILITY flexible group category. Refer to Figure 3-1 for the applicable permit cover page.

RECEIVED

MAY 20 2014

AIR QUALITY DIV.

Michigan Department of Natural Resources & Environment
Air Quality Division

EFFECTIVE DATE: December 22, 2010

ISSUED TO

Chrysler - Jefferson North Assembly Plant

State Registration Number (SRN): N2155

LOCATED AT

2101 Conner Avenue, Detroit, Michigan 48215

RENEWABLE OPERATING PERMIT

Permit Number: MI-ROP-N2155-2010

Expiration Date: December 22, 2015

Administratively Complete ROP Renewal Application Due
Between June 22, 2014 and June 22, 2015

This Renewable Operating Permit (ROP) is issued in accordance with and subject to Section 5506(3) of Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451). Pursuant to Michigan Air Pollution Control Rule 210(1), this ROP constitutes the permittee's authority to operate the stationary source identified above in accordance with the general conditions, special conditions and attachments contained herein. Operation of the stationary source and all emission units listed in the permit are subject to all applicable future or amended rules and regulations pursuant to Act 451 and the federal Clean Air Act.

SOURCE-WIDE PERMIT TO INSTALL

Permit Number: MI-PTI-N2155-2010

This Permit to Install (PTI) is issued in accordance with and subject to Section 5505(5) of Act 451. Pursuant to Michigan Air Pollution Control Rule 214a, the terms and conditions herein, identified by the underlying applicable requirement citation of Rule 201(1)(a), constitute a federally enforceable PTI. The PTI terms and conditions do not expire and remain in effect unless the criteria of Rule 201(6) are met. Operation of all emission units identified in the PTI is subject to all applicable future or amended rules and regulations pursuant to Act 451 and the federal Clean Air Act.

Figure 3-1. Permit Cover Page

3.4 Summary of Results

The purpose of the testing is to obtain PM emissions data for the Basecoat Zone 1, Basecoat Zone 2, and Clearcoat stacks from the EU-TOPCOAT2 and EU-TOPCOAT3 lines at the JNAP facility.

Detailed results are presented in Tables 1 through 6 after the Tables Tab of this report. Calibration and inspection sheets are presented in Appendix A. Sample calculations are presented in Appendix B. Field and computer-generated data sheets are behind Appendices C and D. Facility operating parameters and laboratory data are presented in Appendices E and F. Photographs of the sample filters, from each source, are presented as Appendix G.

The results are summarized in Table 3-2.

Table 3-2
Topcoat Spraybooth Exhausts PM Emission Results

Stack Identification	Units	Run 1	Run 2	Run 3	Average
EU-TOPCOAT2					
SVST-PS-040	lb/hr	1.2	0.81	1.0	0.99
	lb/veh	0.052	0.030	0.051	0.045
SVST-PS-042	lb/hr	0.40	0.36	0.27	0.34
	lb/veh	0.018	0.014	0.014	0.016
SVST-PS-044	lb/hr	1.7	1.3	1.6	1.6
	lb/veh	0.077	0.048	0.089	0.072
EU-TOPCOAT3					
SVST-PS-089	lb/hr	1.6	0.46	0.46	0.84
	lb/veh	0.069	0.028	0.020	0.039
SVST-PS-090	lb/hr	0.62	0.32	0.23	0.39
	lb/veh	0.039	0.014	0.013	0.022
SVST-PS-091	lb/hr	1.1	1.6	1.3	1.3
	lb/veh	0.056	0.086	0.087	0.076

PM: particulate matter
lb/hr: pound per hour
lb/veh: pound per vehicle

4.0 Sampling and Analytical Procedures

Bureau Veritas measured emissions following the guidelines and procedures specified in 40 CFR 60, Appendix A, "Standards of Performance for New Stationary Sources," and State of Michigan Part 10 Rules, "Intermittent Testing and Sampling." The sampling and analytical methods used are indicated in the following table:

Table 4-1
Emission Test Methods

Sampling Method	Parameter	Analysis
EPA 1 and 2	Gas stream volumetric flowrate	Field measurement, S-type Pitot tube
EPA 3	Molecular weight	Fyrite® chemical absorbance analyzer
EPA 4	Moisture content	Gravimetric
EPA 5	Particulate matter	Gravimetric

4.1 Sampling Train and Procedures

Since each topcoat line exhausts to atmosphere through three stacks, emissions measurements were conducted at a total of six stacks (collectively "the Test Stacks"). The emission test parameters and sampling procedure at each sampling location are provided in Table 4-2.

Table 4-2
Emissions Test Parameters

Parameter	Topcoat Sources		USEPA Reference	
	EU-TOPCOAT2	EU-TOPCOAT3	Method	Title
Sampling ports/ traverse points	•	•	1	Sample and Velocity Traverses for Stationary Sources
Velocity and flowrate	•	•	2	Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
Molecular weight	•	•	3	Gas Analysis for the Determination of Dry Molecular Weight
Moisture content	•	•	4	Determination of Moisture Content in Stack Gases (Approximation Method)
Particulate matter	•	•	5 (Modified)	Determination of Particulate Matter Emissions from Stationary Sources

• Denotes a test parameter

4.1.1 Volumetric Flowrate (USEPA Methods 1 and 2)

Method 1, "Sample and Velocity Traverses for Stationary Sources," from 40 CFR 60, Appendix A, was used to evaluate the sampling location and the number of traverse points for sampling and the measurement of velocity profiles. Details of the sampling location and number of velocity traverse points are presented in the Table 4-3.

Table 4-3
Sampling Location and Number of Traverse Points

Source	Sampling Location	Duct Diameter (inch)	Distance from Ports to Upstream Flow Disturbance (diameter)	Distance from Ports to Downstream Flow Disturbances (diameter)	Number of Ports	Traverse Points per Port	Total Points
EU-TOPCOAT2	SVST-PS-040	120	2.5	2.5	4	6	24
	SVST-PS-042	108	2.8	2.8	4	6	24
	SVST-PS-044	108	2.8	2.8	4	6	24
EU-TOPCOAT3	SVST-PS-089	120	2.5	2.5	4	6	24
	SVST-PS-090	108	2.8	2.8	4	6	24
	SVST-PS-091	120	2.5	2.5	4	6	24

Figures 1 and 2 in the Appendix depict the EU-TOPCOAT2 and EU-TOPCOAT3 topcoat spraybooth exhaust source sampling locations and traverse points.

