

FINAL REPORT



GENERAL MOTORS, LLC

DETROIT, MICHIGAN

**EMISSIONS TESTING REPORT: DETROIT HAMTRAMCK ASSEMBLY
CENTER FACTORY ZERO: BOOTH AND OVEN RTO SYSTEMS
DESTRUCTION EFFICIENCY TESTING & PARTICULATE TESTING**

RWDI # 2306604

September 24, 2024

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EXECUTIVE SUMMARY

RWDI USA LLC (RWDI) has been retained by General Motors, LLC (GM) to complete the emission sampling program at the Detroit Hamtramck Assembly Center Factory ZERO located at 2500 East Grand Blvd, Detroit, Michigan.

The test program included measurements of Particulate Matter (PM, PM₁₀ and PM_{2.5}) from each of the Booth RTO and Oven RTO outlets. Total Hydrocarbons (THC) (or VOC) were tested at the inlet and outlet of each Booth RTO 110, Booth RTO 120, Booth RTO 130 and THC, Methane and Non-methane organic compounds or Volatile Organic Compounds (VOC) were tested at the inlet and outlet of each Oven RTO 210, and Oven RTO 220 to verify the destruction efficiency of each unit. The testing was completed to fulfill the requirements within the Michigan Department of Environment, Great Lakes, and Energy (EGLE) issued Permit to Install (PTI) 209-19A on April 15th, 2022 that outlines the following conditions for testing covered under this Source Testing Plan under Flexible Group FGAUTOASSEMBLY:

- Within 180 days of the end of the initial low production period as specified in SC III.1, the permittee shall conduct initial testing and, at least once every five years thereafter unless the permittee maintains a yearly demonstration that the most recent acceptable test remains valid and representative, the permittee shall verify PM, PM₁₀, and PM_{2.5} emission rates from each RTO stack as identified in a complete test plan by testing at owner's expense, in accordance with Department requirements.
- The permittee shall verify the destruction efficiency of each RTO in FGAUTOASSEMBLY by testing at the owner's expense, in accordance with Department requirements and according to the following schedule:
 - a) Within 365 days after the beginning of saleable vehicle production.
 - b) Within 180 days of the end of the initial low production period as specified in SC III.1.
 - c) Within 2 years of the testing required in SC V.5(b).
 - d) Within 2.5 years of the testing required in SC V.5(c).

For destruction efficiency testing, triplicate 60-minute tests were complete concurrently at the inlet and outlet of each RTO. Particulate matter consisted of triplicate 120-minute test at the outlet of the Booth RTO and Oven RTO.

The testing program was completed July 29th and July 30th, 2024.



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Executive Summary Table i: Average Emission Data - Booth RTO 110

Source	Parameter	Emission Rates			
		Run 1	Run 2	Run 3	Average
Booth RTO 110	THC (as Propane) Inlet	100.5 ppmvd 23.5 lb/hr	108.2 ppmvd 25.0 lb/hr	107.5 ppmvd 24.0 lb/hr	105.4 ppmvd 24.2 lb/hr
	THC (as Propane) Outlet	2.10 ppmvd 0.42 lb/hr	4.53 ppmvd 1.05 lb/hr	2.81 ppmvd 0.57 lb/hr	3.15 ppmvd 0.68 lb/hr
	Destruction Efficiency (%)	98.2 %	95.8 %	97.6 %	97.2 %

Executive Summary Table ii: Average Emission Data - Booth RTO 120

Source	Parameter	Emission Rates			
		Run 1	Run 2	Run 3	Average
Booth RTO 120	THC (as Propane) Inlet	109.8 ppmvd 16.1 lb/hr	113.2 ppmvd 20.5 lb/hr	114.6 ppmvd 21.3 lb/hr	112.5 ppmvd 19.3 lb/hr
	THC (as Propane) Outlet	2.24 ppmvd 0.65 lb/hr	3.74 ppmvd 0.97 lb/hr	2.57 ppmvd 0.74 lb/hr	2.85 ppmvd 0.79 lb/hr
	Destruction Efficiency (%)	96.0 %	95.2 %	96.5 %	95.9 %

Executive Summary Table iii: Average Emission Data - Booth RTO 130

Source	Parameter	Emission Rates			
		Run 1	Run 2	Run 3	Average
Booth RTO 130	THC (as Propane) Inlet	114.5 ppmvd 29.0 lb/hr	115.8 ppmvd 29.2 lb/hr	118.9 ppmvd 28.4 lb/hr	116.4 ppmvd 28.8 lb/hr
	THC (as Propane) Outlet	1.65 ppmvd 0.40 lb/hr	1.88 ppmvd 0.47 lb/hr	1.83 ppmvd 0.44 lb/hr	1.79 ppmvd 0.44 lb/hr
	Destruction Efficiency (%)	98.6 %	98.4 %	98.5 %	98.5 %

Executive Summary Table iv: Average PM/PM10/PM2.5 - Booth RTO Combined Outlet

Parameter	Destruction Efficiency (%)			
	Run 1	Run 2	Run 3	Average
PM/PM2.5/PM10	0.80 lb/hr 0.0009 gr./dscf	0.83 lb/hr 0.0009 gr./dscf	1.06 lb/hr 0.0011 gr./dscf	0.90 lb/hr 0.0010 gr./dscf



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Executive Summary Table v: Average Emission Data - Oven RTO 210

Source	Parameter	Emission Rates			
		Run 1	Run 2	Run 3	Average
Oven RTO 210	VOC (as Propane) Inlet	91.39 ppmvd 18.7 lb/hr	97.61 ppmvd 20.3 lb/hr	88.17ppmvd 17.7 lb/hr	92.39 ppmvd 18.8 lb/hr
	VOC (as Propane) Outlet	1.58 ppmvd 0.32 lb/hr	1.52 ppmvd 0.29 lb/hr	2.73 ppmvd 0.54 lb/hr	1.94 ppmvd 0.38 lb/hr
	Destruction Efficiency (%) VOC	98.3% VOC	98.6 % VOC	96.9 % VOC	97.9 % VOC

Executive Summary Table vi: Average Emission Data - Oven RTO 220

Source	Parameter	Emission Rates			
		Run 1	Run 2	Run 3	Average
Oven RTO 220	NMOC (as Propane) Inlet	80.94 ppmvd 23.6 lb/hr	85.67 ppmvd 24.2 lb/hr	84.11 ppmvd 23.8 lb/hr	83.31 ppmvd 23.9lb/hr
	NMOC (as Propane) Outlet	2.75 ppmvd 0.80 lb/hr	2.39 ppmvd 0.69 lb/hr	2.60 ppmvd 0.79 lb/hr	2.57 ppmvd 0.74 lb/hr
	Destruction Efficiency (%) VOC	96.6 % VOC	97.1 % VOC	96.7 % VOC	96.9 % VOC

Executive Summary Table vii: Average PM/PM₁₀/PM_{2.5} - Oven RTO Combined Outlet

Parameter	Destruction Efficiency (%)			
	Run 1	Run 2	Run 3	Average
PM/PM _{2.5} /PM ₁₀	0.81 lb/hr 0.0012 gr./dscf	0.85 lb/hr 0.0013 gr./dscf	0.64 lb/hr 0.0009 gr./dscf	0.77 lb/hr 0.0011 gr./dscf

Notes: All emission data is based on a volumetric flow rate expressed as cfm



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1 INTRODUCTION

RWDI USA LLC (RWDI) has been retained by General Motors, LLC (GM) to complete the emission sampling program at the Detroit Hamtramck Assembly Center Factory ZERO located at 2500 East Grand Blvd, Detroit, Michigan.

The test program included measurements of Particulate Matter (PM, PM₁₀ and PM_{2.5}) from each of the Booth RTO and Oven RTO outlets. Total Hydrocarbons (THC) (or VOC) were tested at the inlet and outlet of each Booth RTO 110, Booth RTO 120, Booth RTO 130 and THC, Methane and Non-methane organic compounds or Volatile Organic Compounds (VOC) were tested at the inlet and outlet of each Oven RTO 210, and Oven RTO 220 to verify the destruction efficiency of each unit. The testing was completed to fulfill the requirements within the Michigan Department of Environment, Great Lakes, and Energy (EGLE) issued Permit to Install (PTI) 209-19A on April 15th, 2022 that outlines the following conditions for testing covered under this Source Testing Plan under Flexible Group FGAUTOASSEMBLY:

- Within 180 days of the end of the initial low production period as specified in SC III.1, the permittee shall conduct initial testing and, at least once every five years thereafter unless the permittee maintains a yearly demonstration that the most recent acceptable test remains valid and representative, the permittee shall verify PM, PM₁₀, and PM_{2.5} emission rates from each RTO as identified in a complete test plan by testing at owner's expense, in accordance with Department requirements.
- The permittee shall verify the destruction efficiency of each RTO in FGAUTOASSEMBLY by testing at the owner's expense, in accordance with Department requirements and according to the following schedule:
 - e) Within 365 days after the beginning of saleable vehicle production.
 - f) Within 180 days of the end of the initial low production period as specified in SC III.1.
 - g) Within 2 years of the testing required in SC V.5(b).
 - h) Within 2.5 years of the testing required in SC V.5(c).

For destruction efficiency testing, triplicate 60-minute tests were complete concurrently at the inlet and outlet of each RTO. Particulate matter consisted of triplicate 120-minute test at the outlet of the Booth RTO and Oven RTO.

The testing program was completed July 29th and July 30th, 2024.



1.1 Location and Dates of Testing

The test program was completed on July 29th and July 30th, 2024 at the GM Factory ZERO facility located at 2500 East Grand Blvd, Detroit, Michigan.

1.2 Purpose of Testing

The purpose of the emissions test program was to verify emissions required by Michigan Department of Environment, Great Lakes, and Energy (EGLE) Permit to Install (PTI) 209-19A.

1.3 Description of Source

ELPO - An electrodeposition coating process (ELPO) consisting of a coating dip tank, followed by a series of rinse tanks, and two (2) natural gas-fired ELPO curing ovens, each with a cooling zone. Repairs take place in an ELPO sand booth to correct minor imperfections. Emissions from the coating tank and the curing ovens are controlled by the bank of Oven RTOs.

Sealer - Various manual and robotic sealer, adhesive, and sound deadener material application stations/booths. Sealers, fillers, and liquid applied sound deadener materials applied in the paint shop after the ELPO and prior to primer application are air-dried prior to further curing in the primer curing ovens. VOC emissions released in the primer curing ovens will be controlled by the appropriate RTO(s).

Prime - A prep area, an automatic primer booth for application of solvent borne main primer and solvent borne two-tone primer, a primer observation zone, an ambient flash-off area, two (2) natural gas-fired primer curing ovens, each with a cooling tunnel, and a booth for manual wet sanding repair to correct surface blemishes. Emissions are controlled by two banks of RTOs.

