

FINAL REPORT



FORD MOTOR COMPANY

DEARBORN, MICHIGAN

DEARBORN TRUCK PLANT (DTP): PARTICULATE MATTER TESTING REPORT

RWDI #2305533

December 1, 2023

SUBMITTED TO

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) was retained by Ford Motor Company (Ford) to complete the emission sampling program at their Dearborn Truck Plant (DTP) located 3001 Miller Road, Dearborn, Michigan. DTP operates an automobile assembly plant which produces the F-150. Testing was executed as required by Permit to Install A8648-2022 and MI-ROP-A8648-2002 following the test plan attached in **Appendix F**.

The approved Source Testing Plan covered the following six (6) sources:

- Basecoat Robots E2 (Stack 27);
- Basecoat Robots E1 (Stack 28);
- Prime (Stack 32);
- Clearcoat Cut-in Robots E1 (Stack 42);
- Clearcoat Cut-in Robots E2 (Stack 45); and
- Clearcoat Observation (Stack 47).

Table i: Average Emission Data – Particulate Testing

Source	Parameter	Emission Rate
		Average
Basecoat Robots – E2 Stack 27	PM (lb/hr)	0.16
	PM (lb/1,000 lbs wet)	0.0010
	PM (gr/dscf)	5.29x10 ⁻⁴
	PM (gr/1000 dscf)	0.529
	PM (lb/vehicle)	0.0057
Basecoat Robots – E1 Stack 28	PM (lb/hr)	0.20
	PM (lb/1,000 lbs wet)	0.0012
	PM (gr/dscf)	6.1x10 ⁻⁴
	PM (gr/1000 dscf)	0.61
	PM (lb/vehicle)	0.0060
Prime Stack 32	PM (lb/hr)	0.15
	PM (lb/1,000 lbs wet)	0.0010
	PM (gr/dscf)	5.53x10 ⁻⁴
	PM (gr/1000 dscf)	0.553
	PM (lb/vehicle)	0.0029
Clearcoat Cut-in Robots – E1 Stack 42	PM (lb/hr)	0.30
	PM (lb/1,000 lbs wet)	0.0011
	PM (gr/dscf)	5.91x10 ⁻⁴
	PM (gr/1000 dscf)	0.591
	PM (lb/vehicle)	0.0097
Clearcoat Cut-in Robots – E2 Stack 45	PM (lb/hr)	0.23
	PM (lb/1,000 lbs wet)	0.0007
	PM (gr/dscf)	3.9x10 ⁻⁴
	PM (gr/1000 dscf)	0.387
	PM (lb/vehicle)	0.0074
Clearcoat Observation Stack 47	PM (lb/hr)	0.15
	PM (lb/1,000 lbs wet)	0.0010
	PM (gr/dscf)	5.06x10 ⁻⁴
	PM (gr/1000 dscf)	0.506
	PM (lb/vehicle)	0.0058



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1.4 Personnel Involved in Testing

Table 1.4.1: Summary of Testing Personnel

Name	Title & Affiliation	Address	Contact Number
Ms. Susan Hicks	Senior Environmental Engineer Ford Motor Company	290 Town Center Drive Dearborn, MI 48126	313.570.1328
Mr. Andrew Riley	EGL E AQD	Cadillac Place 3058 West Grand Boulevard, Suite 2-300 Detroit, MI 48202	586.565.7379
Mr. Brad Bergeron	Senior Project Manager RWDI USA LLC	2239 Star Court Rochester Hills, MI 48309	519.817.9888
Mr. Steve Smith	Project Manager RWDI USA LLC		734.751.9701
Mr. Mason Sakshaug	Senior Scientist – Supervisor RWDI USA LLC		248.841.8442
Mr. Ben Durham	Senior Field Technician RWDI USA LLC		
Mr. Mike Nummer	Senior Field Technician RWDI USA LLC		
Mr. David Trahan	Senior Field Technician RWDI USA LLC		
Ms. Kate Strang	Field Technician RWDI USA LLC		
Mr. Cade Smith	Field Technician RWDI USA LLC		



2 SUMMARY OF RESULTS

2.1 Operating Data

Ford personnel made sure the sources were operating correctly and production was at acceptable capacity.

2.2 Applicable Permit Number

MI-ROP-A8648-2002

3 SOURCE DESCRIPTION

3.1 Description of Process and Emission Control Equipment

See 1.3 for further description of the process.

3.2 Process Flow Sheet or Diagram (if applicable)

A process flowsheet can be obtained upon request.

3.3 Type and Quantity of Raw and Finished Materials

Top/basecoat color paints, protective coatings, and electro deposition primer.

3.4 Normal Rated Capacity of Process

The plant operates at a maximum of 60 jobs per hour.

3.5 Process Instrumentation Monitored During the Test

For all sources, production counts processed during each test are included. This process data can be found in **Appendix A**.



4 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Description of Sampling Train and Field Procedures

The following section provides brief descriptions of the sampling methods and discusses any modifications to the reference test methods that were completed with the testing.

- **Method 1** – Sample and Velocity Traverses for Stationary Sources
- **Method 2** – Determination of Stack Gas Velocity and Volumetric Flowrate
- **Method 3** – Determination of Molecular Weight of Dry Stack Gases (fyrite)
- **Method 4** – Determination of Moisture Content in Stack Gases
- **Method 5** – Determination of Particulate Matter from Stationary Sources

4.1.1 USEPA Method 1 - *“Sample and Velocity Traverses for Stationary Sources”*

USEPA Method 1 is used in the selection of sampling ports and traverse points at which sampling for air pollutants will be performed, based on diameter, upstream, and downstream disturbances. The stack is divided into a determined number of equally sized areas, and sampling points are located within each area.

4.1.2 USEPA Method 2 - *“Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)”*

USEPA Method 2 is used for the determination of the average velocity and the volumetric flow rate of a gas stream. Velocity measurements were taken with a pre-calibrated S-Type pitot tube and incline manometer. Temperature measurements were made simultaneously with the velocity measurements and were conducted using a chromel-alumel type “k” thermocouple in conjunction with a digital temperature indicator at each point as determined by USEPA Method 1.

A cyclonic verification check is done prior to testing to verify cyclicity is absent from the flow. The average absolute value of all points measure must be at or below 20 degrees for the flow measurements to be valid at the designated sampling point. The average absolute value of the angle of flow for all sampling points was at or below 20 degrees, so the sampling location is not considered cyclonic.



4.1.3 USEPA Method 3A – “Gas Analysis for the Determination of Dry Molecular Weight”

USEPA Method 3A is an instrumental test method used to measure the concentration of oxygen and carbon dioxide in stack gases where the stack gas is continuously sampled by the CEMS. CO₂, and O₂ concentrations were determined utilizing RWDI's continuous emissions monitoring (CEM) system. Prior to testing, a 3-point analyzer calibration error check was conducted using USEPA protocol gases. The calibration error check was performed by introducing zero, mid and high-level calibration gases directly into the analyzer. The calibration error check was performed to confirm that the analyzer response is within $\pm 2\%$ of the certified calibration gas introduced. Prior to each test run, a system-bias test was performed where known concentrations of calibration gases were introduced at the probe tip to measure if the analyzers response was within $\pm 5\%$ of the introduced calibration gas concentrations. At the conclusion of each test run a system-bias check was performed to evaluate the percent drift from pre and post-test system bias checks. The system bias checks were used to confirm that the analyzer did not drift greater than $\pm 3\%$ throughout a test run.

Zero and upscale calibration checks were conducted both before and after each test run in order to quantify measurement system calibration drift and sampling system bias. Upscale is either the mid- or high-range gas, whichever most closely approximates the flue gas level. During these checks, the calibration gases were introduced into the sampling so that the calibration gases were analyzed in the same manner as the flue gas samples.

A gas sample was captured from the stack in an airtight, non-reactive tedlar bag and delivered to the gas analyzer, which measure the diluent concentrations in the gas. The analyzers were calibrated on-site using EPA Protocol No. 1 certified calibration mixtures. Before entering the analyzer, the gas sample passed directly into a refrigerated condenser, which cools the gas to approximately 35°F to remove the stack gas moisture. After passing through the condenser, the dry gas entered a Teflon-head diaphragm pump and a flow control panel, which delivered the gas in series to the analyzer. The analyzer measured the gas concentration on a dry volumetric basis.