Method 2, "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)," was used to measure flue gas velocity and calculate volumetric flowrate. An S-type Pitot tube and thermocouple assembly calibrated in accordance with Method 2, Section 10.0, connected to an oil-filled inclined manometer was used during testing. Because the dimensions of the Pitot tube met the requirements outlined in Method 2, Section 10.1, and were within the specified limits, the baseline Pitot tube coefficient of 0.84 (dimensionless) was assigned. Refer to Appendix A for the calibration and inspection sheets. Refer to Appendix B for sample calculations of flue gas velocity and volumetric flow rate.

Cyclonic Flow Check. Bureau Veritas evaluated whether cyclonic flow was present at the sampling location. Cyclonic flow is defined as a flow condition with an average null angle greater than 20°. The direction of flow can be determined by aligning the Pitot tube to obtain zero (null) velocity head reading—the direction would be parallel to the Pitot tube face openings or perpendicular to the null position. By measuring the angle of the Pitot tube face openings in relation to the stack walls when a null angle is obtained, the direction of flow is measured. If the absolute average of the flow direction angles is greater than 20 degrees, the flue gas is considered to be cyclonic at that sampling location and an alternative location should be found.

The measurements indicate the absence of cyclonic flow at the sampling location. Field data sheets are included in Appendix C.

4.1.2 Molecular Weight (USEPA Method 3)

The carbon dioxide contribution to stack gas molecular weight was measured using Method 3, "Gas Analysis for the Determination of Dry Molecular Weight." Flue gas was extracted from the stack through a probe positioned near the centroid of the duct and directed into a Fyrite® gas analyzer. The concentrations of carbon dioxide (CO_2) and oxygen (O_2) were measured by chemical absorption with a Fyrite® gas analyzer to within ±0.5%. The average CO_2 and O_2 results of the grab samples were used to calculate molecular weight.

4.1.3 Moisture Content (USEPA Method 4)

Before testing, moisture content was estimated using previous test data, psychrometric charts, and/or saturation vapor pressure tables. This estimate was used in conjunction with preliminary velocity head and temperature data to (1) calculate flue gas velocity, 2) ideal nozzle diameter, and (3) establish isokinetic sampling rates.

For each sampling run, moisture content of the flue gas was measured using the reference method outlined in Section 2 of Method 4, "Determination of Moisture Content in Stack Gases" in conjunction with USEPA Method 5 sampling train.

4.1.4 Particulate Matter (USEPA Modified Method 5)

USEPA Method 5, "Determination of Particulate Emissions from Stationary Sources," was used to measure the "front-half" particulate matter emissions. Based on communication with MDEQ, USEPA Method 5 was modified by maintaining the probe and filter temperatures below 85°F, during this testing program (see Section 3.2.1). Figure 3 in the Appendix depicts the USEPA Method 5 sampling train. Bureau Veritas' modular isokinetic stack sampling system consisted of the following:

- A quartz-glass steel button-hook nozzle.
- A temperature controlled (<85°F) quartz-glass-lined probe.
- A desiccated and pre-weighed 110-millimeter-diameter quartz fiber filter (manufactured to at least 99.95% efficiency (<0.05% penetration) for 0.3-micron dioctyl phthalate smoke particles) in a temperature controlled (<85°F) filter box.
- A set of four Greenburg-Smith (GS) impingers with the configuration shown in Table 4-4.
- A sampling line.
- An Environmental Supply® control case equipped with a pump, dry-gas meter, and calibrated orifice.

Table 4-4
Modified Method 5 Impinger Configuration

Impinger Order (Upstream to Downstream)	Impinger Type	Impinger Contents	Amount of Contents
1	Modified	Water	100 milliliters
2	Greenburg Smith	Water	100 milliliters
3	Modified	Empty	0 milliliters
4	Modified	Silica desiccant	~300 grams

Before testing, a preliminary velocity traverse was performed and a nozzle size was calculated that would allow isokinetic sampling at an average rate of 0.75 cubic feet per minute. Bureau Veritas selected a pre-cleaned nozzle that had an inner diameter that approximated the calculated ideal value. The nozzle was measured with calipers across three cross-sectional chords to evaluate the inside diameter; rinsed and brushed with acetone; and connected to the stainless steel-lined sample probe. Refer to Appendix A for the nozzle diameter measurement sheet.

The impact and static pressure openings of the Pitot tube were leak-checked at or above a velocity head of 3.0 inches of water for more than 15 seconds. The sampling train was leak-checked by capping the nozzle tip and applying a vacuum of approximately 15 inches of water to the sampling train. The dry-gas meter was then monitored for approximately 1 minute to measure that the sample train leakage rate was less than 0.02 cubic feet per minute (cfm). The sample probe was then inserted into the sampling port to begin sampling.

Ice was placed around the impingers and the probe and filter temperatures were allowed to stabilize at <85 °F before each sample run. After the desired operating conditions were coordinated with the facility, testing was initiated.

Stack parameters (e.g., flue velocity, temperature) were monitored to establish the isokinetic sampling rate within ±10 % for the duration of the test (see Section 3.2.2). Data was recorded at each of the traverse points at 2.5-minute intervals.

At the conclusion of a test run and the post-test leak check, the sampling train was disassembled and the impingers and filter were transported to the recovery area. The filter was recovered using tweezers and placed in a Petri dish. The Petri dish was immediately labeled and sealed with Teflon tape. The nozzle, probe, and the front half of the filter holder assembly were brushed and, at a minimum, triple-rinsed with acetone to recover particulate matter. The acetone rinses were collected in pre-cleaned sample containers.

At the end of a test run, the mass of liquid collected in each impinger was measured using a scale to within ±0.5 grams; these masses were used to calculate moisture content of the flue gas. The contents of the impinger train were discarded after the mass was measured.

Bureau Veritas labeled each container with the test number, test location, and test date, and marked the level of liquid on the outside of the container. Immediately after recovery, the sample containers were stored. Bureau Veritas personnel transported all samples to Bureau Veritas' laboratory in Novi, Michigan, for analysis. Refer to Appendix F for the USEPA Method 5 laboratory results.

4.2 Procedures for Obtaining Process Data

Process data was recorded by Chrysler Group LLC personnel. Recorded process data were provided to Bureau Veritas at the conclusion of the testing. The process data are summarized in Section 2.0 and included in Appendix E.

4.3 Sampling Identification and Custody

Recovery and analytical procedures were applicable to the sampling methods used in this test program. Detailed sampling and recovery procedures are described in Section 4.1. For each sample collected (i.e. filter, probe rinse) sample identification and custody procedures were completed as follows:

- Containers were sealed with Teflon tape to prevent contamination.
- Containers were labeled with test number, location, and test date.
- The level of fluid was marked on the outside of the sample containers to identify if leakage occurred prior to receipt of the samples by the laboratory.
- Containers were placed in a cooler for storage.
- Samples were logged using guidelines outlined in ASTM D4840-99 (Reapproved 2010), "Standard Guide for Sample Chain-of-Custody Procedures."
- Samples were transported to the laboratory under chain of custody.