Topcoat - An automatic topcoat spray application process consisting of a waterborne basecoat coating booth, a basecoat heated flash-off area, a solvent borne clearcoat coating booth, an observation zone, and a natural gas-fired curing oven. All emissions are controlled by two banks of RTOs.

The destruction efficiency will be determined by measuring the inlet and outlet of each of the Booth RTOs (RTO 110, 120, and 130) individually as well as the Oven RTOs (RTO 210 and 220) individually. RWDI will measure the three (3) Booth RTOs concurrently. The two (2) Oven RTOs will also be tested concurrently, however the timing for production emissions may offset the start time of the testing between the Booth RTOs and the Oven RTOs.

1.4 Sampling Locations Overview

The sampling locations for each source is located outside. **Figure Section** outlines the stack diameters and upstream and downstream distances to flow disturbances.



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1.5 Personnel Involved in Testing

Table 1.5.1: Testing Personnel

Jessica Alderton Staff Environmental Engineer	General Motors, LLC Detroit Hamtramck Assembly Plant (Factory ZERO) 2500 East Grand Blvd Detroit, MI 48211	(586) 863-8490 Jessica.Alderton@gm.com
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Roy Zimmer Field Technician		Roy.Zimmer@rwdi.com
Hunter Griggs Field Technician		Hunter.Griggs@rwdi.com



2 SUMMARY OF RESULTS

2.1 Operating Data

GM personnel monitored the process during the testing. All process data can be found in **Appendix A**.

2.2 Applicable Permit Number

Detroit Hamtramck Assembly Center Factory ZERO, SRN M4199, operates under Permit to Install 209-19A.

3 SOURCE DESCRIPTION

3.1 Description of Process and Emission Control Equipment

Refer to Section 1.3.

3.2 Process Flow Sheet or Diagram (if applicable)

Process flow diagram can be provided upon request.

3.3 Type and Quantity of Raw and Finished Materials

Various raw materials are used for the assembly of vehicles. For the ELPO, Prime, Basecoat and Clearcoat processes, the vehicles are coated in separate booths by robots with various material.

3.4 Normal Rated Capacity of Process

Testing was completed under normal operating conditions.

3.5 Process Instrumentation Monitored During the Test

No process instrumentation was monitored during testing.



4 SAMPLING AND ANALYTICAL PROCEDURES

4.1 Description of Sampling Train and Field Procedures

4.1.1 Stack Velocity, Temperature, and Volumetric Flow Rate Determination

The exhaust velocities and flow rates were determined following the USEPA Method 2, "Determination of Stack Gas Velocity and 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 USEPA Method 2. 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.

There are two (2) sources identified as not meeting the minimum distance from flow disturbance as outlined in USEPA Method 1:

- Booth RTO 110 Inlet; and
- Oven RTO 220 Inlet.

For these sources, RWDI utilized a 3D probe as per the Alternative Measurement Site Selection Procedures in Method 1 Section 11.5 with the 3D probe

There are a total of four (4) sources that were identified as not able to measure for flow rate given the non-ideal locations, these sources include the following:

- Booth RTO 120 Inlet;
- Booth RTO 110 Outlet;
- Oven RTO 210 Inlet; and
- Oven RTO 210 Outlet.

As discussed with EGLE on June 20th, 2024 the following was completed to obtain the flow rate estimate for each of the inlet and outlets from the RTOs:

Booth RTO inlet measurements consisted of the following:

- Booth RTO 110 Inlet
- Booth RTO 130 Inlet
- Booth RTO Inlet Main Header
 - The flow rate for Booth RTO 120 inlet was determined by using the measured overall flow rate from the Booth RTO Main header and subtracting from the measured data at RTO 110 and RTO 130 Booth Inlet



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Booth RTO Outlet measurements consisted of the following:

- Booth RTO 120 Outlet (note that this flow location includes flow from RTO 120 and 130 Outlet combined)
- Booth RTO 130 Outlet
- Booth RTO Combined Exhaust (SVR55)
 - The flow rate for Booth RTO 120 outlet was determined by using the measured combined flow rate of RTO 120 and 130 and subtracting from the measured flowrate of RTO 130 outlet.
 - The flow rate from Booth RTO 110 outlet was determined by using the measured flow rate from the RTO outlet main stack (SVR55) and subtracting from the measured and calculated flow rate of RTO 120 and RTO 130 outlet.

Oven RTO inlet measurements consisted of the following:

- Oven RTO 220 Inlet
- Oven RTO Inlet Main Header
 - The flow rate for Oven RTO 210 inlet was determined by using the overall measured flow rate from the Oven RTO Inlet Main header and subtracting from the measured flow rate at RTO 220 Oven Inlet

Oven RTO Outlet measurements consisted of the following:

- Oven RTO 220 Outlet
- Oven RTO Combined Exhaust (SVR56)
 - The flow rate from Oven RTO 210 outlet was determined by from the measured flow rate from the RTO outlet main stack (SVR56) and subtracting the measured flow rate of RTO 220 outlet.

The dry molecular weight of the stack gas was determined following calculations outlined in USEPA Method 3, "Determination of Molecular Weight of Dry Stack Gas" from each of the flow measurement locations. Stack moisture content was determined through direct condensation and according to USEPA Method 4, "Determination of Moisture Content of Stack Gas" from each of the flow measurement locations. Moisture was collected for 30 minutes during each of the Destruction Efficiency tests for each source where flow measurements were taken. For the PM tests, moisture was taken over the duration of the PM test runs.

For any source under 200°F, the wet bulb/dry bulb procedure was used to calculate moisture.



4.1.2 Sampling for Total Hydrocarbons, Methane and Non-Methane Organic Hydrocarbons (NMOCs) (Destruction Efficiency)

VOC (as Non-Methane Organic Hydrocarbons (NMOCs)) Destruction Efficiency testing was performed simultaneously on the inlet and outlet of each the three Booth RTOs and the two Oven RTOs. The measurements were taken continuously following the USEPA Method 25A on the inlets and outlets.

The compliance test consisted of three 60-minute tests on each unit at the preferred temperature as predetermined by GM. Regular performance checks on the CEMS were carried out by zero and span calibration checks using USEPA Protocol calibration gases. These checks verified the ongoing precision of the monitor with time by introducing pollutant-free (zero) air followed by known calibration gas (span) into the monitor. The response of the monitor to pollutant-free air and the corresponding sensitivity to the span gases were reviewed frequently as an ongoing indication of analyzer performance.

Prior to testing, a 4-point analyzer calibration error check was conducted using USEPA protocol gases. The calibration error check was performed by introducing zero, low, 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 system at the probe outlet so that the calibration gases were analyzed in the same manner as the flue gas samples.

A gas sample was continuously extracted from the stack and delivered to a JUM 109A, which measures the pollutant concentrations in the gas. The analyzers were calibrated on-site using EPA Protocol No. 1 certified calibration mixtures. The probe tip was equipped with a sintered stainless-steel filter for particulate removal. The end of the probe was connected to a heated Teflon sample line, which delivers the sample gases from the stack to the CEM system. The heated sample line was designed to maintain the gas temperature above 250°F in order to prevent condensation of stack gas moisture within the line.



4.1.3 Sampling for Particulate Matter (PM, PM₁₀ and PM_{2.5})

Particulate matter (PM/PM₁₀/PM_{2.5}) was sampled following procedures outlined in USEPA Method 5 and Method 202 (Condensable Particulate Matter).

Testing was performed on the combined outlet of the Booth System RTO (SVR55) and Oven System RTO (SVR56) only. Measurements were taken following USEPA Method 5 (filterable) front half and USEPA Method 202 (condensable particulate matter) back half.

Three (3) 120-minute tests were performed on the noted outlet of each system during the compliance program.

A stack sample is withdrawn isokinetically from the source, particulate emissions are collected in the probe and on a heated filter and the condensable particulate matter were collected in the back half of the train. All samples were sent to the laboratory for analysis. RWDI completed the filterable particulate analysis in-house and the condensable particulate matter was sent to ALS Global for analysis.

Since the testing used USEPA Method 5 and 202. All data will be assumed equivalent to PM/PM₁₀/PM_{2.5}.

4.2 Description of Recovery and Analytical Procedures

The recoveries followed USEPA Methods 5 and 202.



5 TEST RESULTS AND DISCUSSION

5.1 Detailed Results

The following tables give a summary of the Destruction Efficiency and Particulate Matter testing complete at GM Factory ZERO. More detailed data for the Destruction Efficiency testing can be found in **Appendix B**, and detailed Particulate Matter results are in **Appendix D**. Each individual must show an average of at least 95% destruction efficiency.

Table 5.1.1: Average Emission Data - Booth RTO 110

Source	Parameter	Emission Rates			
		Run 1	Run 2	Run 3	Average
Booth RTO 110	THC (as Propane) Inlet	100.5 ppmvd 23.5 lb/hr	108.2 ppmvd 25.0 lb/hr	107.5 ppmvd 24.0 lb/hr	105.4 ppmvd 24.2 lb/hr
	THC (as Propane) Outlet	2.10 ppmvd 0.42 lb/hr	4.53 ppmvd 1.05 lb/hr	2.81 ppmvd 0.57 lb/hr	3.15 ppmvd 0.68 lb/hr
	Destruction Efficiency (%)	98.2 %	95.8 %	97.6 %	97.2 %

Table 5.1.2: Average Emission Data - Booth RTO 120

Source	Parameter	Emission Rates			
		Run 1	Run 2	Run 3	Average
Booth RTO 120	THC (as Propane) Inlet	109.8 ppmvd 16.1 lb/hr	113.2 ppmvd 20.5 lb/hr	114.6 ppmvd 21.3 lb/hr	112.5 ppmvd 19.3 lb/hr
	THC (as Propane) Outlet	2.24 ppmvd 0.65 lb/hr	3.74 ppmvd 0.97 lb/hr	2.57 ppmvd 0.74 lb/hr	2.85 ppmvd 0.79 lb/hr
	Destruction Efficiency (%)	96.0 %	95.2 %	96.5 %	95.9 %

Table 5.1.3: Average Emission Data - Booth RTO 130

Source	Parameter	Emission Rates			
		Run 1	Run 2	Run 3	Average
Booth RTO 130	THC (as Propane) Inlet	114.5 ppmvd 29.0 lb/hr	115.8 ppmvd 29.2 lb/hr	118.9 ppmvd 28.4 lb/hr	116.4 ppmvd 28.8 lb/hr
	THC (as Propane) Outlet	1.65 ppmvd 0.40 lb/hr	1.88 ppmvd 0.47 lb/hr	1.83 ppmvd 0.44 lb/hr	1.79 ppmvd 0.44 lb/hr
	Destruction Efficiency (%)	98.6 %	98.4 %	98.5 %	98.5 %