4.1.4 USEPA Method 4 – “Determination of Moisture Content in Stack Gases”

USEPA Method 4 is used to determine the moisture content of stack gas. Moisture is determined via direct condensation. In the case of determining moisture content during an isokinetic test, a gas sample is drawn through a probe and filter, then through a series of impingers (impinger type and contents vary depending on the isokinetic method) and dropped to a temperature below 68° Fahrenheit to ensure all moisture is removed from the sample. The impingers are analyzed gravimetrically pre and post test to determine total moisture gain. Moisture content is then calculated based on moisture gain and total sample volume passed through the impingers.



4.1.5 USEPA Method 5 – “Sampling for Particulate Matter”

Particulate matter (PM) was sampled following procedures outlined in USEPA Method 5 with an unheated probe and filter to keep stack temperatures under 85°F. The sample is drawn from the stack isokinetically. Following each test, a leak check was performed, and the samples were recovered following USEPA Method 5.

4.2 Description of Recovery and Analytical Procedures

Recoveries followed USEPA Method 5 and 202 for applicable sources.

4.3 Sampling Port Description

Table 4.3.1: Summary of Stack Characteristics

Source	Parameter	Diameter	Number of Ports	Points per Traverse	Total Points per Test	Average Stack Temperature
Basecoat Robots - E2 - Stack 27	PM	75"	2	12	24 PM/Flow	72°F
Basecoat Robots - E1 - Stack 28	PM	75"	2	12	24 PM/Flow	72°F
Prime Stack 32	PM	81.75"	2	12	24 PM/Flow	72°F
Clearcoat Cut-in Robots - E1 Stack 42	PM	89"	2	12	24 PM/Flow	72°F
Clearcoat Cut-in Robots - E2 Stack 45	PM	89.75"	2	12	24 PM/Flow	70°F
Clearcoat Observation Stack 47	PM	59.25"	2	12	24 PM/Flow	72°F



5 TEST RESULTS AND DISCUSSION

5.1 Detailed Results

Table 5.1.1: Average Emission Data – Particulate Testing

Source	Parameter	Emission Rate
		Average
Basecoat Robots – E2 Stack 27	PM (lb/hr)	0.16
	PM (lb/1,000 lbs wet)	0.0010
	PM (gr/dscf)	5.29x10 ⁻⁴
	PM (gr/1000 dscf)	0.529
	PM (lb/vehicle)	0.0057
Basecoat Robots – E1 Stack 28	PM (lb/hr)	0.20
	PM (lb/1,000 lbs wet)	0.0012
	PM (gr/dscf)	6.1x10 ⁻⁴
	PM (gr/1000 dscf)	0.61
	PM (lb/vehicle)	0.0060
Prime Stack 32	PM (lb/hr)	0.15
	PM (lb/1,000 lbs wet)	0.0010
	PM (gr/dscf)	5.53x10 ⁻⁴
	PM (gr/1000 dscf)	0.553
	PM (lb/vehicle)	0.0029
Clearcoat Cut-in Robots – E1 Stack 42	PM (lb/hr)	0.30
	PM (lb/1,000 lbs wet)	0.0011
	PM (gr/dscf)	5.91x10 ⁻⁴
	PM (gr/1000 dscf)	0.591
	PM (lb/vehicle)	0.0097
Clearcoat Cut-in Robots – E2 Stack 45	PM (lb/hr)	0.23
	PM (lb/1,000 lbs wet)	0.0007
	PM (gr/dscf)	3.9x10 ⁻⁴
	PM (gr/1000 dscf)	0.387
	PM (lb/vehicle)	0.0074
Clearcoat Observation Stack 47	PM (lb/hr)	0.15
	PM (lb/1,000 lbs wet)	0.0010
	PM (gr/dscf)	5.06x10 ⁻⁴
	PM (gr/1000 dscf)	0.506
	PM (lb/vehicle)	0.0058



5.1.1 Discussion of Results

Detailed results can be found in **Appendix B**.

5.2 Variations in Testing Procedures

Due to cyclonic flow conditions, Prime Stack 20 was changed to 32.

5.3 Process Upset Conditions During Testing

There were normal process breaks during production.

5.4 Maintenance Performed in Last Three Months

There has been no maintenance in the last three months.

5.5 Re-Test

This was not a retest.

5.6 Audit Samples

This test did not require any audit samples.

5.7 Field Data Sheets

Field data sheets can be found in **Appendix B**.

5.8 Calibration Sheets

Calibration sheets can be found in **Appendix C**.

5.9 Sample Calculations

Sample calculations can be found in **Appendix D**.

5.10 Laboratory Data

Laboratory data can be found in **Appendix E**.