Chains of custody and laboratory analytical results are included in Appendix F.

5.0 QA/QC Activities

Equipment used in this emissions test program passed quality assurance/quality control (QA/QC) procedures. Refer to Appendix A for equipment inspection and calibration documents. Field data sheets are presented in Appendix C. Computer-generated Data Sheets are presented within Appendix D.

5.1 Pretest QA/QC Activities

Before testing, the sampling equipment was cleaned, inspected, and calibrated according to procedures outlined in the applicable USEPA sampling method and USEPA's "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume and Principles: Volume III, Stationary Source Specific Methods." Refer to Appendix A for pre-test Pitot tube, dry-gas meter, and nozzle inspection and calibration sheets.

5.2 QA/QC Audits

The results of select sampling and equipment QA/QC audits and the acceptable USEPA tolerance are presented in the following sections. Calibration and inspection sheets for dry-gas meters (DGM), thermocouples, and Pitot tubes are presented in Appendix A.

5.2.1 Sampling Train QA/QC Audits

The sampling trains described in Section 4.1 were audited for measurement accuracy and data reliability. The Table 5-1 summarizes the Method 5 QA/QC audits conducted on each sampling train.

Table 5-1
Method 5 Sampling Train QA/QC Audits

Parameter	Run 1	Run 2	Run 3	Method Requirement	Comment
EU-TOPCOAT2 (040)					
Average velocity pressure head (in H_2O)	0.17	0.15	0.15	>0.05 in $H_2O^†$	Valid
Sampling train leak check Post–test	0.010 ft^3 for 1 min at 7 in Hg	0.000 ft^3 for 1 min at 6 in Hg	0.000 ft^3 for 1 min at 7 in Hg	<0.020 ft^3 for 1 minute at ≥ recorded during test	Valid
Sampling vacuum (in Hg)	2 to 4	1 to 2	2		
EU-TOPCOAT2 (042)					
Average velocity pressure head (in H_2O)	0.36	0.35	0.35	>0.05 in $H_2O^†$	Valid
Sampling train leak check Post–test	0.000 ft^3 for 1 min at 5 in Hg	0.010 ft^3 for 1 min at 5 in Hg	0.000 ft^3 for 1 min at 5 in Hg	<0.020 ft^3 for 1 minute at ≥ recorded during test	Valid
Sampling vacuum (in Hg)	1	1	1		
EU-TOPCOAT2 (044)					
Average velocity pressure head (in H_2O)	0.16	0.15	0.15	>0.05 in $H_2O^†$	Valid
Sampling train leak check Post–test	0.000 ft^3 for 1 min at 6 in Hg	0.000 ft^3 for 1 min at 6 in Hg	0.000 ft^3 for 1 min at 7 in Hg	<0.020 ft^3 for 1 minute at ≥ recorded during test	Valid
Sampling vacuum (in Hg)	1 to 2	1	1		
EU-TOPCOAT3 (089)					
Average velocity pressure head (in H_2O)	0.24	0.23	0.24	>0.05 in $H_2O^†$	Valid
Sampling train leak check Post–test	0.002 ft^3 for 1 min at 5 in Hg	0.000 ft^3 for 1 min at 7 in Hg	0.000 ft^3 for 1 min at 6 in Hg	<0.020 ft^3 for 1 minute at ≥ recorded during test	Valid
Sampling vacuum (in Hg)	2 to 5	2 to 5	2 to 5		

Table 5-1
Method 5 Sampling Train QA/QC Audits

Parameter	Run 1	Run 2	Run 3	Method Requirement	Comment
EU-TOPCOAT3 (090)					
Average velocity pressure head (in H_2O)	0.20	0.23	0.23	>0.05 in H_2O†	Valid
Sampling train leak check Post–test	0.000 ft^3 for 1 min at 5 in Hg	0.000 ft^3 for 1 min at 5 in Hg	0.000 ft^3 for 1 min at 8 in Hg	<0.020 ft^3 for 1 minute at ≥ recorded during test	Valid
Sampling vacuum (in Hg)	0 to 1	0 to 1	1		
EU-TOPCOAT3 (091)					
Average velocity pressure head (in H_2O)	0.21	0.23	0.26	>0.05 in H_2O†	Valid
Sampling train leak check Post–test	0.010 ft^3 for 1 min at 4 in Hg	0.000 ft^3 for 1 min at 4 in Hg	0.000 ft^3 for 1 min at 4 in Hg	<0.020 ft^3 for 1 minute at ≥ recorded during test	Valid
Sampling vacuum (in Hg)	1	1 to 2	1 to 3		

† Manometer capable of reading 0 to 10 in H_2O acceptable for measuring differential pressure head above 0.05 in H_2O

5.2.2 Isokinetic Sampling

Isokinetic sampling, which means collecting flue gas into the sampling nozzle at the velocity equal to that of the flue gas velocity, is a requirement of USEPA Method 5. Maintaining isokinetic sampling is important because under anisokinetic conditions, sample concentrations may be biased depending on the inertial effects of the particles.

When flue gas containing small and large particles are collected isokinetically, the small and large particle concentrations are consistent with the flue gas composition. However, in over-isokinetic conditions (200% high sampling flowrate into nozzle) the particulate matter concentrations are biased low, because a greater number of smaller, lighter particles and fewer larger, heavier particles will be collected compared to isokinetic conditions. Under-isokinetic sampling (50% low sampling flowrate into nozzle) will bias the results high because a greater number of larger, heavy particles will be collected.

The USEPA Method 5 isokinetic sampling rate for each test run is presented in Table 5-2.

Table 5-2
Summary of Isokinetic Sampling Rates

Source	Run	Actual % Isokinetic Sampling Rate	Allowable % Isokinetic Sampling Rate
EU-TOPCOAT2			
SVST-PS-040	1	99	100±10%
	2	98	
	3	99	
SVST-PS-042	1	98	100±10%
	2	97	
	3	98	
SVST-PS-044	1	99	100±10%
	2	99	
	3	99	
EU-TOPCOAT3			
SVST-PS-089	1	98	100±10%
	2	99	
	3	99	
SVST-PS-090	1	99	100±10%
	2	99	
	3	99	
SVST-PS-091	1	99	100±10%
	2	98	
	3	95	

The isokinetic sampling rates were within the isokinetic requirement of 100±10% percent.