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Table 5.1.4: Average PM/PM10/PM2.5 - Booth RTO Combined Outlet

Parameter	Destruction Efficiency (%)			
	Run 1	Run 2	Run 3	Average
PM/PM2.5/PM10	0.80 lb/hr 0.0009 gr./dscf	0.83 lb/hr 0.0009 gr./dscf	1.06 lb/hr 0.0011 gr./dscf	0.90 lb/hr 0.0010 gr./dscf

Table 5.1.5: Average Emission Data - Oven RTO 210

Source	Parameter	Emission Rates			
		Run 1	Run 2	Run 3	Average
Oven RTO 210	VOC (as Propane) Inlet	91.39 ppmvd 18.7 lb/hr	97.61 ppmvd 20.3 lb/hr	88.17 ppmvd 17.7 lb/hr	92.39 ppmvd 18.8 lb/hr
	VOC (as Propane) Outlet	1.58 ppmvd 0.32 lb/hr	1.52 ppmvd 0.29 lb/hr	2.73 ppmvd 0.54 lb/hr	1.94 ppmvd 0.38 lb/hr
	Destruction Efficiency (%) VOC	98.3% VOC	98.6 % VOC	96.9 % VOC	97.9 % VOC

Table 5.1.6 Average Emission Data - Oven RTO 220

Source	Parameter	Emission Rates			
		Run 1	Run 2	Run 3	Average
Oven RTO 220	NMOC (as Propane) Inlet	80.94 ppmvd 23.6 lb/hr	85.67 ppmvd 24.2 lb/hr	84.11 ppmvd 23.8 lb/hr	83.31 ppmvd 23.9 lb/hr
	NMOC (as Propane) Outlet	2.75 ppmvd 0.80 lb/hr	2.39 ppmvd 0.69 lb/hr	2.60 ppmvd 0.79 lb/hr	2.57 ppmvd 0.74 lb/hr
	Destruction Efficiency (%) VOC	96.6 % VOC	97.1 % VOC	96.7 % VOC	96.9 % VOC

Table 5.1.7: Average PM/PM10/PM2.5 - Oven RTO Combined Outlet

Parameter	Destruction Efficiency (%)			
	Run 1	Run 2	Run 3	Average
PM/PM2.5/PM10	0.81 lb/hr 0.0012 gr./dscf	0.85 lb/hr 0.0013 gr./dscf	0.64 lb/hr 0.0009 gr./dscf	0.77 lb/hr 0.0011 gr./dscf

Notes: All emission data is based on a volumetric flow rate expressed as cfm



5.2 Process Upset Conditions During Testing

There were no major process upsets during testing.

5.3 Maintenance Performed in Last Three Months

Only routine maintenance has been performed within the last three months.

5.4 Audit Samples

This test did not require any audit samples.

5.5 Field Data Sheets

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

5.6 Calibration Sheets

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

5.7 Laboratory Data

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

TABLES

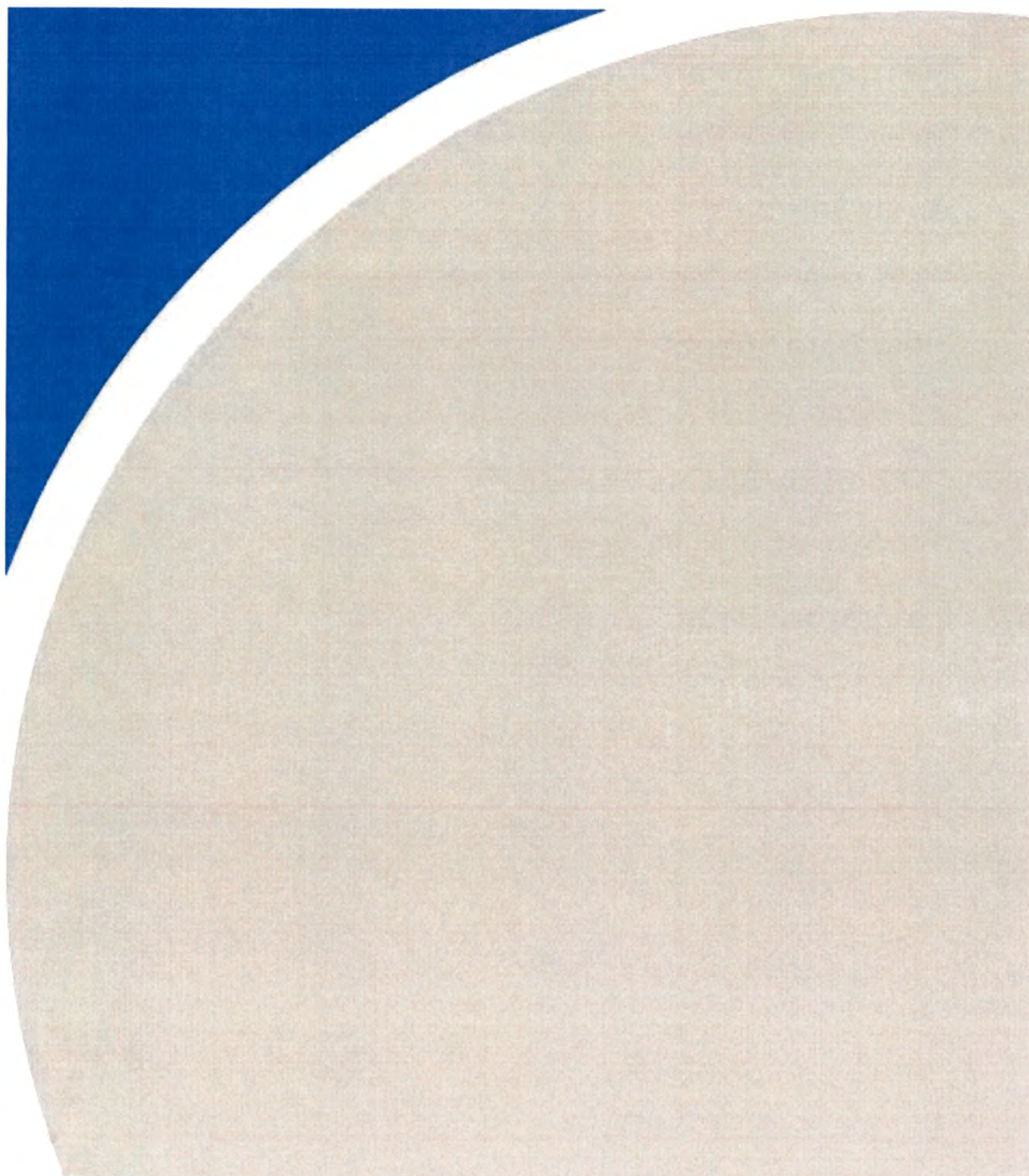


Table 1: Summary of Sampling Parameters and Methodology

Source Location	No. of Tests	Sampling Parameter	Sampling Method
Booth RTO 110 Inlet & Outlet	3	Velocity, Temperature and Flow Rate	U.S. EPA ^[1] Method 1-4
	3	VOC	U.S. EPA ^[1] Method 25A
	3	Gas Dilution	U.S. EPA ^[1] Method 205
Booth RTO 120 Inlet & Outlet	3	Velocity, Temperature and Flow Rate	U.S. EPA ^[1] Method 1-4
	3	VOC	U.S. EPA ^[1] Method 25A
	3	Gas Dilution	U.S. EPA ^[1] Method 205
Booth RTO 130 Inlet and Outlet	3	Velocity, Temperature and Flow Rate	U.S. EPA[1] Method 1-4
	3	VOC	U.S. EPA[1] Method 25A
	3	Gas Dilution	U.S. EPA[1] Method 205
Booth RTO Outlet	3	Velocity, Temperature and Flow Rate	U.S. EPA[1] Method 1-4
	3	Filterable Particulate Matter	U.S. EPA[1] Method 5
	3	Condensable Particulate Matter	U.S. EPA[1] Method 202
Oven RTO 210 Inlet & Outlet	3	Velocity, Temperature and Flow Rate	U.S. EPA[1] Method 1-4
	3	VOC	U.S. EPA[1] Method 25A
	3	Gas Dilution	U.S. EPA[1] Method 205
Oven RTO 220 Inlet & Outlet	3	Velocity, Temperature and Flow Rate	U.S. EPA[1] Method 1-4
	3	VOC	U.S. EPA[1] Method 25A
		Gas Dilution	U.S. EPA[1] Method 205
Oven RTO Outlet	3	Velocity, Temperature and Flow Rate	U.S. EPA[1] Method 1-4
	3	Filterable Particulate Matter	U.S. EPA[1] Method 5
	3	Condensable Particulate Matter	U.S. EPA[1] Method 202

Notes:

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

Table 2a: Sampling Summary and Sample Log - VOCs

Source and Test #	Sampling Date	Start Time	End Time
Booth RTOs			
Test #1	29-Jul-24	9:00 AM	9:59 AM
Test #2	29-Jul-24	1:45 PM	2:44 PM
Test #3	30-Jul-24	11:58 AM	12:57 PM
Oven RTOs			
Test #1	29-Jul-24	9:10 AM	10:09 AM
Test #2	29-Jul-24	1:55 PM	2:54 PM
Test #3	30-Jul-24	12:08 PM	1:07 PM

Table 2b: Sampling Summary and Sample Log - Particulate Matter

Source and Test #	Sampling Date	Start Time	End Time	Filter ID	Lab ID
Velocity & Particulate Matter					
Booth RTO Recovery Blank	29-Jul-24	-	-	-	L2756960-7
Booth RTO Proof Blank	29-Jul-24	-	-	-	L2756960-8
Oven RTO Recovery Blank	29-Jul-24	-	-	-	L2756960-9
Oven RTO Proof Blank	29-Jul-24	-	-	-	L2756960-10
Method 5 Filter Blank	29-Jul-24	-	-	QZ249	-
Booth RTO Outlet					
Test #1	29-Jul-24	9:00 AM	11:56 AM	QZ251	L2756960-1
Test #2	29-Jul-24	1:29 PM	3:43 PM	QZ250	L2756960-2
Test #3	30-Jul-24	11:55 AM	2:10 PM	QZ248	L2756960-3
Oven RTO Outlet					
Test #1	29-Jul-24	9:10 AM	11:19 AM	QZ254	L2756960-4
Test #2	29-Jul-24	1:24 PM	3:36 PM	QZ253	L2756960-5
Test #3	30-Jul-24	12:14 PM	2:31 PM	QZ252	L2756960-6

Table 3a: Sampling Summary - Booth RTO - Flow Characteristics (DE)