TABLES

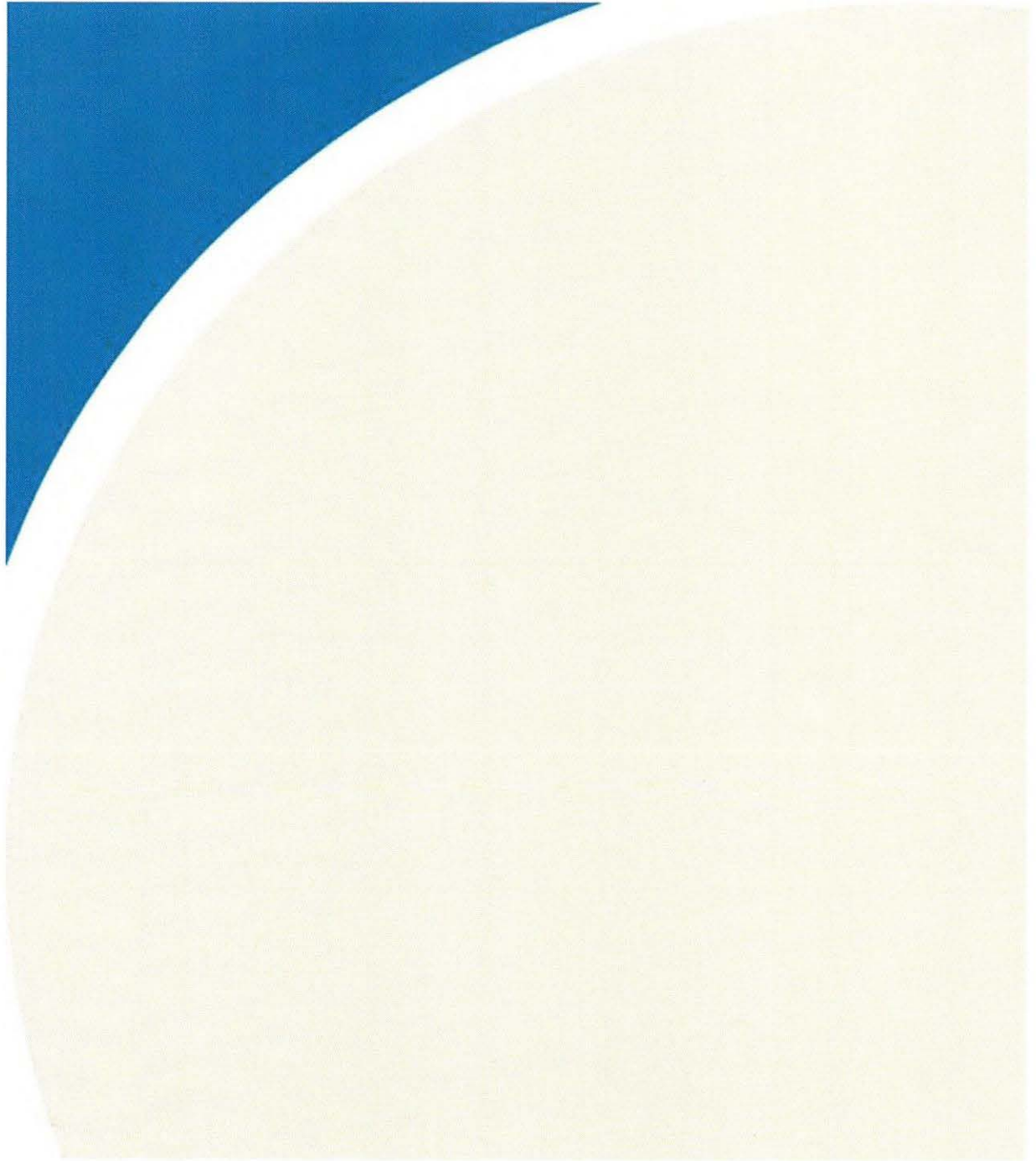


Table 1: Summary of Sampling Parameters and Methodology

Source Location	No. of Tests per Stack	Sampling Parameter	Sampling Method
Stack 27 Basecoat Robot E2	3	Velocity, Temperature and Flow Rate	U.S. EPA ^[1] Methods 1, 2, and 4
	3	Particulate	U.S. EPA ^[1] Method 5
	3	Oxygen / Carbon Dioxide	U.S. EPA ^[1] Method 3/3A
Stack 28 Basecoat Robot E1	3	Velocity, Temperature and Flow Rate	U.S. EPA ^[1] Methods 1, 2, and 4
	3	Particulate	U.S. EPA ^[1] Method 5
	3	Oxygen / Carbon Dioxide	U.S. EPA ^[1] Method 3/3A
Stack 32 Prime	3	Velocity, Temperature and Flow Rate	U.S. EPA ^[1] Methods 1, 2, and 4
	3	Particulate	U.S. EPA ^[1] Method 5
	3	Oxygen / Carbon Dioxide	U.S. EPA ^[1] Method 3/3A
Stack 42 Clearcoat Robot E1	3	Velocity, Temperature and Flow Rate	U.S. EPA ^[1] Methods 1, 2, and 4
	3	Particulate	U.S. EPA ^[1] Method 5
	3	Oxygen / Carbon Dioxide	U.S. EPA ^[1] Method 3/3A
Stack 45 Clearcoat Robot E2	3	Velocity, Temperature and Flow Rate	U.S. EPA ^[1] Methods 1, 2, and 4
	3	Particulate	U.S. EPA ^[1] Method 5
	3	Oxygen / Carbon Dioxide	U.S. EPA ^[1] Method 3/3A
Stack 47 Clearcoat Observation	3	Velocity, Temperature and Flow Rate	U.S. EPA ^[1] Methods 1, 2, and 4
	3	Particulate	U.S. EPA ^[1] Method 5
	3	Oxygen / Carbon Dioxide	U.S. EPA ^[1] Method 3/3A

Notes:

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

Table 2: Sampling Summary and Sample Log

Source and Test #	Sampling Date	Start Time	End Time	Filter ID / Trap ID
Stack 27 - Velocity / Total Particulate				
Blank	5-Oct-23	-	-	E-276
Test #1	3-Oct-23	6:52 AM	10:41 AM	A-334
Test #2	3-Oct-23	12:17 PM	3:20 PM	E-248
Test #3	4-Oct-23	6:50 AM	10:24 AM	E-251
Stack 28 - Velocity / Total Particulate				
Blank	5-Oct-23	-	-	E-276
Test #1	3-Oct-23	6:51 AM	10:33 AM	A-350
Test #2	3-Oct-23	12:18 PM	3:22 PM	E-293
Test #3	4-Oct-23	6:49 AM	10:28 AM	E-292
Stack 32 - Velocity / Total Particulate				
Blank	5-Oct-23	-	-	E-276
Test #1	4-Oct-23	12:14 PM	3:34 PM	E-259
Test #2	5-Oct-23	6:48 AM	10:02 AM	E-260
Test #3	5-Oct-23	10:27 AM	2:08 PM	E-262
Stack 42 - Velocity / Total Particulate				
Blank	5-Oct-23	-	-	E-276
Test #1	3-Oct-23	6:51 AM	10:06 AM	E-273
Test #2	3-Oct-23	12:17 PM	3:20 PM	E-242
Test #3	4-Oct-23	6:50 AM	10:34 AM	E-249
Stack 45 - Velocity / Total Particulate				
Blank	5-Oct-23	-	-	E-276
Test #1	4-Oct-23	12:15 PM	3:24 PM	E-258
Test #2	5-Oct-23	6:47 AM	10:19 AM	E-261
Test #3	5-Oct-23	10:41 AM	2:19 PM	E-275
Stack 47 - Velocity / Total Particulate				
Blank	5-Oct-23	-	-	E-276
Test #1	3-Oct-23	6:51 AM	10:06 AM	E-274
Test #2	3-Oct-23	12:17 PM	3:20 PM	E-241
Test #3	4-Oct-23	6:50 AM	10:31 AM	E-250

Table 3A: Sampling Summary - Flow Characteristics - Stack 27

Stack Gas Parameter		Test No. 1	Test No. 1	Test No. 3	Average
		Particulate	Particulate	Particulate	
Testing Date		3-Oct-23	3-Oct-23	4-Oct-23	
Stack Temperature	°F	72	73	72	72
Moisture	%	2.0%	2.3%	1.7%	2.0%
Velocity	ft/s	20.2	19.7	19.5	19.8
Referenced Flow Rate	CFM	35,687	34,597	34,425	34,903
Oxygen	%	21.1	21.1	21.1	21.1
Carbon Dioxide	%	0.0	0.0	0.0	0.0
Sampling Isokinetic Rate	%	100.0	100.3	100.0	100.1

Notes:

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

Table 3B: Sampling Summary - Flow Characteristics - Stack 28

Stack Gas Parameter		Test No. 1 Particulate	Test No. 1 Particulate	Test No. 3 Particulate	Average
Testing Date		3-Oct-23	3-Oct-23	4-Oct-23	
Stack Temperature	°F	71	73	71	72
Moisture	%	2.0%	2.4%	2.7%	2.4%
Velocity	ft/s	22.7	21.8	19.2	21.2
Referenced Flow Rate	CFM	40,061	38,220	33,690	37,324
Oxygen	%	21.1	21.1	21.1	21.1
Carbon Dioxide	%	0.0	0.0	0.0	0.0
Sampling Isokinetic Rate	%	100.7	99.7	99.7	100.0

Notes:

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

Table 3C: Sampling Summary - Flow Characteristics - Stack 32

Stack Gas Parameter		Test No. 1	Test No. 1	Test No. 3	Average
		Particulate	Particulate	Particulate	
Testing Date		4-Oct-23	5-Oct-23	5-Oct-23	
Stack Temperature	°F	73	71	71	72
Moisture	%	2.5%	2.1%	2.4%	2.3%
Velocity	ft/s	14.5	15.1	16.4	15.3
Referenced Flow Rate	CFM	30,302	31,539	34,004	31,948
Oxygen	%	20.9	21.0	21.0	21.0
Carbon Dioxide	%	0.0	0.0	0.0	0.0
Sampling Isokinetic Rate	%	101.4	100.2	100.2	100.6

Notes:

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

Table 3D: Sampling Summary - Flow Characteristics - Stack 42

Stack Gas Parameter		Test No. 1	Test No. 1	Test No. 3	Average
		Particulate	Particulate	Particulate	
Testing Date		3-Oct-23	3-Oct-23	4-Oct-23	
Stack Temperature	°F	72	73	71	72
Moisture	%	2.4%	2.4%	2.3%	2.4%
Velocity	ft/s	23.8	23.2	22.7	23.2
Referenced Flow Rate	CFM	60,294	58,756	57,540	58,863
Oxygen	%	21.1	21.1	21.1	21.1
Carbon Dioxide	%	0.0	0.0	0.0	0.0
Sampling Isokinetic Rate	%	100.7	100.9	100.6	100.7

Notes:

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

Table 3E: Sampling Summary - Flow Characteristics - Stack 45

Stack Gas Parameter		Test No. 1	Test No. 1	Test No. 3	Average
		Particulate	Particulate	Particulate	
Testing Date		4-Oct-23	5-Oct-23	5-Oct-23	
Stack Temperature	°F	71	69	69	70
Moisture	%	2.1%	2.0%	2.3%	2.1%
Velocity	ft/s	26.8	26.3	27.0	26.7
Referenced Flow Rate	CFM	69,325	68,088	69,529	68,981
Oxygen	%	20.9	21.0	21.0	21.0
Carbon Dioxide	%	0.0	0.0	0.0	0.0
Sampling Isokinetic Rate	%	100.2	100.3	100.5	100.3

Notes:

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

Table 3F: Sampling Summary - Flow Characteristics - Stack 47

Stack Gas Parameter		Test No. 1	Test No. 1	Test No. 3	Average
		Particulate	Particulate	Particulate	
Testing Date		3-Oct-23	3-Oct-23	4-Oct-23	
Stack Temperature	°F	71	74	72	72
Moisture	%	2.1%	2.4%	2.0%	2.2%
Velocity	ft/s	32.4	31.7	32.0	32.0
Referenced Flow Rate	CFM	35,757	34,666	35,127	35,183
Oxygen	%	21.1	21.1	21.1	21.1
Carbon Dioxide	%	0.0	0.0	0.0	0.0
Sampling Isokinetic Rate	%	100.7	101.2	100.3	100.7

Notes:

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

Table 4: Summary of Particulate Results - Stack 27 Basecoat Robot E2

Company	Ford Dearborn			
Source	27 Basecoat Robot E2			
Date	3-Oct-23	3-Oct-23	4-Oct-23	--
Test Number	Test 1	Test 2	Test 3	Average
Start Time:	6:52	12:17	6:50	--
Stop Time:	10:41	15:20	10:24	--
Total Time (min):	229	183	214	
Stack Information				
Flow ft3 (Actual)	37,178	36,221	35,843	36,414
Flow ft3 (Standard Wet)	36,401	35,409	35,023	35,611
Flow ft3 (Standard Dry)	35,687	34,597	34,425	34,903
Flow m3 (Standard Dry)	1,011	980	975	988
Meter Info				
Isokinetic Variation I	100.0	100.3	100.0	100.1
Meter Pressure Pm ("Hg)	29.7	29.7	29.6	29.7
Meter Temperature Tm (F)	64.5	80.9	69.0	71.5
Measured Sample Volume Vm	151.95	152.42	148.25	150.87
Sample Volume (Vm St ft3)	151.34	147.18	145.90	148.14
Sample Volume (Vm St m3)	4.29	4.17	4.13	4.19
Total Weight of Sampled Gas (m g lbs) wet	11.43	11.14	11.00	11.19
Total Weight of Sampled Gas (m g lbs) dry	11.29	10.98	10.88	11.05
Gas Density Ps wet	0.07	0.07	0.07	0.07
Gas Density Ps dry	0.07	0.07	0.07	0.07
Condensate Volume	3.03	3.46	2.54	3.01
Nozzle Size	0.00072	0.00072	0.00072	0.00
Impinger Gain	42.3	45.2	27.3	38.3
Silica Gel Gain	22.0	28.1	26.5	25.5
Total Gas Sampled (vm st ft3 + condensate volume)	154.37	150.63	148.43	151.15
Particulate Results				
Nozzle/Probe/Filter Weight (mg)	4.2	5.5	5.5	5.1
Total Particulate (mg)	4.2	5.5	5.5	5.1
lb/hr	0.13	0.17	0.17	0.16
lb/1000 lb (wet)	0.00081	0.00109	0.00110	0.00100
lb/1000 lb (dry)	0.001	0.001	0.001	0.001
mg/dscm (dry)	0.980	1.320	1.331	1.210
gr/dscf	0.000428	0.000577	0.000582	0.000529
Vehicle Count per Test	100	88	99	96
Vehicle Count per Hour	26	29	28	28
lb / vehicle	0.0050	0.0059	0.0062	0.0057

Table 5: Summary of Particulate Results - Stack 28 Basecoat Robot E1

Company	Ford Dearborn			
Source	28 Basecoat Robot E1			
Date	3-Oct-23	3-Oct-23	4-Oct-23	
Test Number	Test 1	Test 2	Test 3	Average
Start Time:	6:51	12:18	6:49	--
Stop Time:	10:33	15:22	10:28	--
Total Duration (min):	222	184	219	--
Stack Information				
Flow ft3 (Actual)	41,701	40,069	35,399	39,056
Flow ft3 (Standard Wet)	40,899	39,180	34,623	38,234
Flow ft3 (Standard Dry)	40,061	38,220	33,690	37,324
Flow m3 (Standard Dry)	1,134	1,082	954	1,057
Percent Moisture	2.0	2.4	2.7	2.4
Pressure Ps ("Hg)	29.53	29.53	29.44	29.50
Average Stack Temperature Ts (F)	71.4	73.0	71.2	71.9
Molecular Weight of Stack Gas dry (Md)	28.86	28.85	28.85	28.86
Molecular Weight of Stack Gas wet (Ms)	28.64	28.59	28.56	28.60
Stack Gas Specific Gravity (Gs)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction	0.0	0.0	0.0	0.0
Average Stack Velocity Vs (ft/sec)	22.7	21.8	19.2	21.2
Area of Stack (ft2)	30.7	30.7	30.7	30.7
Percent Carbon Dioxide	0.1	0.1	0.1	0.1
Percent Oxygen	21.1	21.1	21.1	21.1
Percent Carbon Monoxide	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location	--	--	--	--
Meter Info				
Isokinetic Variation I	100.7	99.7	99.7	100.1
Meter Pressure Pm ("Hg)	29.7	29.7	29.6	29.7
Meter Temperature Tm (F)	68.1	82.2	72.2	74.2
Measured Sample Volume Vm	162.29	157.39	136.86	152.18
Sample Volume (Vm St ft3)	162.74	153.63	135.52	150.63
Sample Volume (Vm St m3)	4.61	4.35	3.84	4.27
Total Weight of Sampled Gas (m g lbs) wet	12.30	11.64	10.28	11.40
Total Weight of Sampled Gas (m g lbs) dry	12.14	11.46	10.11	11.23
Gas Density Ps wet	0.07	0.07	0.07	0.07
Gas Density Ps dry	0.07	0.07	0.07	0.07
Condensate Volume	3.40	3.86	3.75	3.67
Nozzle Size	0.00069	0.00069	0.00069	0.00
Impinger Gain	49.7	52.1	50.8	50.9
Silica Gel Gain	22.5	29.7	28.8	27.0
Total Gas Sampled (vm st ft3 + condensate volume)	166.15	157.49	139.27	154.30
Particulate Results				
Nozzle/Probe/Filter Weight (mg)	6.0	6.0	5.8	5.9
Total Particulate (mg)	6.0	6.0	5.8	5.9
lb/hr	0.20	0.20	0.19	0.20
lb/1000 lb (wet)	0.0011	0.0011	0.0012	0.0012
lb/1000 lb (dry)	0.0011	0.0012	0.0013	0.0012
mg/dscm (dry)	1.30	1.38	1.51	1.40
gr/dscf	0.00057	0.00060	0.00066	0.00061
Vehicle Count per Test	117	109	110	112
Vehicle Count per Hour	32	36	30	32
lb / vehicle	0.0062	0.0056	0.0064	0.0060

Table 6: Summary of Particulate Results - Stack 32 Prime

Company	Ford Dearborn			
Source	32 Prime			
Date	4-Oct-23	5-Oct-23	5-Oct-23	
Test Number	Test 1	Test 2	Test 3	Average
Start Time:	12:14	6:48	10:27	--
Stop Time:	15:34	10:02	14:08	--
Total Duration (min):	200	194	221	--
Stack Information				
Flow ft3 (Actual)	31,785	33,077	35,769	33,543
Flow ft3 (Standard Wet)	31,063	32,227	34,852	32,714
Flow ft3 (Standard Dry)	30,302	31,539	34,004	31,948
Flow m3 (Standard Dry)	858	893	963	905
Percent Moisture	2.5	2.1	2.4	2.3
Pressure Ps ("Hg)	29.52	29.32	29.32	29.38
Average Stack Temperature Ts (F)	73.0	71.0	71.0	71.7
Molecular Weight of Stack Gas dry (Md)	28.84	28.86	28.85	28.85
Molecular Weight of Stack Gas wet (Ms)	28.58	28.63	28.59	28.60
Stack Gas Specific Gravity (Gs)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction	0.0	0.0	0.0	0.0
Average Stack Velocity Vs (ft/sec)	14.5	15.1	16.4	15.3
Area of Stack (ft2)	36.5	36.5	36.5	36.5
Percent Carbon Dioxide	0.1	0.1	0.1	0.1
Percent Oxygen	20.9	21.0	21.0	21.0
Percent Carbon Monoxide	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location	--	--	--	--
Meter Info				
Isokinetic Variation I	101.4	100.2	100.2	100.6
Meter Pressure Pm ("Hg)	29.6	29.4	29.4	29.5
Meter Temperature Tm (F)	78.1	67.0	67.8	71.0
Measured Sample Volume Vm	113.24	114.84	123.84	117.31
Sample Volume (Vm St ft3)	111.08	114.25	123.09	116.14
Sample Volume (Vm St m3)	3.15	3.24	3.49	3.29
Total Weight of Sampled Gas (m g lbs) wet	8.41	8.64	9.32	8.79
Total Weight of Sampled Gas (m g lbs) dry	8.28	8.52	9.18	8.66
Gas Density Ps wet	0.07	0.07	0.07	0.07
Gas Density Ps dry	0.07	0.07	0.07	0.07
Condensate Volume	2.79	2.49	3.07	2.78
Nozzle Size	0.00072	0.00072	0.00072	0.00
Impinger Gain	34.2	31.5	38.1	34.6
Silica Gel Gain	25.0	21.3	27.0	24.4
Total Gas Sampled (vm st ft3 + condensate volume)	113.87	116.74	126.16	118.92
Particulate Results				
Nozzle/Probe/Filter Weight (mg)	5.5	3.2	3.7	4.1
Total Particulate (mg)	5.5	3.2	3.7	4.1
lb/hr	0.199	0.117	0.136	0.151
lb/1000 lb (wet)	0.00144	0.00082	0.00087	0.00104
lb/1000 lb (dry)	0.00146	0.00083	0.00089	0.00106
mg/dscm (dry)	1.75	0.99	1.06	1.27
gr/dscf	0.000764	0.000432	0.000464	0.000553
mg/acm	1.67	0.95	1.01	1.21
Vehicle Count per Test	165	164	205	178
Vehicle Count per Hour	50	51	56	52
lb / vehicle	0.0040	0.0023	0.0024	0.0029