5.2.3 Dry-Gas Meter QA/QC Audits

Table 5-3 summarizes the dry-gas meter calibration checks in comparison to the acceptable USEPA tolerance. Dry-gas meter Boxes 2, 6, 7, and 8 were used during this testing to measure particulate matter and moisture content at the topcoat exhausts. Refer to Appendix A for DGM calibrations.

Table 5-3
Dry-Gas Meter Calibration QA/QC Audit

Test Method	Meter Box	Pre-test DGM Calibration Factor (Y) (dimensionless)	Post-Test DGM Calibration Check Value (Y_{qa}) (dimensionless)	Absolute Difference Between Pre- and Post-test DGM Calibrations	Acceptable Tolerance	Calibration Result
Method 5	2	1.009 (February 28, 2014)	1.008 (March 28, 2014)	0.001	≤0.05	Valid
Method 5	6	1.030 (February 26, 2014)	0.989 (April 18, 2014)	0.041	≤0.05	Valid
Method 5	7	1.022 (March 11, 2014)	1.015 (March 27, 2014)	0.007	≤0.05	Valid
Method 5	8	1.009 (January 4, 2013)	1.002 (April 16, 2014)	0.007	≤0.05	Valid

5.2.4 Thermocouple QA/QC Audits

Temperature measurements using thermocouples and digital pyrometers were compared to a reference temperature (i.e., ice water bath, boiling water) prior to testing to evaluate accuracy of the equipment. The thermocouples and pyrometers measured temperature within ±1.5% of reference temperatures and were within USEPA acceptance criteria. Thermocouple calibration sheets are presented in Appendix A.

5.2.5 QA/QC Checks for Data Reduction and Validation

The emissions testing Project Manager and/or the QA/QC Officer validated computer spreadsheets onsite. The computer spreadsheets were used to evaluate whether field calculations are accurate. Random inspection of the field data sheets were conducted to evaluate whether data have been recorded appropriately. At the completion of a test, the raw field data was entered into computer spreadsheets to provide applicable onsite emissions calculations. The computer data sheets were checked against the raw field data sheets for accuracy.

5.3 QA/QC Blanks

Reagent and filter blanks were analyzed for the constituent of interest. The results of the blanks are presented in Table 5-4. The blank results do not indicate significant contamination within the reagents or that it occurred in the field. Blank corrections were not applied.

Table 5-4
QA/QC Blanks

Sample Identification	Result (mg)	Comment
Acetone Reagent Blank	<0.5	Blank corrections were not applied. Method detection limit is 0.5 mg.
Filter Blank	0.94	Blank corrections were not applied. Method detection limit is 0.5 mg.

5.4 QA/QC Issues

QA/QC issues were not encountered; the audits demonstrate sample collection accuracy for the test runs.

RECEIVED

MAY 20 2014

AIR QUALITY DIV.

Limitations

The information and opinions rendered in this report are exclusively for use by Chrysler Group LLC. Bureau Veritas North America, Inc. will not distribute or publish this report without Chrysler Group LLC's consent except as required by law or court order. The information and opinions are given in response to a limited assignment and should be implemented only in light of that assignment. Bureau Veritas North America, Inc. accepts responsibility for the competent performance of its duties in executing the assignment and preparing reports in accordance with the normal standards of the profession, but disclaims any responsibility for consequential damages.

This report prepared by: Thomas R. Schmelter

Thomas R. Schmelter, QSTI
Senior Project Manager
Health, Safety, and Environmental Services

This report reviewed by:

Derek R. Wong, Ph.D., P.E.
Director and Vice President
Health, Safety, and Environmental Services

Tables

EU-TOPCOAT2 Tables

Table 1 - Color 2 ST-PS-040 Particulate Matter Results

Facility		Chrysler Group LLC - JNAP			
Source Designation		Color 2 - ST-PS-040			
Test Date		Mar 20, 2014	Mar 20, 2014	Mar 20, 2014	
Meter/Nozzle Information		**Run 1**	**Run 2**	**Run 3**	**Average**
Meter Temperature, T_m	°F	38	39	41	39
Meter Pressure, P_m	in Hg	29.94	29.93	29.93	29.94
Measured Sample Volume, V_m	ft^3	66.03	60.29	59.78	62.03
Sample Volume, V_m	std ft^3	70.68	64.37	63.60	66.21
Sample Volume, V_m	std m^3	2.00	1.82	1.80	1.87
Condensate Volume, V_w	std ft^3	0.56	0.91	1.49	0.99
Gas Density, ρ_s	std lb/ft^3	0.0746	0.0745	0.0742	0.0744
Total weight of sampled gas	lb	5.317	4.861	4.854	5.011
Nozzle Size, A_n	ft^2	0.0004337	0.0004337	0.0004337	0.0004337
Isokinetic Variation, I	%	99	98	99	99
Stack Data					
Average Stack Temperature, T_s	°F	68	68	68	68
Molecular Weight Stack Gas-dry, M_d	lb/lb-mole	28.84	28.84	28.84	28.84
Molecular Weight Stack Gas-wet, M_s	lb/lb-mole	28.76	28.69	28.59	28.68
Stack Gas Specific Gravity, G_s		0.99	0.99	0.99	0.99
Percent Moisture, B_{ws}	%	0.78	1.39	2.30	1.49
Water Vapor Volume (fraction)		0.008	0.014	0.023	0.015
Pressure, P_s	in Hg	29.89	29.89	29.89	29.89
Average Stack Velocity, V_s	ft/sec	23.18	21.27	21.16	21.87
Area of Stack	ft^2	78.54	78.54	78.54	78.54
Exhaust Gas Flowrate					
Flowrate	ft^3/min, actual	109,212	100,223	99,699	103,045
Flowrate	ft^3/min, standard wet	108,991	100,091	99,552	102,878
Flowrate	ft^3/min, standard dry	108,140	98,696	97,266	101,367
Flowrate	m^3/min, standard dry	3,062	2,795	2,754	2,870
Collected Mass					
Particulate Matter Acetone Wash	mg	1.6	1.9	1.5	1.7
Particulate Matter Filter	mg	4.1	2.1	3.5	3.2
Total Particulate Matter (PM)	mg	5.7	4.0	5.0	4.9
Concentration					
Particulate Matter (PM)	mg/dscf	0.081	0.062	0.079	0.074
Particulate Matter (PM)	grain/dscf	0.0012	0.00096	0.0012	0.0011
Mass Emission Rate					
Particulate Matter (PM)	lb/vehicle	0.052	0.030	0.051	0.045
Particulate Matter (PM)	lb/hr	1.2	0.81	1.0	0.99