RTO 110[2]		Test No. 1		Test No. 2		Test No. 3		Inlet	Outlet
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Average	Average
Testing Date		29-Jul-24		29-Jul-24		30-Jul-24		-	-
Stack Temperature	°F	80	Not Measured	82	Not Measured	82	Not Measured	81	Not Measured
Moisture	%	1.6%	Not Measured	1.8%	Not Measured	1.5%	Not Measured	1.65%	Not Measured
Velocity	ft/s	24.9	Not Measured	24.7	Not Measured	24.0	Not Measured	24.5	Not Measured
Referenced Flow Rate[1]	CFM	34,107	29,180	33,657	33,916	32,579	29,628	33,448	30,908
RTO 120[3]		Test No. 1		Test No. 2		Test No. 3		Inlet	Outlet
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Average	Average
Testing Date		29-Jul-24		29-Jul-24		30-Jul-24		-	-
Stack Temperature	°F	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
Moisture	%	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
Velocity	ft/s	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
Referenced Flow Rate[1]	CFM	21,400	42,103	26,381	38,006	27,120	41,732	24,967	40,614
RTO 120 & RTO 130[4]		Test No. 1		Test No. 2		Test No. 3		Inlet	Outlet
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Average	Average
Testing Date		29-Jul-24		29-Jul-24		30-Jul-24		-	-
Stack Temperature	°F	Not Applicable	166	Not Applicable	165	Not Applicable	165	Not Applicable	165
Moisture	%	Not Applicable	2.6%	Not Applicable	2.1%	Not Applicable	2.4%	Not Applicable	2.37%
Velocity	ft/s	Not Applicable	33.5	Not Applicable	32.0	Not Applicable	33.2	Not Applicable	32.9
Referenced Flow Rate[1]	CFM	Not Applicable	77,544	Not Applicable	74,516	Not Applicable	76,596	Not Applicable	76,219
RTO 130		Test No. 1		Test No. 2		Test No. 3		Inlet	Outlet
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Average	Average
Testing Date		29-Jul-24		29-Jul-24		30-Jul-24		-	-
Stack Temperature	°F	85	169	89	168	80	173	84.7	170
Moisture	%	1.8%	3.0%	1.9%	2.2%	1.7%	2.6%	1.77%	2.58%
Velocity	ft/s	27.9	29.6	28.0	30.2	26.2	29.4	27.4	29.7
Referenced Flow Rate[1]	CFM	36,994	35,441	36,785	36,510	34,895	34,864	36,225	35,605
Main Duct		Test No. 1		Test No. 2		Test No. 3		Inlet	Outlet
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Average	Average
Testing Date		29-Jul-24		29-Jul-24		30-Jul-24		-	-
Stack Temperature	°F	82	171	91	171	78	171	83.6	170.7
Moisture	%	1.6%	2.2%	1.8%	2.1%	1.5%	2.6%	1.65%	2.30%
Velocity	ft/s	37.3	34.9	39.7	34.8	38.1	35.2	38.4	34.9
Referenced Flow Rate[1]	CFM	92,501	106,724	96,823	108,432	94,594	106,224	94,639	107,127

Notes:

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

[2] RTO 110 Outlet was not measured and was calculated based on the difference from the Main RTO Outlet Exhaust and the combined RTO 120 & 130 duct measurements

[3] RTO 120 Inlet and Outlet was not measured. RTO 120 Inlet was calculated based on the difference from the Main Booth Inlet measurements minus the measured RTO110 and 130 inlet measurements.

RTO 120 Outlet was calculated by subtracting the combined RTO 130 and RTO 120 Outlet duct measurement from the RTO 130 Outlet measurement

[4] Due to complexity of sampling locations, the combined flow from RTO 120 and RTO 130 was completed

Table 3b: Sampling Summary - Oven RTO - Flow Characteristics (DE)

RTO 210[2,3]		Test No. 1		Test No. 2		Test No. 3		Inlet Average	Outlet Average
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet		
Testing Date		29-Jul-24		29-Jul-24		30-Jul-24		-	-
Stack Temperature	°F	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
Moisture	%	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
Velocity	ft/s	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured	Not Measured
Referenced Flow Rate[1]	CFM	29,784	29,419	30,257	27,557	29,211	29,080	29,751	28,685
RTO 220		Test No. 1		Test No. 2		Test No. 3		Inlet Average	Outlet Average
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet		
Testing Date		29-Jul-24		29-Jul-24		30-Jul-24		-	-
Stack Temperature	°F	234	321	226	218	230	228	229.9	255.7
Moisture	%	4.0%	3.7%	2.8%	2.5%	3.2%	3.3%	3.35%	3.16%
Velocity	ft/s	32.0	43.9	30.6	39.1	31.0	42.2	31.2	41.7
Referenced Flow Rate[1]	CFM	42,519	42,169	41,126	42,193	41,269	44,172	41,638	42,845
Oven Main Duct		Test No. 1		Test No. 2		Test No. 3		Inlet Average	Outlet Average
		Inlet	Outlet	Inlet	Outlet	Inlet	Outlet		
Testing Date		29-Jul-24		29-Jul-24		30-Jul-24		-	-
Stack Temperature	°F	234	319	231	314	237	317	234.0	316.3
Moisture	%	3.7%	3.6%	4.8%	3.5%	3.9%	3.5%	4.12%	3.52%
Velocity	ft/s	43.8	42.2	41.5	40.8	41.3	43.4	42.2	42.1
Referenced Flow Rate[1]	CFM	72,303	71,588	71,383	69,750	70,480	73,252	71,389	71,530

Notes:

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

[2] RTO 210 Inlet was not measured and was calculated based on the difference from the Oven Main Duct Inlet and the measured flow rate from RTO 220 Inlet

[3] RTO 210 Outlet was not measured and was calculated based on the difference from the Main RTO Outlet Exhaust and the measured flow rate from RTO 220 outlet

Table 3c: Sampling Summary - Flow Characteristics (Particulate Matter)

Source	Stack Gas Parameter		Test No. 1	Test No. 2	Test No. 3	TOTAL AVERAGE
Booth RTO	Stack Temperature	°F	170	170	169	170
	Moisture	%	2.2%	2.1%	2.6%	2.3%
	Velocity	ft/s	34.9	35.0	34.7	34.9
	Referenced Flow Rate ^[1]	dscfm	109,196	108,190	107,534	108,307
	Sampling Isokinetic Rate	%	101.1	101.3	101.4	101
Oven RTO	Stack Temperature	°F	318	315	317	317
	Moisture	%	3.6%	3.5%	3.5%	3.5%
	Velocity	ft/s	47.4	45.4	46.6	46.5
	Referenced Flow Rate ^[1]	dscfm	80,419	77,398	78,752	78,856
	Sampling Isokinetic Rate	%	101.5	100.8	100.5	101

Notes:

[1] All Referenced concentration values are expressed at 68°F, 29.92 in. Hg and Actual Oxygen

Table 4: Results Summary Table - Destruction Efficiency - Booth RTO 110

Source: Booth RTO 110

RWDI Project # 2306604

Parameter	1	2	3	Average
Date	29-Jul-24	29-Jul-24	30-Jul-24	--
Start Time:	9:00	13:45	11:58	--
Stop Time:	9:59	14:44	12:57	--
Duration (mins):	60	60	60	--
Set Point Temperature for RTO (°F):	1520	1520	1520	1520
Booth RTO 110 Booth Inlet Flow Rate (dscfm):	34,107	33,657	32,579	33,448
Moisture:	0.016	0.018	0.015	0.016
Booth RTO 110 Booth Inlet VOC Concentration (as propane) (ppmw):	98.9	106.3	105.9	103.7
Booth RTO 110 Booth Inlet VOC Concentration (as propane) (ppmd):	100.5	108.2	107.5	105.4
Booth RTO 110 Booth Inlet THC Concentration (as propane) (lb/hrd):	23.5	25.0	24.0	24.2
Booth RTO 110 Booth Outlet Flow Rate (dscfm):	29,180	33,916	29,628	30,908
Moisture:	0.026	0.021	0.024	0.023
Booth RTO 110 Booth Outlet THC Concentration (as propane) (ppmw):	2.05	4.44	2.75	3.08
Booth RTO 110 Booth Outlet THC Concentration (as propane) (ppmd):	2.10	4.53	2.81	3.15
Booth RTO 110 Booth Outlet THC Concentration (as propane) (lb/hrd):	0.42	1.05	0.57	0.68
Destruction Efficiency (THC) (%):	98.2%	95.8%	97.6%	97.2%

Note: "d" indicated based on dry conditions

Table 5: Results Summary Table - Destruction Efficiency - Booth RTO 120

Source: Booth RTO 120

RWDI Project # 2306604

Parameter	1	2	3	Average
Date	29-Jul-24	29-Jul-24	30-Jul-24	--
Start Time:	9:00	13:45	11:58	--
Stop Time:	9:59	14:44	12:57	--
Duration (mins):	60	60	60	--
Set Point Temperature for RTO (°F):	1520	1520	1520	1520
Booth RTO 120 Inlet Flow Rate (dscfm):	21,400	26,381	27,120	24,967
Moisture:	0.017	0.016	0.017	0.017
Booth RTO 120 Inlet VOC Concentration (as propane) (ppm _w):	107.9	111.3	112.7	110.7
Booth RTO 120 Inlet VOC Concentration (as propane) (ppm _d):	109.8	113.2	114.6	112.5
Booth RTO 120 Inlet THC Concentration (as propane) (lb/hr _d):	16.1	20.5	21.3	19.3
Booth RTO 120 Outlet Flow Rate (dscfm):	42,103	38,006	41,732	40,614
Moisture:	0.026	0.023	0.026	0.025
Booth RTO 120 Outlet THC Concentration (as propane) (ppm _w):	2.18	3.65	2.50	2.78
Booth RTO 120 Outlet THC Concentration (as propane) (ppm _d):	2.24	3.74	2.57	2.85
Booth RTO 120 Outlet THC Concentration (as propane) (lb/hr _d):	0.65	0.97	0.74	0.79
Destruction Efficiency (THC) (%):	96.0%	95.2%	96.5%	95.9%