Table 7: Summary of Particulate Results - Stack 42 Clearcoat Robot E1

Company	Ford Dearborn			
Source	42 E1 Clearcoat			
Date	3-Oct-23	3-Oct-23	4-Oct-23	
Test Number	Test 1	Test 2	Test 3	Average
Start Time:	6:51	12:17	6:50	--
Stop Time:	10:06	15:20	10:34	--
Test Duration (min):	195	183	224	--
Stack Information				
Flow ft3 (Actual)	61,688	60,191	58,818	60,232
Flow ft3 (Standard Wet)	61,795	60,192	58,883	60,290
Flow ft3 (Standard Dry)	60,294	58,756	57,540	58,863
Flow m3 (Standard Dry)	1,707	1,664	1,629	1,667
Percent Moisture	2.4	2.4	2.3	2.4
Pressure Ps ("Hg)	30.21	30.21	30.12	30.18
Average Stack Temperature Ts (F)	72.3	73.2	71.0	72.1
Molecular Weight of Stack Gas dry (Md)	28.86	28.85	28.85	28.85
Molecular Weight of Stack Gas wet (Ms)	28.59	28.60	28.61	28.60
Stack Gas Specific Gravity (Gs)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction	0.0	0.0	0.0	0.0
Average Stack Velocity Vs (ft/sec)	23.8	23.2	22.7	23.2
Area of Stack (ft2)	43.2	43.2	43.2	43.2
Percent Carbon Dioxide	0.1	0.1	0.1	0.1
Percent Oxygen	21.1	21.1	21.1	21.1
Percent Carbon Monoxide	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location	-	-	-	-
Meter Info				
Isokinetic Variation I	100.7	100.9	100.6	100.7
Meter Pressure Pm ("Hg)	30.3	30.3	30.2	30.3
Meter Temperature Tm (F)	65.7	81.3	70.4	72.5
Measured Sample Volume Vm	134.18	134.84	129.41	132.81
Sample Volume (Vm St ft3)	139.56	136.20	132.96	136.24
Sample Volume (Vm St m3)	3.95	3.86	3.77	3.86
Total Weight of Sampled Gas (m g lbs) wet	10.57	10.31	10.06	10.31
Total Weight of Sampled Gas (m g lbs) dry	10.41	10.16	9.92	10.16
Gas Density Ps wet	0.07	0.07	0.07	0.07
Gas Density Ps dry	0.07	0.07	0.07	0.07
Condensate Volume	3.47	3.33	3.10	3.30
Nozzle Size	0.00055	0.00055	0.00055	0.00
Impinger Gain	42.8	43.0	42.5	42.8
Silica Gel Gain	30.9	27.6	23.3	27.3
Total Gas Sampled (vm st ft3 + condensate volume)	143.04	139.53	136.06	139.54
Particulate Results				
Nozzle/Probe/Filter Weight (mg)	6.7	4.9	4.1	5.2
Total Particulate (mg)	6.7	4.9	4.1	5.2
lb/hr	0.38	0.28	0.24	0.30
lb/1000 lb (wet)	0.0014	0.0010	0.0009	0.0011
lb/1000 lb (dry)	0.0014	0.0011	0.0009	0.0011
mg/dscm (dry)	1.70	1.27	1.09	1.35
gr/dscf	0.00074	0.00056	0.00048	0.00059
Vehicle Count per Test	101	97	111	103
Vehicle Count per Hour	31	32	30	31
lb / vehicle	0.0124	0.0088	0.0079	0.0097

Table 8: Summary of Particulate Results - Stack 45 Clearcoat Robot E2

Company	Ford Dearborn			
Source	45 E2 Clearcoat			
Date	4-Oct-23	5-Oct-23	5-Oct-23	
Test Number	Test 1	Test 2	Test 3	Average
Start Time:	12:15	6:47	10:41	--
Stop Time:	15:24	10:19	14:19	--
Total Duration (min):	189	212	218	--
Stack Information				
Flow ft3 (Actual)	70,717	69,433	71,115	70,422
Flow ft3 (Standard Wet)	70,816	69,508	71,167	70,497
Flow ft3 (Standard Dry)	69,325	68,088	69,529	68,981
Flow m3 (Standard Dry)	1,963	1,928	1,969	1,953
Meter Info				
Isokinetic Variation I	100.2	100.3	100.5	100.4
Meter Pressure Pm ("Hg)	30.3	30.2	30.2	30.2
Meter Temperature Tm (F)	79.9	68.7	70.2	72.9
Measured Sample Volume Vm	155.23	150.05	153.92	153.07
Sample Volume (Vm St ft3)	156.99	154.36	157.92	156.42
Sample Volume (Vm St m3)	4.45	4.37	4.47	4.43
Total Weight of Sampled Gas (m g lbs) wet	11.86	11.66	11.95	11.82
Total Weight of Sampled Gas (m g lbs) dry	11.70	11.51	11.78	11.66
Gas Density Ps wet	0.07	0.07	0.07	0.07
Gas Density Ps dry	0.07	0.07	0.07	0.07
Condensate Volume	3.38	3.22	3.72	3.44
Nozzle Size	0.00055	0.00055	0.00055	0.00
Impinger Gain	44.6	41.8	46.0	44.1
Silica Gel Gain	27.0	26.5	32.9	28.8
Total Gas Sampled (vm st ft3 + condensate volume)	160.37	157.58	161.64	159.86
Particulate Results				
Nozzle/Probe/Filter Weight (mg)	3.7	2.2	5.9	3.9
Total Particulate (mg)	3.7	2.2	5.9	3.9
lb/hr	0.217	0.129	0.345	0.230
lb/1000 lb (wet)	0.00069	0.00042	0.00109	0.00073
lb/1000 lb (dry)	0.00070	0.00042	0.00110	0.00074
mg/dscm (dry)	0.83	0.50	1.32	0.88
gr/dscf	0.00036	0.00022	0.00058	0.00039
mg/acm	0.821	0.496	1.297	0.871
Vehicle Count per Test	84	110	125	106
Vehicle Count per Hour	27	31	34	31
lb / vehicle	0.0081	0.0041	0.0100	0.0074