Table 2 - Color 2 ST-PS-042 Particulate Matter Results

Facility		**Chrysler Group LLC - JNAP**			
Source Designation		**Color 2 - ST-PS-042**			
Test Date		**Mar 20, 2014**	**Mar 20, 2014**	**Mar 20, 2014**	
Meter/Nozzle Information		**Run 1**	**Run 2**	**Run 3**	**Average**
Meter Temperature, T_m	°F	37	38	40	38
Meter Pressure, P_m	in Hg	30.06	30.09	30.10	30.08
Measured Sample Volume, V_m	ft^3	112.28	108.62	110.22	110.37
Sample Volume, V_m	std ft^3	123.50	119.38	120.68	121.18
Sample Volume, V_m	std m^3	3.50	3.38	3.42	3.43
Condensate Volume, V_w	std ft^3	1.32	1.67	1.74	1.58
Gas Density, ρ_s	std lb/ft^3	0.0746	0.0745	0.0745	0.0745
Total weight of sampled gas	lb	9.307	9.015	9.240	9.188
Nozzle Size, A_n	ft^2	0.0005241	0.0005241	0.0005241	0.0005241
Isokinetic Variation, I	%	98	97	98	98
Stack Data					
Average Stack Temperature, T_s	°F	66	67	67	66
Molecular Weight Stack Gas-dry, M_d	lb/lb-mole	28.84	28.84	28.84	28.84
Molecular Weight Stack Gas-wet, M_s	lb/lb-mole	28.73	28.69	28.69	28.70
Stack Gas Specific Gravity, G_s		0.99	0.99	0.99	0.99
Percent Moisture, B_{ws}	%	1.06	1.38	1.43	1.29
Water Vapor Volume (fraction)		0.011	0.014	0.014	0.013
Pressure, P_s	in Hg	29.83	29.88	29.88	29.87
Average Stack Velocity, V_s	ft/sec	33.75	33.18	32.98	33.30
Area of Stack	ft^2	63.62	63.62	63.62	63.62
Exhaust Gas Flowrate					
Flowrate	ft^3/min, actual	128,836	126,654	125,886	127,125
Flowrate	ft^3/min, standard wet	129,049	126,839	126,065	127,318
Flowrate	ft^3/min, standard dry	127,684	125,085	124,269	125,679
Flowrate	m^3/min, standard dry	3,616	3,542	3,519	3,559
Collected Mass					
Particulate Matter Acetone Wash	mg	1.4	0.60	<0.5	0.8
Particulate Matter Filter	mg	1.5	2.0	1.5	1.7
Total Particulate Matter (PM)	mg	2.9	2.6	2.0	2.5
Concentration					
Particulate Matter (PM)	mg/dscf	0.023	0.022	0.017	0.021
Particulate Matter (PM)	grain/dscf	0.00036	0.00034	0.00026	0.00032
Mass Emission Rate					
Particulate Matter (PM)	lb/vehicle	0.018	0.014	0.014	0.016
Particulate Matter (PM)	lb/hr	0.40	0.36	0.27	0.34

Note: If particulate matter was not detected in a sample, the emission rate was calculated using the laboratory detection limit.

Table 3 - Color 2 ST-PS-044 Particulate Matter Results

Facility		Chrysler Group LLC - JNAP			
Source Designation		Color 2 - ST-PS-044			
Test Date		Mar 20, 2014	Mar 20, 2014	Mar 20, 2014	
Meter/Nozzle Information		**Run 1**	**Run 2**	**Run 3**	**Average**
Meter Temperature, T_m	°F	37	38	40	38
Meter Pressure, P_m	in Hg	29.92	29.91	29.91	29.91
Measured Sample Volume, V_m	ft^3	73.85	71.46	70.53	71.94
Sample Volume, V_m	std ft^3	80.21	77.38	76.07	77.89
Sample Volume, V_m	std m^3	2.27	2.19	2.15	2.21
Condensate Volume, V_w	std ft^3	1.33	1.75	1.57	1.55
Gas Density, ρ_s	std lb/ft^3	0.0744	0.0742	0.0743	0.0743
Total weight of sampled gas	lb	6.067	5.875	5.812	5.918
Nozzle Size, A_n	ft^2	0.0005140	0.0005140	0.0005140	0.0005140
Isokinetic Variation, I	%	99	99	99	99
Stack Data					
Average Stack Temperature, T_s	°F	67	67	68	67
Molecular Weight Stack Gas-dry, M_d	lb/lb-mole	28.84	28.84	28.84	28.84
Molecular Weight Stack Gas-wet, M_s	lb/lb-mole	28.66	28.60	28.62	28.63
Stack Gas Specific Gravity, G_s		0.99	0.99	0.99	0.99
Percent Moisture, B_{ws}	%	1.64	2.21	2.02	1.95
Water Vapor Volume (fraction)		0.016	0.022	0.020	0.020
Pressure, P_s	in Hg	29.83	29.83	29.83	29.83
Average Stack Velocity, V_s	ft/sec	22.33	21.71	21.27	21.77
Area of Stack	ft^2	63.62	63.62	63.62	63.62
Exhaust Gas Flowrate					
Flowrate	ft^3/min, actual	85,253	82,850	81,179	83,094
Flowrate	ft^3/min, standard wet	85,176	82,716	80,926	82,939
Flowrate	ft^3/min, standard dry	83,782	80,888	79,294	81,321
Flowrate	m^3/min, standard dry	2,372	2,290	2,245	2,303
Collected Mass					
Particulate Matter Acetone Wash	mg	11	8.2	9.7	9.6
Particulate Matter Filter	mg	1.6	1.4	2.0	1.7
Total Particulate Matter (PM)	mg	13	10	12	11
Concentration					
Particulate Matter (PM)	mg/dscf	0.16	0.12	0.15	0.14
Particulate Matter (PM)	grain/dscf	0.0024	0.0019	0.0024	0.0022
Mass Emission Rate					
Particulate Matter (PM)	lb/vehicle	0.077	0.048	0.089	0.072
Particulate Matter (PM)	lb/hr	1.7	1.3	1.6	1.6