Note: "d" indicated based on dry conditions

Table 6: Results Summary Table - Destruction Efficiency - Booth RTO 130

Source: Booth RTO 130

RWDI Project # 2306604

Parameter	1	2	3	Average
Date	29-Jul-24	29-Jul-24	30-Jul-24	--
Start Time:	9:00	13:45	11:58	--
Stop Time:	9:59	14:44	12:57	--
Duration (mins):	60	60	60	--
Set Point Temperature for RTO (°F):	1520	1520	1520	1520
Booth RTO 130 Inlet Flow Rate (dscfm):	36,994	36,785	34,895	36,225
Moisture:	0.018	0.016	0.016	0.017
Booth RTO 130 Inlet VOC Concentration (as propane) (ppm _w):	112.5	113.9	116.9	114.4
Booth RTO 130 Inlet VOC Concentration (as propane) (ppm _d):	114.5	115.8	118.9	116.4
Booth RTO 130 Inlet THC Concentration (as propane) (lb/hr _d):	29.0	29.2	28.4	28.9
Booth RTO 130 Outlet Flow Rate (dscfm):	35,441	36,510	34,864	35,605
Moisture:	0.030	0.023	0.023	0.026
Booth RTO 130 Outlet THC Concentration (as propane) (ppm _w):	1.60	1.84	1.78	1.74
Booth RTO 130 Outlet THC Concentration (as propane) (ppm _d):	1.65	1.88	1.83	1.79
Booth RTO 130 Outlet THC Concentration (as propane) (lb/hr _d):	0.40	0.47	0.44	0.44
Destruction Efficiency (THC) (%):	98.6%	98.4%	98.5%	98.5%

Note: "d" indicated based on dry conditions

Table 7: Results Summary Table - Destruction Efficiency - Oven RTO 210

Source: Owens RTO 210

RWDI Project # 2306604

Parameter	1	2	3	Average
Date	29-Jul-24	29-Jul-24	30-Jul-24	--
Start Time:	9:10	13:55	12:08	--
Stop Time:	10:09	14:54	13:07	--
Duration (mins):	60	60	60	--
Set Point Temperature for RTO (°F):	1520	1520	1520	1520
Inlet Flow Rate (dscfm):	29,784	30,257	29,211	29,751
Moisture:	0.037	0.048	0.039	0.041
Inlet VOC Concentration (as propane) (ppm _w):	91.7	96.6	89.1	92.5
Inlet VOC Concentration (as propane) (ppm _d):	95.2	101.4	92.7	96.4
Inlet THC Concentration (as propane) (lb/hr _d):	19.4	21.0	18.6	19.7
Inlet Methane Correction Factor	2.23	2.27	2.27	2.25
Inlet Methane Concentration (as methane) (ppm _w):	8.07	8.16	9.85	8.69
Inlet Methane Concentration (as methane) (ppm _d):	8.37	8.57	10.24	9.06
Inlet Methane Concentration (as propane) (ppm _d):	3.76	3.78	4.52	4.02
Inlet Methane Concentration (as propane) (lb/hr):	0.77	0.79	0.91	0.82
Inlet NMOC Concentration (as propane) (ppmv):	91.39	97.61	88.17	92.39
Inlet NMOC Concentration (as propane) (lbs/hr):	18.66	20.25	17.66	18.86
Outlet Flow Rate (dscfm):	29,419	27,557	29,080	28,685
Moisture:	0.037	0.025	0.033	0.032
Outlet THC Concentration (as propane) (ppm _w):	2.29	2.18	3.37	2.61
Outlet THC Concentration (as propane) (ppm _d):	2.38	2.23	3.48	2.70
Outlet THC Concentration (as propane) (lb/hr _d):	0.48	0.42	0.69	0.53
Outlet Methane Correction Factor	2.44	2.44	2.37	2.42
Outlet Methane Concentration (as methane) (ppm _w):	1.89	1.70	1.72	1.77
Outlet Methane Concentration (as methane) (ppm _d):	1.96	1.75	1.78	1.83
Outlet Methane Concentration (as propane) (ppm _d):	0.80	0.71	0.75	0.76
Outlet Methane Concentration (as propane) (lb/hr):	0.16	0.14	0.15	0.15
Outlet NMOC Concentration (as propane) (ppmv):	1.58	1.52	2.73	1.94
Outlet NMOC Concentration (as propane) (lbs/hr):	0.32	0.29	0.54	0.38
Destruction Efficiency (THC) (%):	97.5%	98.0%	96.3%	97.3%
Destruction Efficiency (NMOC) (%):	98.3%	98.6%	96.9%	97.9%

Note: "d" indicated based on dry conditions

Table 8: Results Summary Table - Destruction Efficiency - Oven RTO 220

Source: Owens RTO 220
 RWDI Project # 2306640

Parameter	1	2	3	Average
Date	29-Jul-24	29-Jul-24	30-Jul-24	--
Start Time:	9:10	13:55	12:08	--
Stop Time:	10:09	14:54	13:07	--
Duration (mins):	60	60	60	--
Average Temperature for RTO (°F):	1520	1520	1520	1520
Inlet Flow Rate (dscfm):	42,519	41,126	41,269	41,823
Moisture:	0.037	0.028	0.033	0.032
Inlet VOC Concentration (as propane) (ppm _w):	81.6	87.0	86.1	84.3
Inlet VOC Concentration (as propane) (ppm _d):	84.6	89.6	89.0	87.1
Inlet THC Concentration (as propane) (lb/hr _d):	24.7	25.3	25.2	25.0
Inlet Methane Correction Factor	2.21	2.12	2.07	2.16
Inlet Methane Concentration (as methane) (ppm _w):	7.88	7.98	9.73	7.93
Inlet Methane Concentration (as methane) (ppm _d):	8.18	8.21	10.06	8.20
Inlet Methane Concentration (as propane) (ppm _d):	3.70	3.88	4.86	3.79
Inlet Methane Concentration (as propane) (lb/hr):	1.08	1.09	1.38	1.09
Inlet NMOC Concentration (as propane) (ppmv):	80.94	85.67	84.11	83.31
Inlet NMOC Concentration (as propane) (lbs/hr):	23.60	24.16	23.80	23.88
Outlet Flow Rate (dscfm):	42,169	42,193	44,172	42,181
Moisture:	0.037	0.025	0.033	0.031
Outlet THC Concentration (as propane) (ppm _w):	2.86	2.52	3.07	2.69
Outlet THC Concentration (as propane) (ppm _d):	2.98	2.59	3.17	2.78
Outlet THC Concentration (as propane) (lb/hr _d):	0.86	0.75	0.96	0.80
Outlet Methane Correction Factor	2.43	2.43	2.24	2.43
Outlet Methane Concentration (as methane) (ppm _w):	0.52	0.47	1.23	0.49
Outlet Methane Concentration (as methane) (ppm _d):	0.54	0.48	1.28	0.51
Outlet Methane Concentration (as propane) (ppm _d):	0.22	0.20	0.57	0.21
Outlet Methane Concentration (as propane) (lb/hr):	0.06	0.06	0.17	0.06
Outlet NMOC Concentration (as propane) (ppmv):	2.75	2.39	2.60	2.57
Outlet NMOC Concentration (as propane) (lbs/hr):	0.80	0.69	0.79	0.74
Destruction Efficiency (THC) (%):	96.5%	97.0%	96.2%	96.8%
Destruction Efficiency (NMOC) (%):	96.6%	97.1%	96.7%	96.9%

Note: "d" indicated based on dry conditions

Table 9: Results Summary Table - Particulate Matter - Booth RTO Outlet

Company	GM Factory Zero			
Source	Booth RTO Outlet			
Date	29-Jul-24	29-Jul-24	30-Jul-24	
Test Number	Test 1	Test 2	Test 3	Average
Start Time	9:00	13:29	11:55	-
End Time	11:56	15:43	14:10	-
Stack Information				
Flow Rate (ft ³ /min) (Actual)	133,315	133,613	132,520	133,150
Flow (ft ³ /min) (Standard Wet)	111,683	110,463	110,413	110,853
Flow (ft ³ /min) (Standard Dry)	109,196	108,190	107,534	108,307
Flow (m ³ /min) (Standard Dry)	3,092	3,064	3,045	3,067
Particulate Results				
Nozzle/Probe/Filter Weight (mg)	0.8	1.2	1.1	1.0
Organic Condensable Particulate (mg)	2.7	3.3	4.4	3.5
Inorganic Condensable Particulate (mg)	3.1	2.3	2.6	2.7
Condensable Blank Correction (mg)	2.0	2.0	2.0	2.0
Total Particulate (mg)	4.6	4.8	6.1	5.2
Total Particulate Emission Rate (lb/hr)	0.80	0.83	1.06	0.90
Total Particulate Concentration lb/1000 lb (wet)	0.002	0.002	0.002	0.002
Total Particulate Concentration lb/1000 lb (dry)	0.002	0.002	0.002	0.002
Total Particulate Concentration mg/dscm (dry)	1.95	2.05	2.61	2.20
Total Particulate Concentration (gr/dscf)	0.0009	0.0009	0.0011	0.0010

Table 10: Results Summary Table - Particulate Matter - Oven RTO Outlet

Company	GM Factory Zero			
Source	Oven RTO Exhaust SVR56			
Date	29-Jul-24	29-Jul-24	30-Jul-24	
Test Number	Test 1	Test 2	Test 3	Average
Start Time	9:10	13:24	12:14	-
End Time	11:19	15:36	14:31	-
Stack Information				
Flow Rate (ft ³ /min) (Actual)	125,670	120,265	123,524	123,153
Flow (ft ³ /min) (Standard Wet)	83,434	80,189	81,584	81,736
Flow (ft ³ /min) (Standard Dry)	80,419	77,398	78,752	78,856
Flow (m ³ /min) (Standard Dry)	2,277	2,192	2,230	2,233
Particulate Results				
Nozzle/Probe/Filter Weight (mg)	0.6	2.1	1.0	1.2
Organic Condensable Particulate (mg)	3.5	3.3	2.9	3.2
Inorganic Condensable Particulate (mg)	4.6	3.6	3.3	3.8
Condensable Blank Correction (mg)	2.0	2.0	2.0	2.0
Total Particulate (mg)	6.7	7.0	5.2	6.3
Total Particulate Emission Rate (lb/hr)	0.81	0.85	0.64	0.77
Total Particulate Concentration lb/1000 lb (wet)	0.002	0.002	0.002	0.002
Total Particulate Concentration lb/1000 lb (dry)	0.002	0.002	0.002	0.002
Total Particulate Concentration mg/dscm (dry)	2.68	2.94	2.15	2.59
Total Particulate Concentration (gr/dscf)	0.0012	0.0013	0.0009	0.0011