Table 9: Summary of Particulate Results - Stack 47 Clearcoat Observation

Company	Ford Dearborn			
Source	47 Clearcoat Obs			
Date	3-Oct-23	3-Oct-23	4-Oct-23	
Test Number	Test 1	Test 2	Test 3	Average
Start Time:	6:51	12:17	6:50	--
Stop Time:	10:06	15:20	10:31	--
Test Duration (min):	195	183	221	--
Stack Information				
Flow ft3 (Actual)	37,203	36,394	36,668	36,755
Flow ft3 (Standard Wet)	36,530	35,536	35,846	35,971
Flow ft3 (Standard Dry)	35,757	34,666	35,127	35,184
Flow m3 (Standard Dry)	1,013	982	995	996
Percent Moisture	2.1	2.4	2.0	2.2
Pressure Ps ("Hg)	29.54	29.54	29.45	29.51
Average Stack Temperature Ts (F)	70.9	73.9	71.6	72.2
Molecular Weight of Stack Gas dry (Md)	28.86	28.86	28.86	28.86
Molecular Weight of Stack Gas wet (Ms)	28.63	28.59	28.64	28.62
Stack Gas Specific Gravity (Gs)	1.0	1.0	1.0	1.0
Water Vapor Volume Fraction	0.0	0.0	0.0	0.0
Average Stack Velocity Vs (ft/sec)	32.4	31.7	31.9	32.0
Area of Stack (ft2)	19.1	19.1	19.1	19.1
Percent Carbon Dioxide	0.1	0.1	0.1	0.1
Percent Oxygen	21.1	21.1	21.1	21.1
Percent Carbon Monoxide	0.0	0.0	0.0	0.0
Percent Excess Air at Test Location	--	--	--	--
Meter Info				
Isokinetic Variation I	100.7	101.2	100.3	100.7
Meter Pressure Pm ("Hg)	29.7	29.7	29.6	29.6
Meter Temperature Tm (F)	67.3	81.4	71.7	73.4
Measured Sample Volume Vm	139.77	139.80	138.40	139.32
Sample Volume (Vm St ft3)	136.57	133.02	133.68	134.42
Sample Volume (Vm St m3)	3.87	3.77	3.79	3.81
Total Weight of Sampled Gas (m g lbs) wet	10.32	10.08	10.10	10.17
Total Weight of Sampled Gas (m g lbs) dry	10.19	9.92	9.97	10.03
Gas Density Ps wet	0.07	0.07	0.07	0.07
Gas Density Ps dry	0.07	0.07	0.07	0.07
Condensate Volume	2.95	3.34	2.73	3.01
Nozzle Size	0.00040	0.00040	0.00040	0.00
Impinger Gain	36.8	44.5	35.0	38.8
Silica Gel Gain	25.8	26.3	23.0	25.0
Total Gas Sampled (vm st ft3 + condensate volume)	139.52	136.35	136.41	137.43
Particulate Results				
Nozzle/Probe/Filter Weight (mg)	3.3	5.8	4.1	4.4
Total Particulate (mg)	3.3	5.8	4.1	4.4
lb/hr	0.115	0.201	0.143	0.153
lb/1000 lb (wet)	0.00070	0.00127	0.00090	0.00096
lb/1000 lb (dry)	0.0007	0.0013	0.0009	0.0010
mg/dscm (dry)	0.85	1.54	1.08	1.16
gr/dscf	0.00037	0.00067	0.00047	0.00051
Vehicle Count per Test	73	89	97	86
Vehicle Count per Hour	22	29	26	26
lb / vehicle	0.0051	0.0069	0.0054	0.0058

FIGURES





Figure No. 1

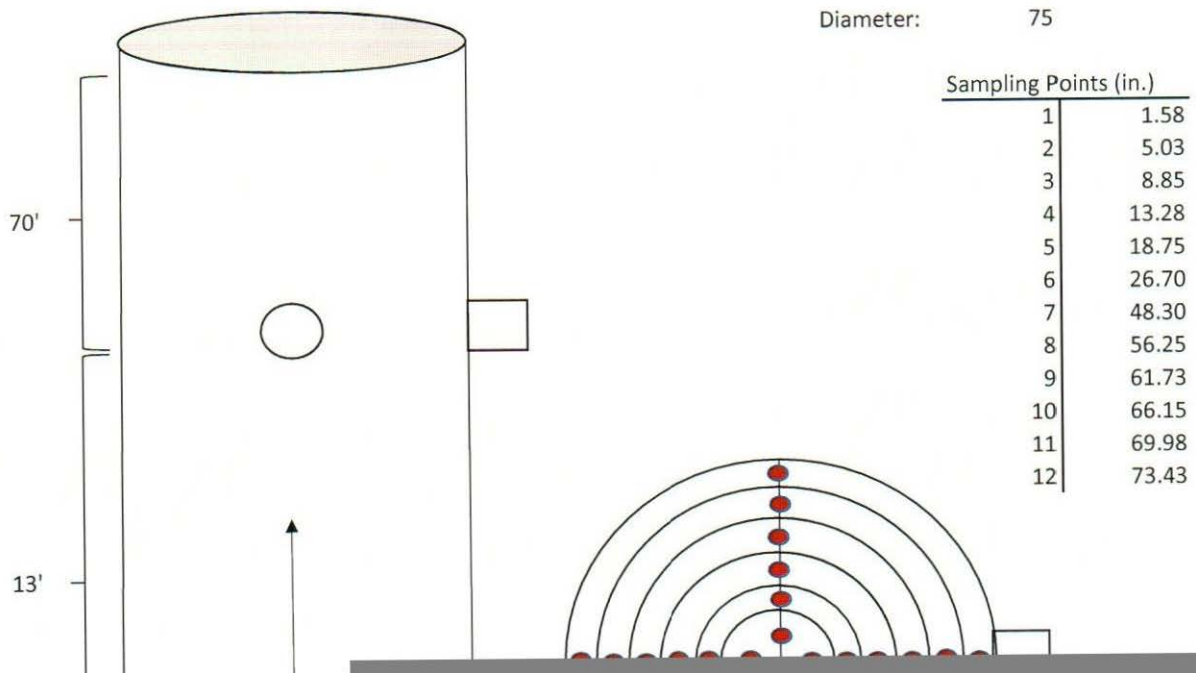
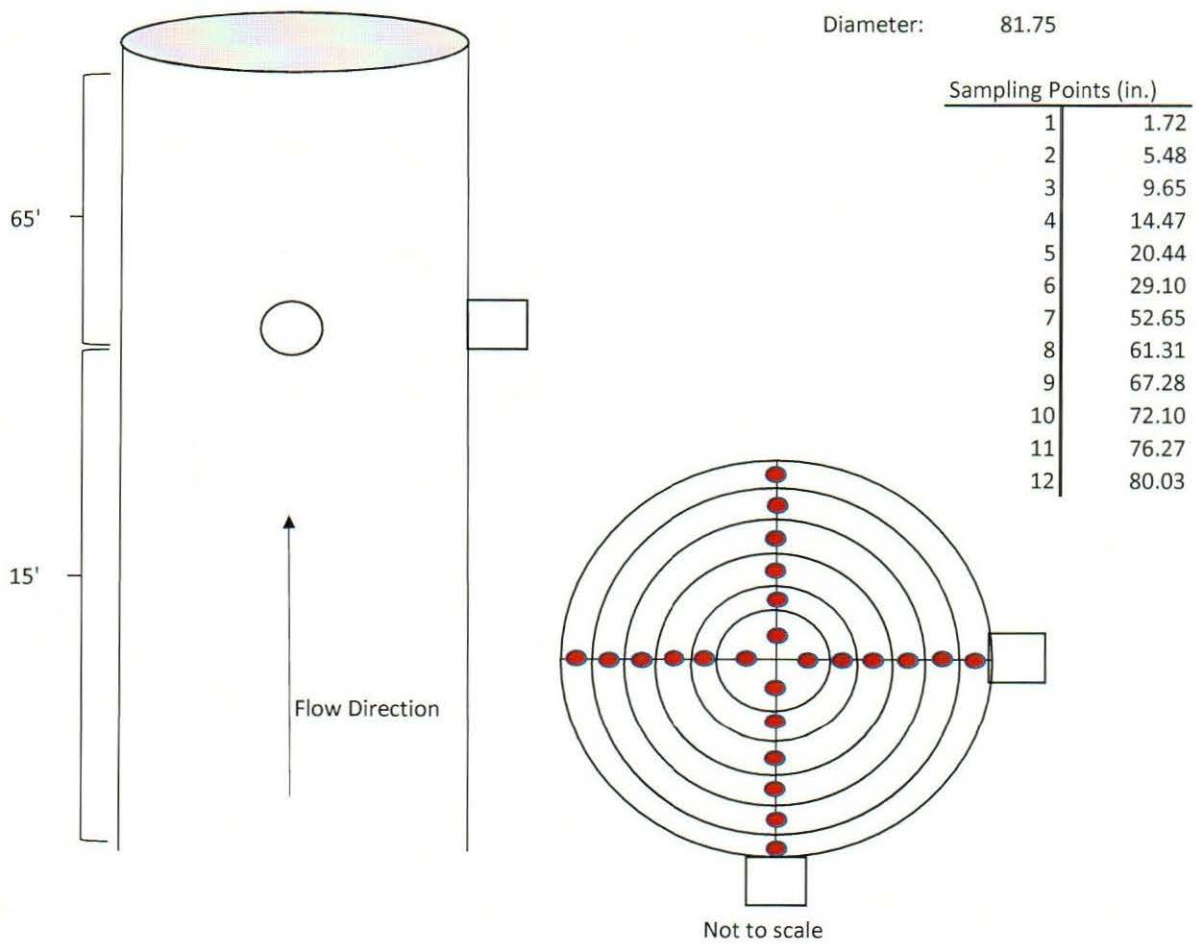