EU-TOPCOAT3 Tables

Table 4 - Color 3 ST-PS-089 Particulate Matter Results

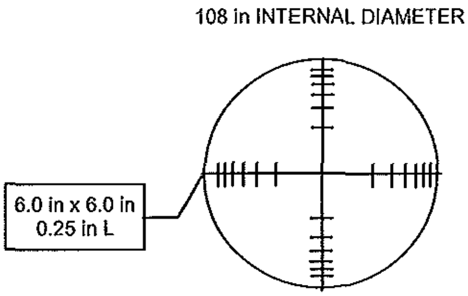
Facility		**Chrysler Group LLC - JNAP**			
Source Designation		**Color 3 - ST-PS-089**			
Test Date		**Mar 18, 2014**	**Mar 18, 2014**	**Mar 18, 2014**	
Meter/Nozzle Information		**Run 1**	**Run 2**	**Run 3**	**Average**
Meter Temperature, T_m	°F	41	51	50	47
Meter Pressure, P_m	in Hg	30.11	30.11	30.11	30.11
Measured Sample Volume, V_m	ft^3	76.75	77.92	78.80	77.82
Sample Volume, V_m	std ft^3	82.22	81.75	82.81	82.26
Sample Volume, V_m	std m^3	2.33	2.32	2.35	2.33
Condensate Volume, V_w	std ft^3	1.90	1.20	1.18	1.43
Gas Density, ρ_s	std lb/ft^3	0.0742	0.0745	0.0745	0.0744
Total weight of sampled gas	lb	6.243	6.177	6.342	6.254
Nozzle Size, A_n	ft^2	0.0004337	0.0004337	0.0004337	0.0004337
Isokinetic Variation, I	%	98	99	99	99
Stack Data					
Average Stack Temperature, T_s	°F	68	68	68	68
Molecular Weight Stack Gas-dry, M_d	lb/lb-mole	28.84	28.84	28.84	28.84
Molecular Weight Stack Gas-wet, M_s	lb/lb-mole	28.60	28.68	28.69	28.66
Stack Gas Specific Gravity, G_s		0.99	0.99	0.99	0.99
Percent Moisture, B_{ws}	%	2.25	1.45	1.41	1.70
Water Vapor Volume (fraction)		0.023	0.014	0.014	0.017
Pressure, P_s	in Hg	30.03	30.03	30.03	30.03
Average Stack Velocity, V_s	ft/sec	27.25	26.81	27.04	27.03
Area of Stack	ft^2	78.54	78.54	78.54	78.54
Exhaust Gas Flowrate					
Flowrate	ft^3/min, actual	128,423	126,351	127,412	127,395
Flowrate	ft^3/min, standard wet	128,957	126,776	127,851	127,861
Flowrate	ft^3/min, standard dry	126,051	124,938	126,050	125,680
Flowrate	m^3/min, standard dry	3,569	3,538	3,569	3,559
Collected Mass					
Particulate Matter Acetone Wash	mg	4.6	1.2	1.6	2.5
Particulate Matter Filter	mg	3.2	1.1	0.69	1.7
Total Particulate Matter (PM)	mg	7.8	2.3	2.3	4.1
Concentration					
Particulate Matter (PM)	mg/dscf	0.095	0.028	0.028	0.050
Particulate Matter (PM)	grain/dscf	0.0015	0.00043	0.00043	0.00077
Mass Emission Rate					
Particulate Matter (PM)	lb/vehicle	0.069	0.028	0.020	0.039
Particulate Matter (PM)	lb/hr	1.6	0.46	0.46	0.84

Table 5 - Color 3 ST-PS-090 Particulate Matter Results

Facility		Chrysler Group LLC - JNAP			
Source Designation		Color 3 - ST-PS-090			
Test Date		Mar 18, 2014	Mar 18, 2014	Mar 18, 2014	
Meter/Nozzle Information		**Run 1**	**Run 2**	**Run 3**	**Average**
Meter Temperature, T_m	°F	43	46	43	44
Meter Pressure, P_m	in Hg	30.09	30.16	30.17	30.14
Measured Sample Volume, V_m	ft^3	66.97	91.23	92.10	83.43
Sample Volume, V_m	std ft^3	72.88	98.77	100.43	90.69
Sample Volume, V_m	std m^3	2.06	2.80	2.84	2.57
Condensate Volume, V_w	std ft^3	0.83	1.39	1.39	1.20
Gas Density, ρ_s	std lb/ft^3	0.0745	0.0745	0.0745	0.0745
Total weight of sampled gas	lb	5.495	7.459	7.692	6.882
Nozzle Size, A_n	ft^2	0.0004185	0.0005241	0.0005241	0.0004889
Isokinetic Variation, I	%	99	99	99	99
Stack Data					
Average Stack Temperature, T_s	°F	65	64	64	64
Molecular Weight Stack Gas-dry, M_d	lb/lb-mole	28.84	28.84	28.84	28.84
Molecular Weight Stack Gas-wet, M_s	lb/lb-mole	28.72	28.69	28.69	28.70
Stack Gas Specific Gravity, G_s		0.99	0.99	0.99	0.99
Percent Moisture, B_{ws}	%	1.13	1.38	1.36	1.29
Water Vapor Volume (fraction)		0.011	0.014	0.014	0.013
Pressure, P_s	in Hg	30.02	30.02	30.02	30.02
Average Stack Velocity, V_s	ft/sec	24.41	26.57	26.89	25.96
Area of Stack	ft^2	63.62	63.62	63.62	63.62
Exhaust Gas Flowrate					
Flowrate	ft^3/min, actual	93,176	101,433	102,631	99,080
Flowrate	ft^3/min, standard wet	94,076	102,479	103,788	100,114
Flowrate	ft^3/min, standard dry	93,017	101,060	102,375	98,817
Flowrate	m^3/min, standard dry	2,634	2,862	2,899	2,798
Collected Mass					
Particulate Matter Acetone Wash	mg	2.7	1.1	0.70	1.5
Particulate Matter Filter	mg	1.0	1.3	1.0	1.1
Total Particulate Matter (PM)	mg	3.7	2.4	1.7	2.6
Concentration					
Particulate Matter (PM)	mg/dscf	0.051	0.024	0.017	0.031
Particulate Matter (PM)	grain/dscf	0.00078	0.00038	0.00026	0.00047
Mass Emission Rate					
Particulate Matter (PM)	lb/vehicle	0.039	0.014	0.013	0.022
Particulate Matter (PM)	lb/hr	0.62	0.32	0.23	0.39