FIGURES

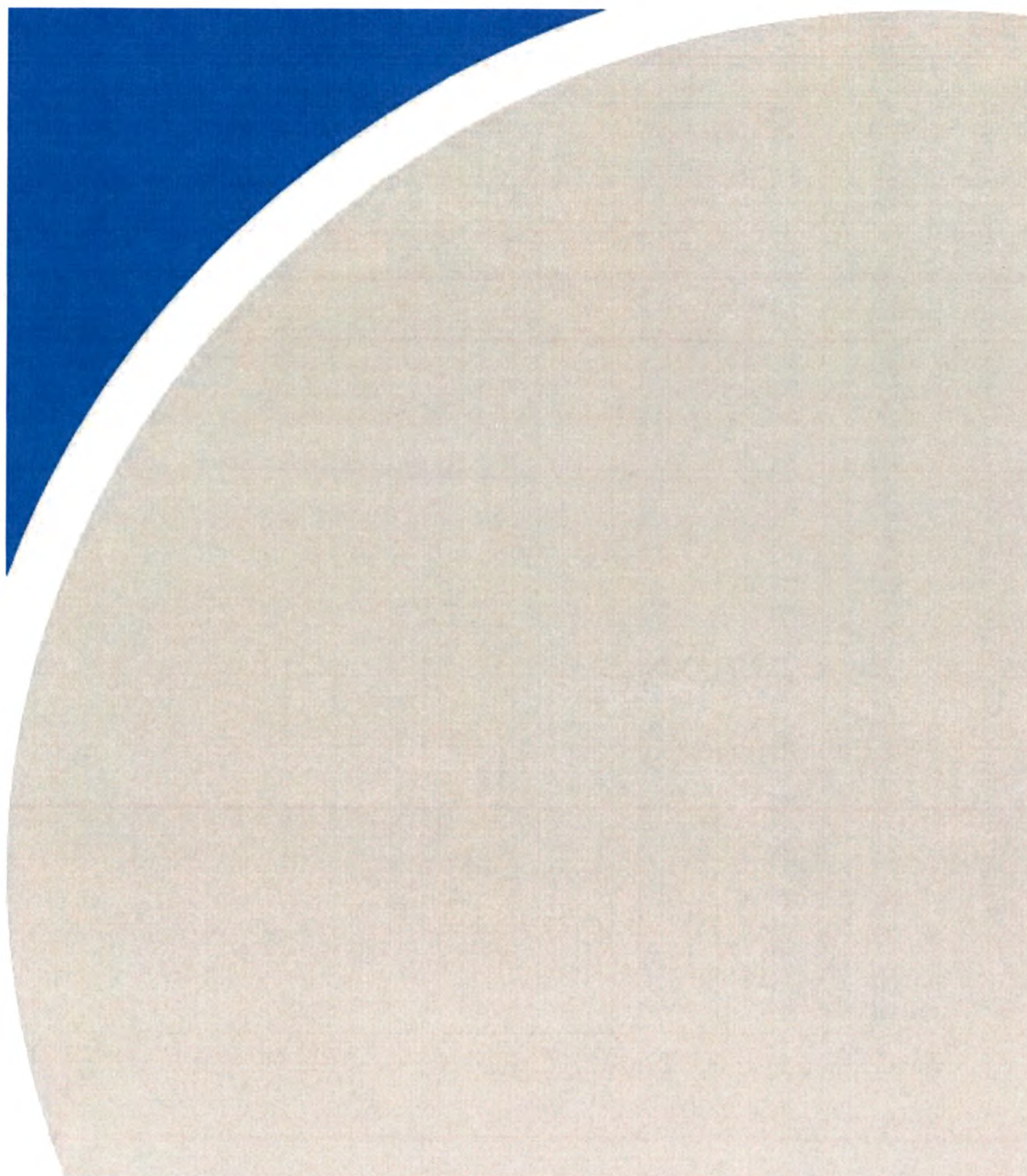
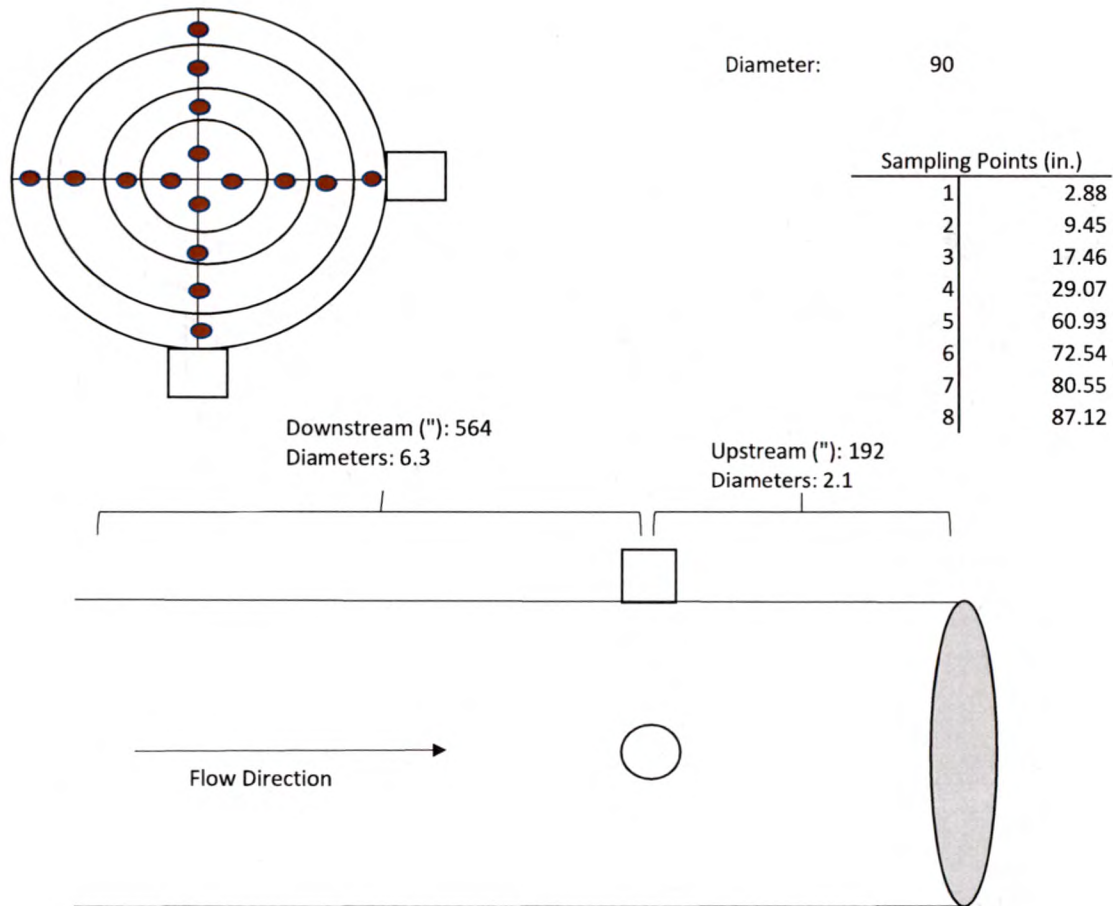




Figure No. 1: Sample Locations and Traverse Points - Booth RTO Main Inlet



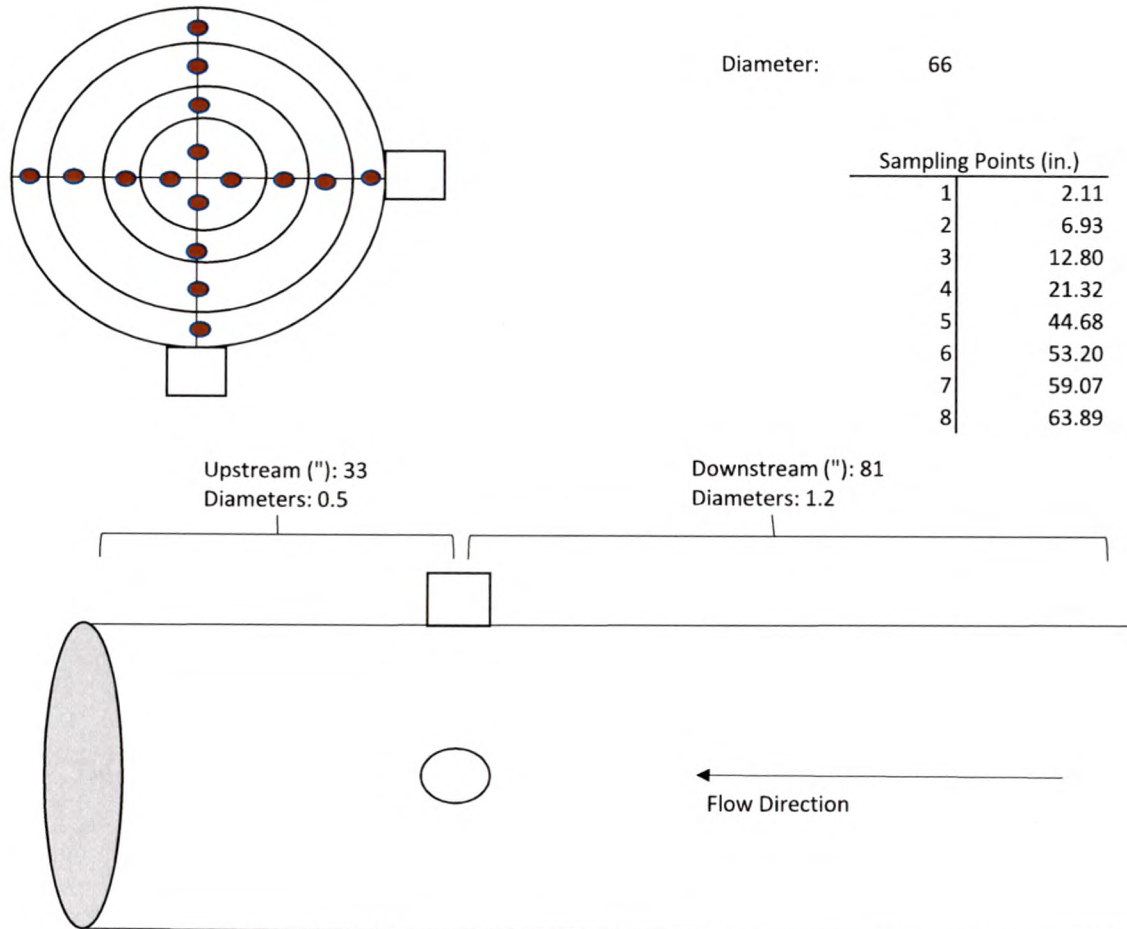
Booth RTO Main Inlet
General Motors, LLC
Factory ZERO
Detroit, Michigan