Figure No. 3



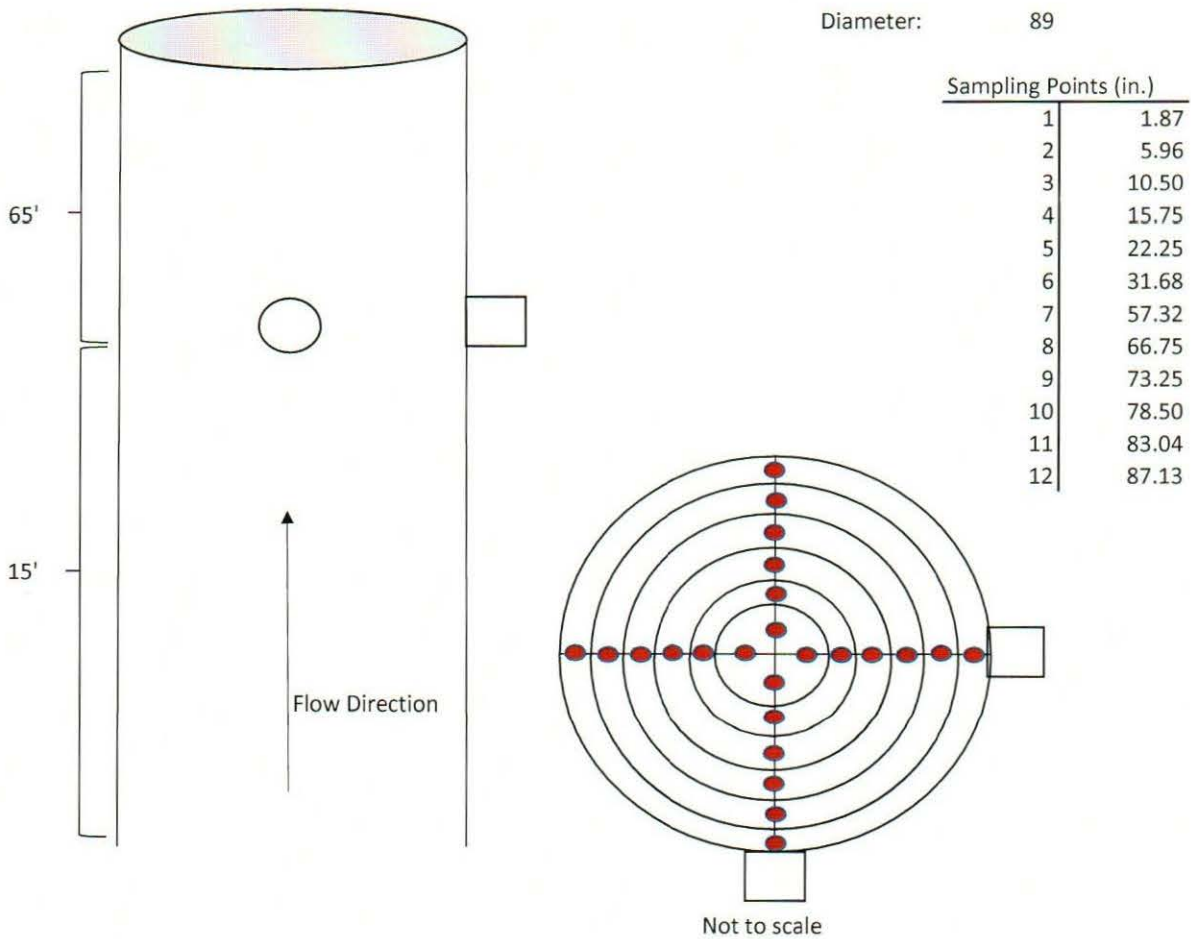
Stack 32
Ford Motor Company
Dearborn Truck Plant
Dearborn, Michigan

Date:
Week of October 2, 2023

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309



Figure No. 4



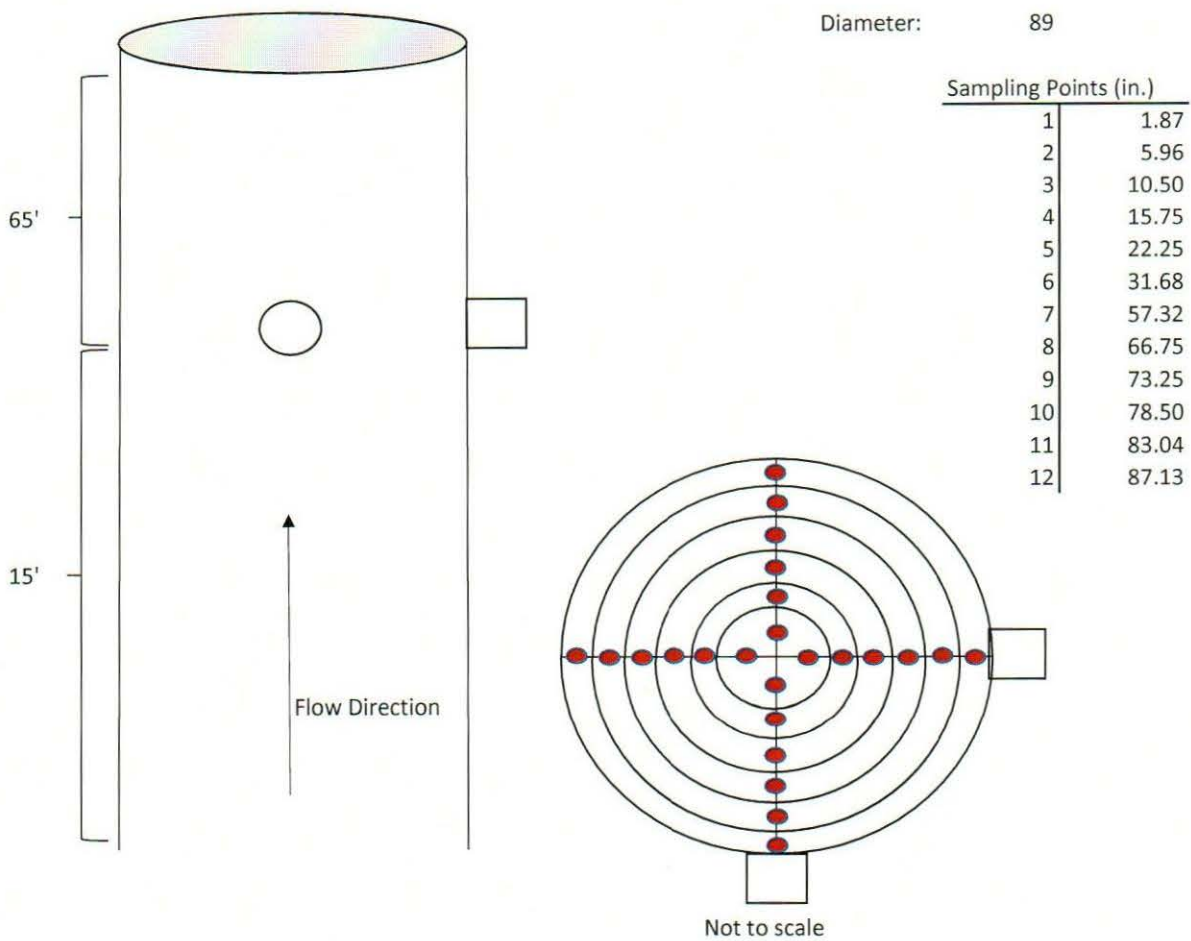
Clearcoat Cut-in Robots E1 - 42
Ford Motor Company
Dearborn Truck Plant
Dearborn, Michigan