Table 6 - Color 3 ST-PS-091 Particulate Matter Results

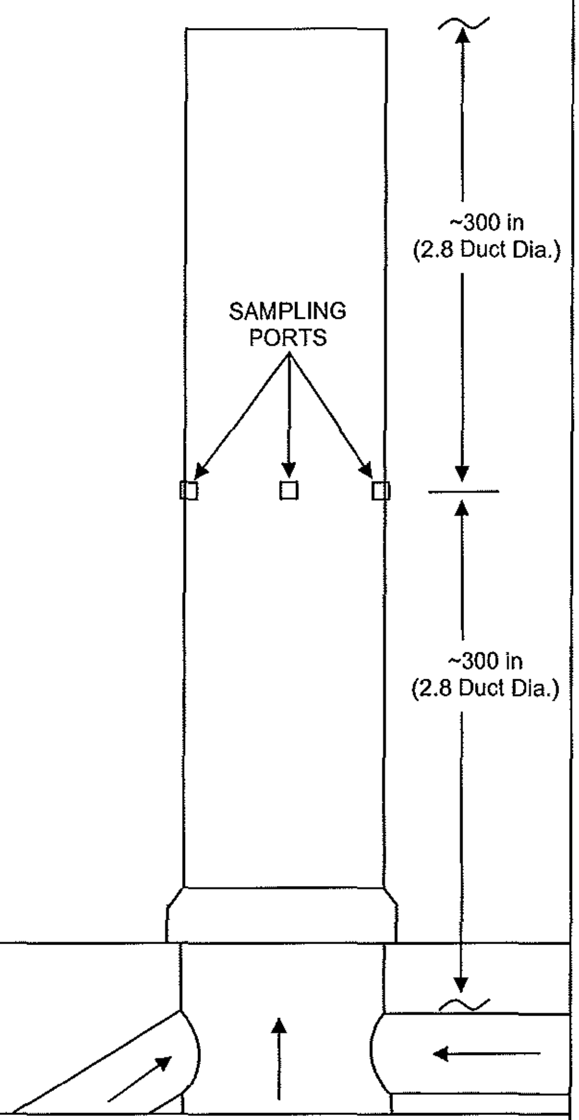
Facility		**Chrysler Group LLC - JNAP**			
Source Designation		**Color 3 - ST-PS-091**			
Test Date		**Mar 18, 2014**	**Mar 18, 2014**	**Mar 18, 2014**	
Meter/Nozzle Information		**Run 1**	**Run 2**	**Run 3**	**Average**
Meter Temperature, T_m	°F	41	48	45	45
Meter Pressure, P_m	in Hg	30.13	30.15	30.17	30.15
Measured Sample Volume, V_m	ft^3	83.45	89.32	92.32	88.36
Sample Volume, V_m	std ft^3	90.53	95.63	99.54	95.23
Sample Volume, V_m	std m^3	2.56	2.71	2.82	2.70
Condensate Volume, V_w	std ft^3	3.04	1.87	0.92	1.95
Gas Density, ρ_s	std lb/ft^3	0.0740	0.0743	0.0746	0.0743
Total weight of sampled gas	lb	6.919	7.247	7.636	7.267
Nozzle Size, A_n	ft^2	0.0005140	0.0005140	0.0005140	0.0005140
Isokinetic Variation, I	%	99	98	95	97
Stack Data					
Average Stack Temperature, T_s	°F	70	71	71	70
Molecular Weight Stack Gas-dry, M_d	lb/lb-mole	28.84	28.84	28.84	28.84
Molecular Weight Stack Gas-wet, M_s	lb/lb-mole	28.49	28.63	28.74	28.62
Stack Gas Specific Gravity, G_s		0.98	0.99	0.99	0.99
Percent Moisture, B_{ws}	%	3.25	1.92	0.92	2.03
Water Vapor Volume (fraction)		0.032	0.019	0.009	0.020
Pressure, P_s	in Hg	30.02	30.02	30.02	30.02
Average Stack Velocity, V_s	ft/sec	25.55	27.04	28.68	27.09
Area of Stack	ft^2	78.54	78.54	78.54	78.54
Exhaust Gas Flowrate					
Flowrate	ft^3/min, actual	120,410	127,409	135,143	127,654
Flowrate	ft^3/min, standard wet	120,379	127,227	134,970	127,525
Flowrate	ft^3/min, standard dry	116,472	124,781	133,729	124,994
Flowrate	m^3/min, standard dry	3,298	3,533	3,787	3,539
Collected Mass					
Particulate Matter Acetone Wash	mg	4.9	2.4	1.9	3.1
Particulate Matter Filter	mg	1.4	7.1	5.6	4.7
Total Particulate Matter (PM)	mg	6.3	9.5	7.5	7.8
Concentration					
Particulate Matter (PM)	mg/dscf	0.070	0.099	0.075	0.081
Particulate Matter (PM)	grain/dscf	0.0011	0.0015	0.0012	0.0013
Mass Emission Rate					
Particulate Matter (PM)	lb/vehicle	0.056	0.086	0.087	0.076
Particulate Matter (PM)	lb/hr	1.1	1.6	1.3	1.3



* REPRESENTS STACKS FROM EU-TOPCOAT2 (SVST-PS-042 and SVST-PS-044), and

EU-TOPCOAT3 (SVST-PS-090)

TRAVERSE POINT	DISTANCE FROM STACK WALL (INCHES)
6	38.4
5	27.0
4	19.1
3	12.7
2	7.2
1	2.3



	DISTANCE FROM PORTS TO NEAREST UPSTREAM BEND/ DISTURBANCE	DISTANCE FROM PORTS TO NEAREST DOWNSTREAM BEND/DISTURBANCE
Topcoat EU-TOPCOAT2 and 3 Spray-booth Stacks	~300 INCHES (~2.8 DIAMETERS)	~300 INCHES (~2.8 DIAMETERS)

Figure 1
EU-TOPCOAT2 and EU-TOPCOAT3 (108 inch Stack Diameter) Topcoat Spraybooth Exhaust Sampling Ports and Traverse Point Locations

BUREAU VERITAS

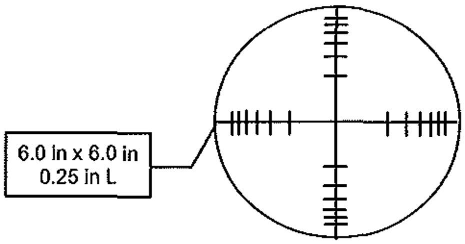
Chrysler Group LLC
Jefferson North Assembly Plant
Detroit, Michigan