Date:
July 29-30, 2024

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309



Figure No. 2: Sample Locations and Traverse Points - Booth RTO 110 Inlet



Booth RTO 110 Inlet
General Motors, LLC
Factory ZERO
Detroit, Michigan

Date:
July 29-30, 2024

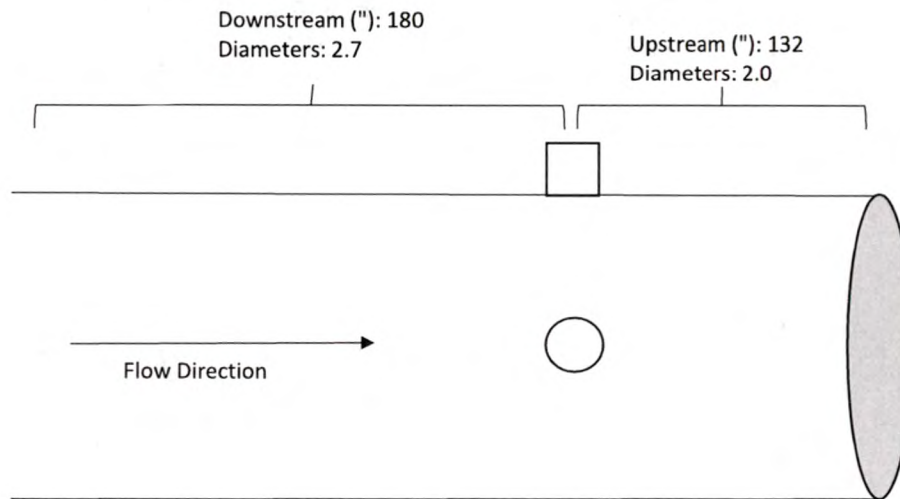
RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309



Figure No. 3: Sample Locations and Traverse Points - Booth RTO 130 Inlet

Diameter ("): 66

Sampling Points (in.)			
1	1.00	11	40.39
2	2.57	12	45.80
3	4.42	13	49.50
4	6.40	14	52.54
5	8.51	15	55.11
6	10.89	16	57.49
7	13.46	17	59.60
8	16.50	18	61.58
9	20.20	19	63.43
10	25.61	20	65.00



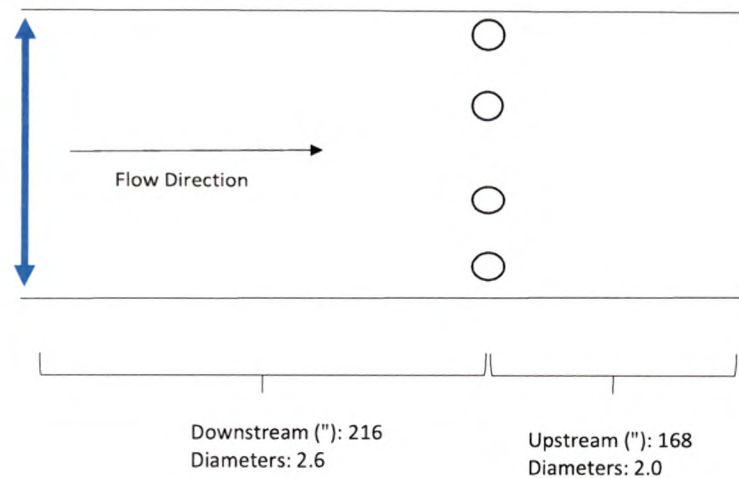
Booth RTO 130 Inlet
General Motors, LLC
Factory ZERO
Detroit, Michigan

Date:
July 29-30, 2024

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309



Figure No. 4: Sample Locations and Traverse Points - Booth RTO 120 Outlet



Diameter: 72" x 96"
Effective Diameter: 82 inches

Point	Distance from inside Wall (inches)			
	Port 1	Port 2	Port 3	Port 4
1	9.0	9.0	9.0	9.0
2	27.0	27.0	27.0	27.0
3	45.0	45.0	45.0	45.0
4	63.0	63.0	63.0	63.0

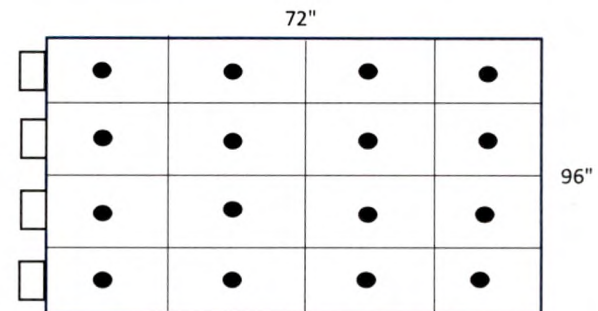
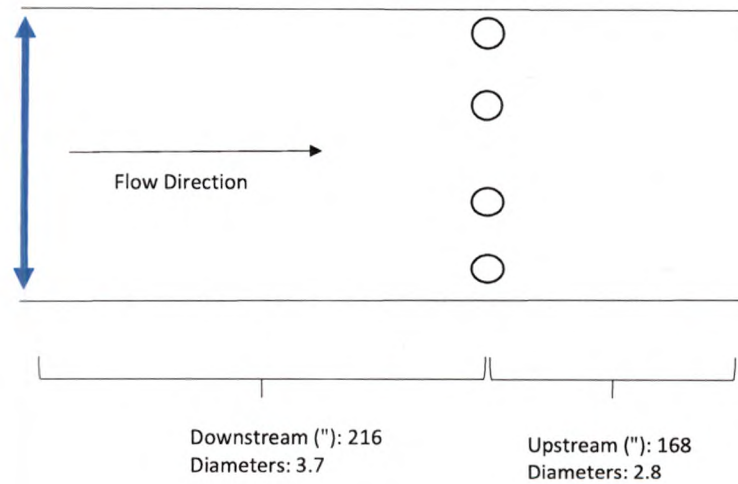




Figure No. 5: Sample Locations and Traverse Points - Booth RTO 130 Outlet



Diameter: 72" x 50"
Effective Diameter: 59 inches

Point	Distance from inside Wall (inches)			
	Port 1	Port 2	Port 3	Port 4
1	9.0	9.0	9.0	9.0
2	27.0	27.0	27.0	27.0
3	45.0	45.0	45.0	45.0
4	63.0	63.0	63.0	63.0

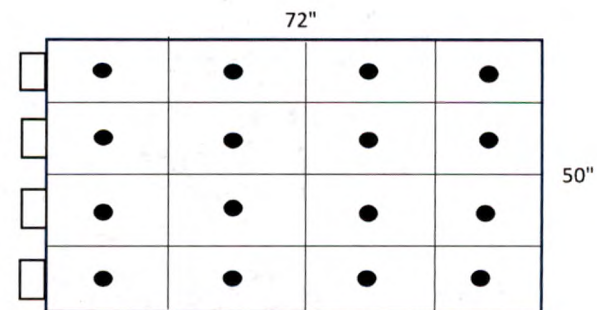




Figure No. 6: Sample Locations and Traverse Points - Booth RTO Main Outlet

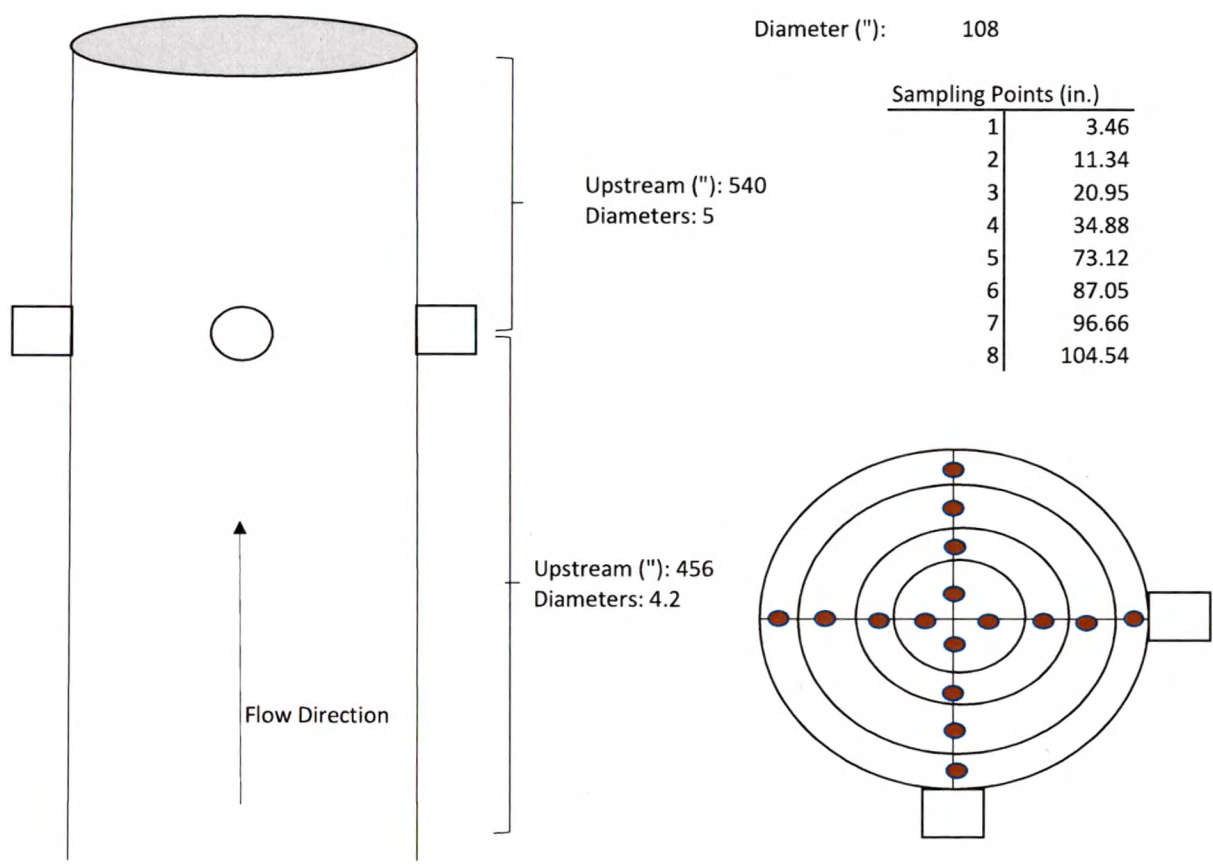
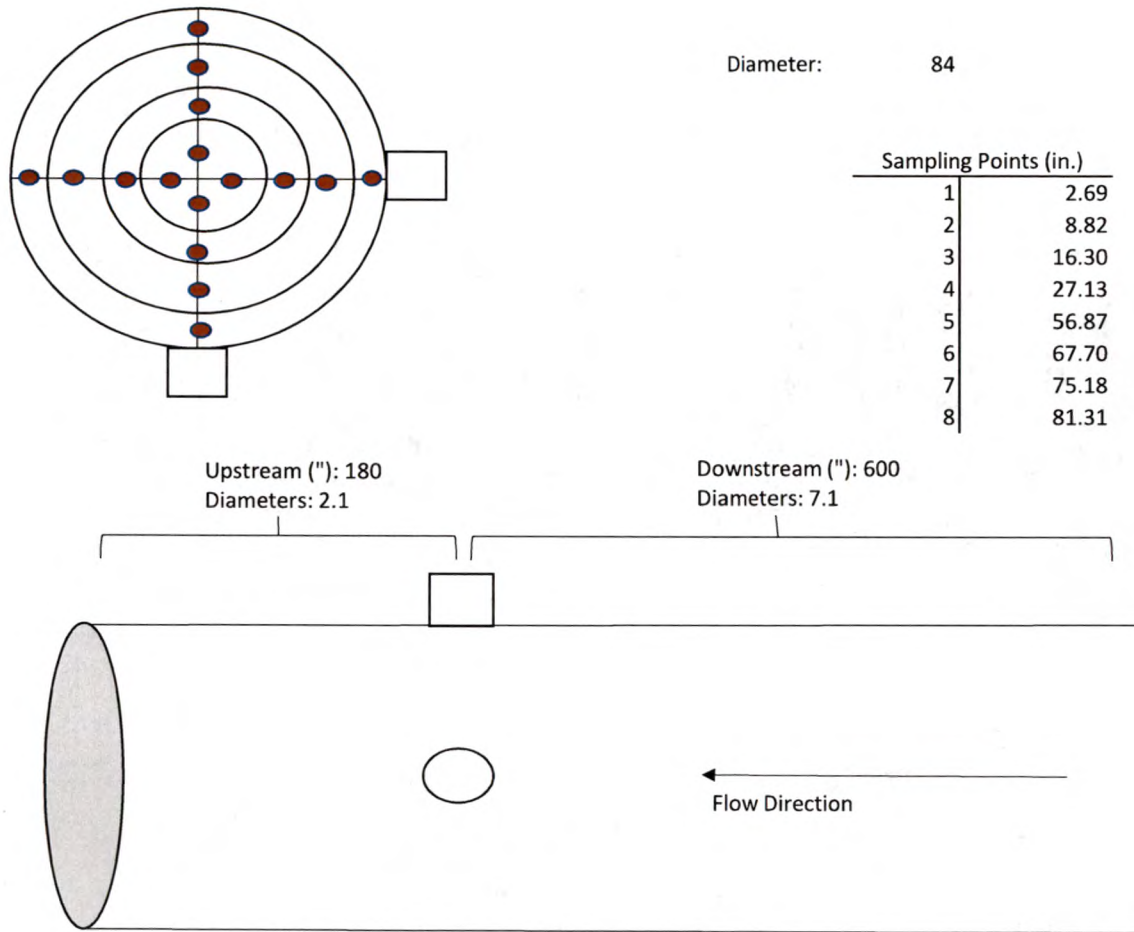