Date:
Week of October 2, 2023

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309



Figure No. 5



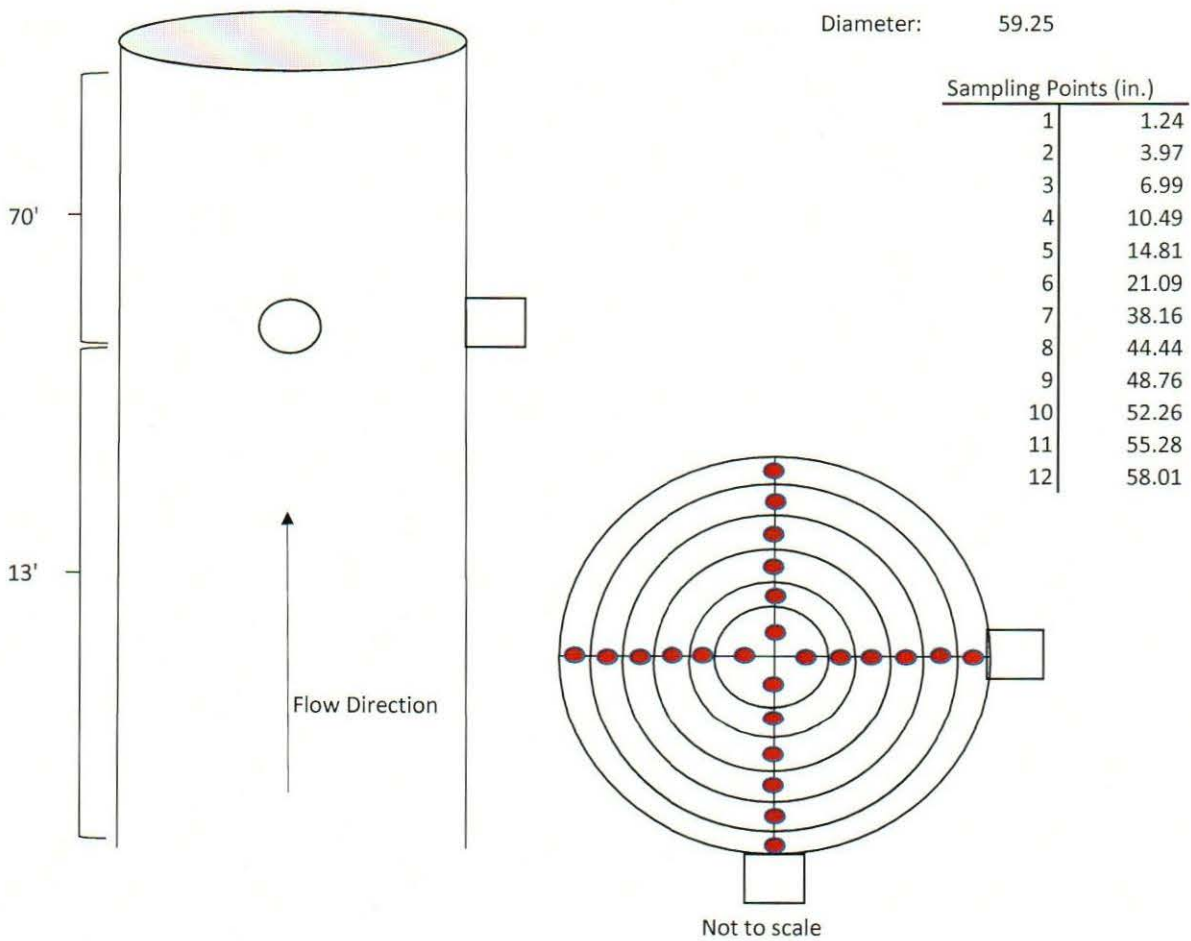
Clearcoat Cut-in Robots E2 - 45
Ford Motor Company
Dearborn Truck Plant
Dearborn, Michigan

Date:
Week of October 2, 2023

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2239 Star Court
Rochester Hills, MI 48309



Figure No. 6



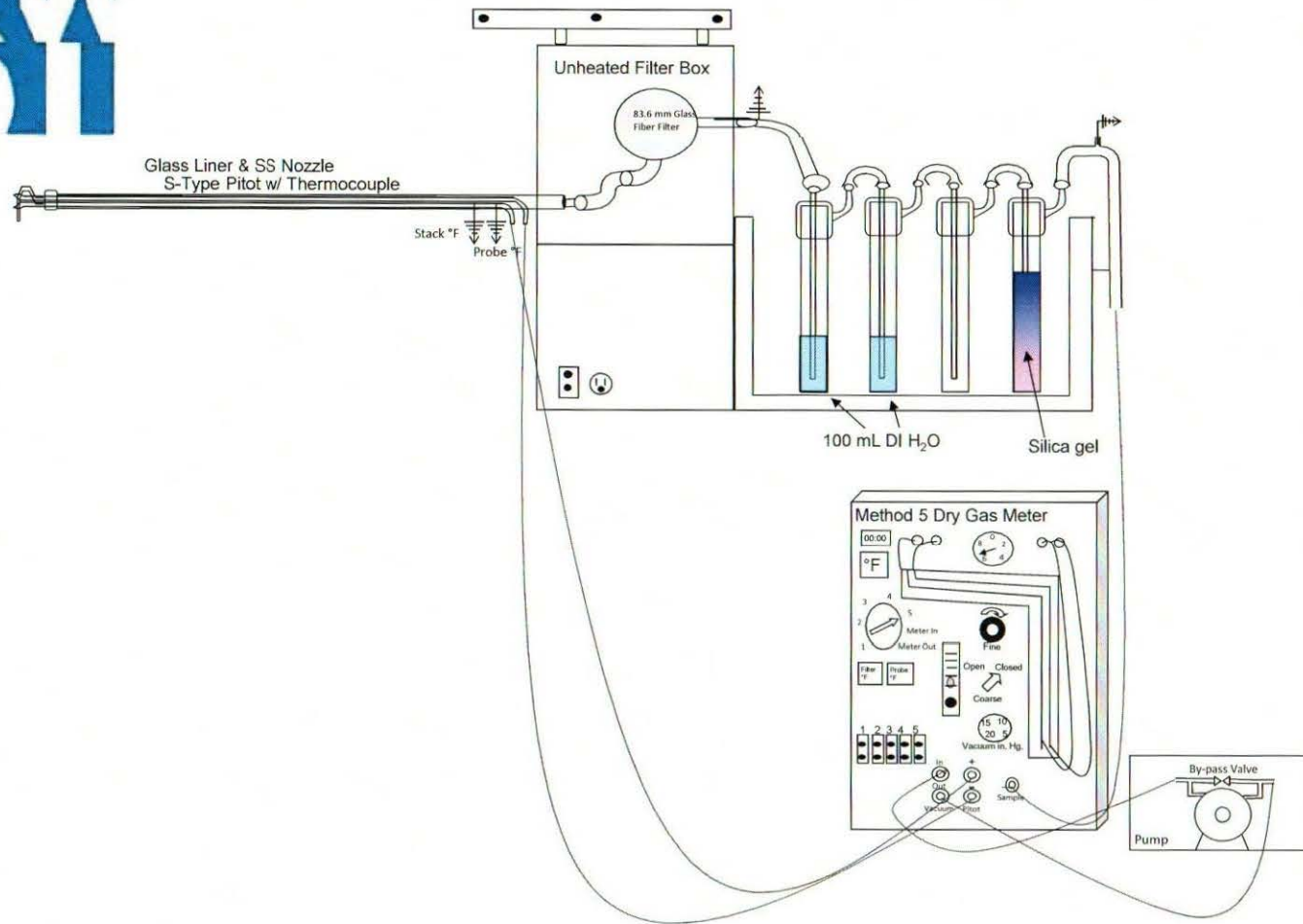
Stack 47 - Clearcoat Observation
Ford Motor Company
Dearborn Truck Plant
Dearborn, Michigan

Date:
Week of October 2, 2023

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309



Figure No. 7: Schematic of USEPA Method 5



USEPA Method 5

Ford Motor Company
Dearborn Truck Plant
Dearborn, Michigan