Project No. 11014-000011.00

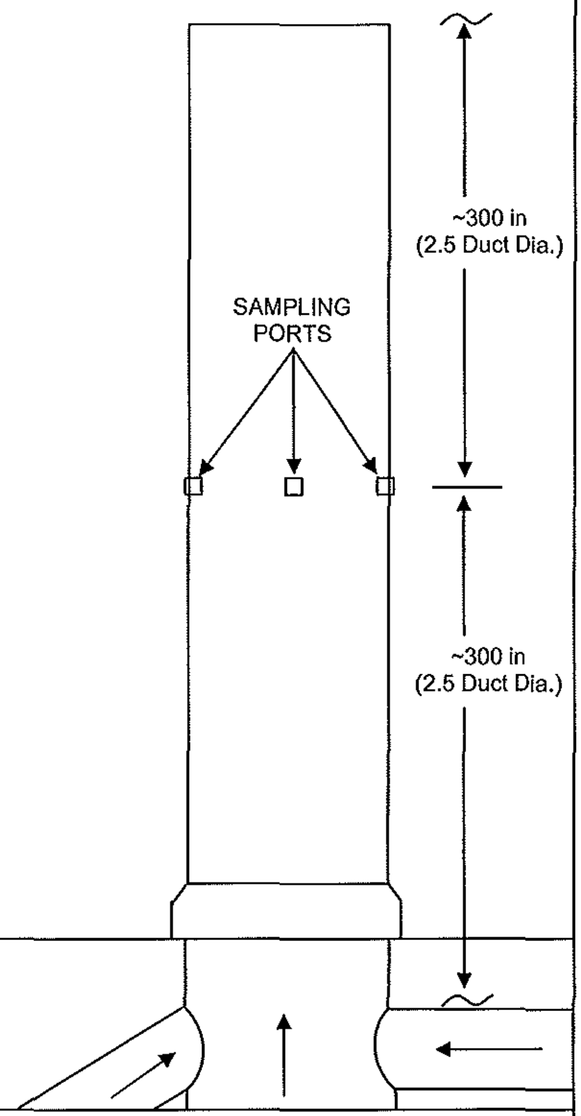
Last Revision: April 16, 2014

* REPRESENTS STACKS FROM EU-TOPCOAT2 (SVST-PS-040) and

EU-TOPCOAT3 (SVST-PS-089 and SVST-PS-091)



TRAVERSE POINT	DISTANCE FROM STACK WALL (INCHES)
6	42.7
5	30.0
4	21.2
3	14.2
2	8.0
1	2.5



	DISTANCE FROM PORTS TO NEAREST UPSTREAM BEND/ DISTURBANCE	DISTANCE FROM PORTS TO NEAREST DOWNSTREAM BEND/DISTURBANCE
Topcoat EU-TOPCOAT2 and 3 Spray-booth Stacks	~300 INCHES (~2.5 DIAMETERS)	~300 INCHES (~2.5 DIAMETERS)

Figure 2
EU-TOPCOAT2 and EU-TOPCOAT3 (120 inch Stack Diameter) Topcoat Spraybooth Exhaust Sampling Ports and Traverse Point Locations

BUREAU VERITAS

Chrysler Group LLC
Jefferson North Assembly Plant
Detroit, Michigan

Project No. 11014-000011.00

Last Revision: April 16, 2014

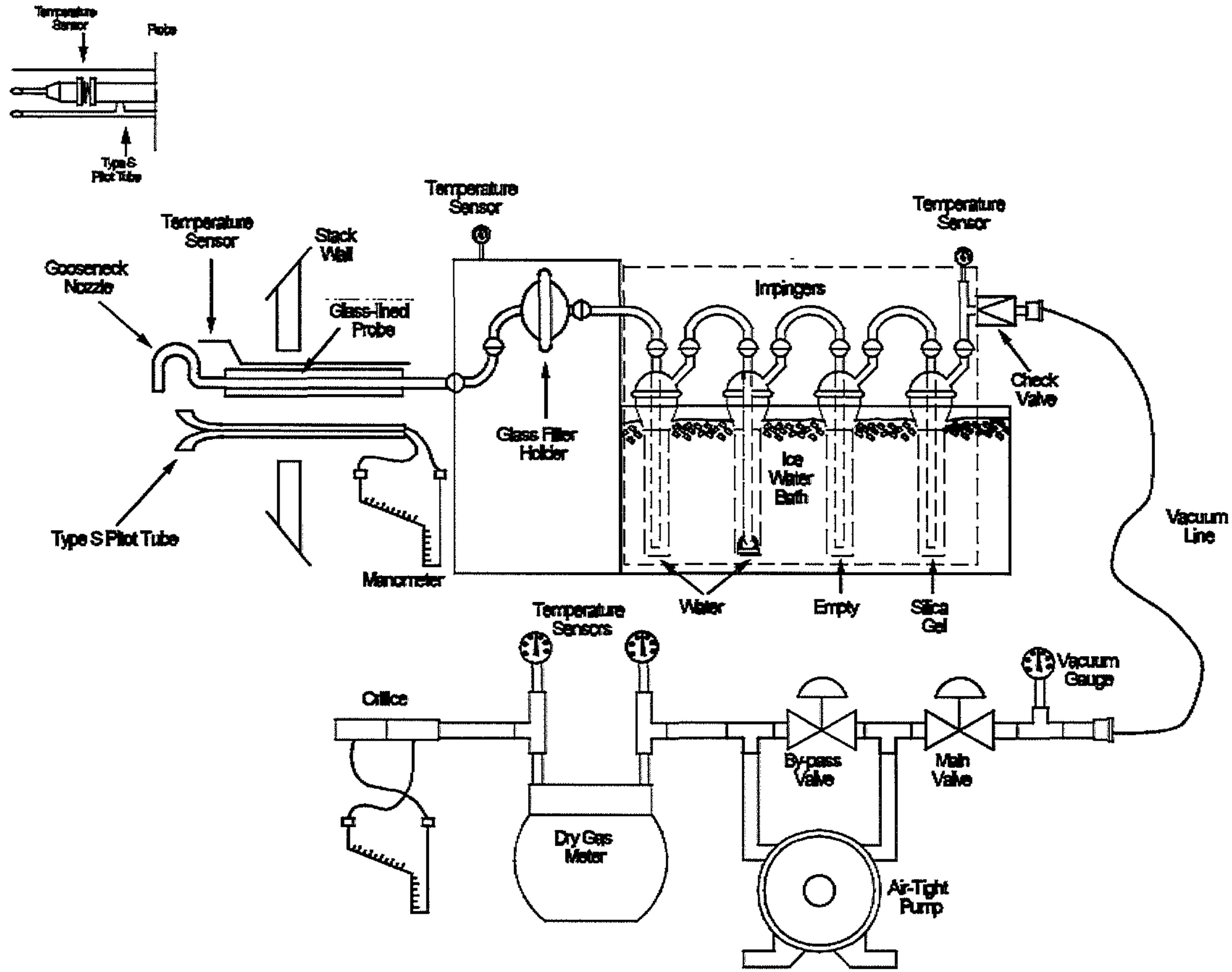


Figure 3 USEPA Method 5 Sampling Train	BUREAU VERITAS	Chrysler Group LLC Jefferson North Assembly Plant Detroit, Michigan
		Project No. 11014-000011.00 — Last Revision: April 16, 2014