Figure No. 8: Sample Locations and Traverse Points - Oven RTO Main Inlet



Oven RTO Main Inlet
General Motors, LLC
Factory ZERO
Detroit, Michigan

Date:
July 29-30, 2024

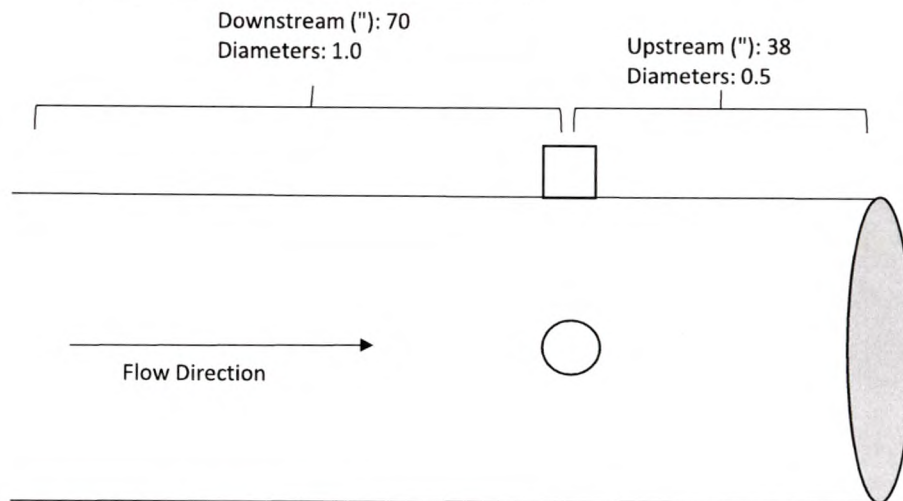
RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309



Figure No. 9: Sample Locations and Traverse Points - Oven RTO 220 Inlet

Diameter ("): 73

Sampling Points (in.)			
1	1.00	11	44.68
2	2.85	12	50.66
3	4.89	13	54.75
4	7.08	14	58.11
5	9.42	15	60.96
6	12.05	16	63.58
7	14.89	17	65.92
8	18.25	18	68.11
9	22.34	19	70.15
10	28.32	20	72.00



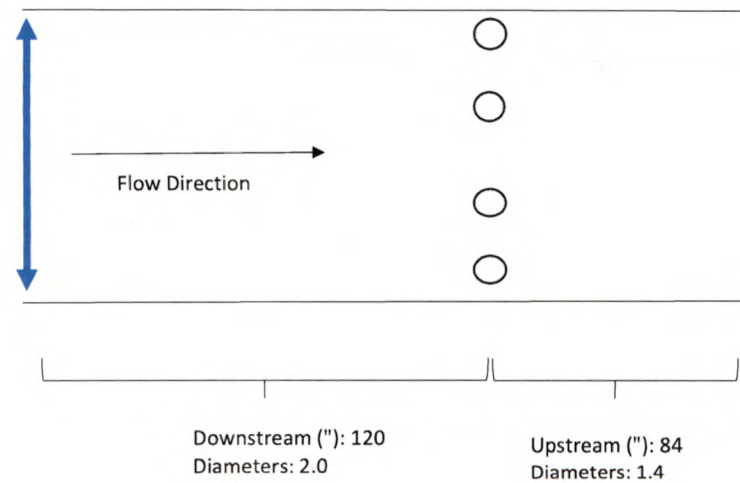
Oven RTO 220 Inlet
General Motors, LLC
Factory ZERO
Detroit, Michigan

Date:
July 29-30, 2024

RWDI USA LLC
2239 Star Court
Rochester Hills, MI 48309



Figure No. 10: Sample Locations and Traverse Points - Oven RTO 220 Outlet



Diameter: 58" x 60"
Effective Diameter: 59 inches

Point	Distance from inside Wall (inches)			
	Port 1	Port 2	Port 3	Port 4
1	7.5	7.5	7.5	7.5
2	22.5	22.5	22.5	22.5
3	37.5	37.5	37.5	37.5
4	52.5	52.5	52.5	52.5

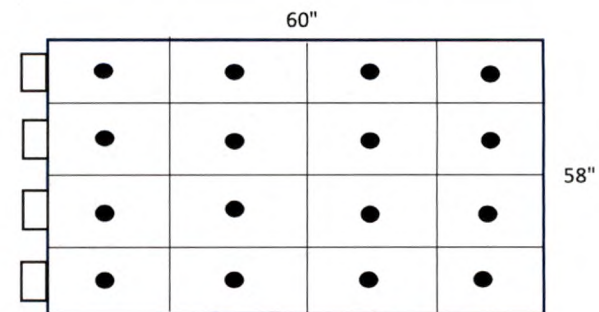
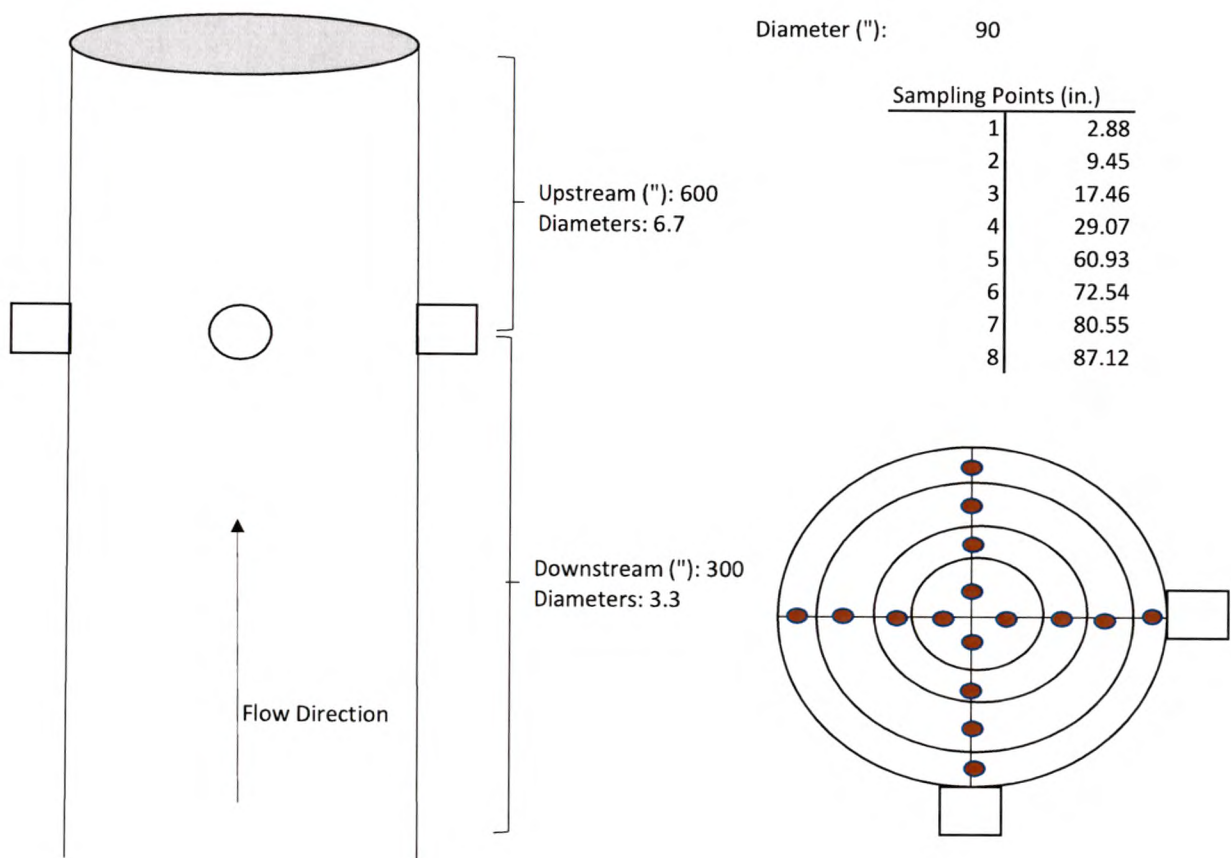




Figure No. 11: Sample Locations and Traverse Points - Oven RTO Main Outlet



Oven RTO Main Outlet

General Motors, LLC
Factory ZERO
Detroit, Michigan

Date:

July 29-30, 20024

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2239 Star Court
Rochester Hills, MI 48309